# IEEE Computer Society Region 10 Newsletter

## Vol. 1 :: No. 3 :: Jul – Sep 2021

## Message from Regional Coordinator, R10 IEEE Computer Society

Dear R10 IEEE Computer Society Members

Congratulations to the editorial team to release the third edition of Region 10 IEEE Computer Society Newsletter despite the current challenging situation. The readership of the R10 Computer Society Newsletter is increasing and we do get valuable feedbacks from members. Please feel free to provide your feedback and contributions to make it more valuable for members.

It has been more than a year we are facing the current global medical and health challenges due to ongoing pandemic. We are witnessing many alarming situations in several countries within Region 10 (Asia Pacific). I express my sincere concern to members and families who have been affected by this pandemic. I would like to advice members to take all the necessary safety measures on Covid-19 and adhere to the SOPs issued by local governments or authorities.

Despite all these challenges pandemic has brought upon us, it does not stop our volunteers to arrange more programs for our members. Numerous excellent programs to engage members for their professional and technical development has been done in last few months. We hope that continuous exposure of our activities will not only benefit the current members, but also attract new members to IEEE Computer Society.

We have appointed two new Area Coordinators; Prof. Shigeru Yamashita for Northern Area and Dr. David Tien for Australian and New Zealand Area. We take this opportunity to welcome the newly appointed Area Coordinators and I hope they can support the Chapter activities and increase membership in both Northern and Australian & New Zealand Areas. We are the largest and fastest-growing region in IEEE Computer Society. We have formed 7 new Student Branches across Region 10 in 2021 and some applications are in the pipeline for approval.

The IEEE Computer Society Grant was announced in July 2021. A total of $15,200.00 is allocated under this Grant for Region 10 Computer Chapters. Professional and Student Chapters in Region 10 are encouraged to apply this Grant to create and support more programs for their members. As of 31 August 2021, 32 Chapters (including Student Chapters) have applied for this Grant. Please contact your respective Chapter Chairs for details about this Grant.

I would like to thank all the members for your continuous support and organizing many programs for the benefit of the members despite the present challenging situation. I hope the pandemic will over soon and there will be a better tomorrow.

Kind regards,

Mohamed Rawidean Mohd Kassim
Regional Coordinator
IEEE Computer Society, Region 10
dean@mimos.my

## Message from Editor

Dear readers,

We are delighted in presenting the third issue of the IEEE Computer Society Region 10 Newsletter (IEEECS R10NL 21Q3) for the year 2021. This current issue of IEEEECS R10NL in 78 pages features the reports of IEEE CS R10 Webinars, IEEE Computer Society Chapter events held during May-Aug 2021 and the message from Dr. Mohamed Rawidean Mohd Kassim, Regional Coordinator, R10 IEEE Computer Society.

IEEECS R10NL thanks the chairs and representatives of Bangalore, Bangladesh, Hyderabad, Karachi, Kolkata and Madras CS Chapters for sending their activity reports as per guidelines. We also thank the anchors of the IEEE CS R10 Webinars. Our special thanks to Dr. Mohamed Rawidean Mohd Kassim, Regional Coordinator, R10 CS for his support & coordination in facilitating the reports from various sources. We also thank Mr. Saiteja Goud Karingu, an enthusiastic volunteer of GAC for his support to the newsletter.

This quarterly newsletter gets published at the end of each quarter. To bring out the issues on time, we need the reports, articles and other matters to reach us latest by the last week of Feb, May, Aug & Nov – depending on the 1st, 2nd, 3rd & 4th quarter issue respectively. While we were expecting activity reports from more chapters for the current issue, we suppose, due to covid-19 pandemic, the response was not to our expectation. However, for the last quarter issue, to be published in Dec 2021, we look forward to receiving matter from all the chapters, R10 GAC members, organizers of major events and other article contributors. The reports and relevant matter may please be sent directly to the dedicated email id ieeecs.r10nl@gmail.com as per the guidelines published in the newsletter and also at http://bit.ly/3jSdbBM

We are happy to inform the current issue features 12 articles as detailed below: Our thanks to the authors.

- Industry 4.0 @ Scale by Dr. Sanjay K Prasad, Mr. Sunil D Patil and Dr. Seshadri Subbanna, IBM, USA
- Application of Machine Learning in Life Sciences by Dr. Jayaraman Valadi, Flame University, Pune, India
- Massive Training and Collaborative Content Creation through Free/Libre and Open-Source Software (FLOSS) by Dr. Kannan M. Moudgalya, IIT Bombay, India
- Migrating University Campus Networks to IPv6: Challenges and Opportunities by Dr. Mohit P. Tahiliani, NITK Surathkal, India
- Technology in Telehealth by Dr. K. Ganapathy, Apollo Telemedicine Networking Foundation & Apollo Tele Health Services. Chennai, India
- Unlock the power of AI with IBM Watson by Mr. Vidyasagar Machupalli, IBM India
- It is not your parents Windows anymore! By Mr. T. N. C. Venkatarangan, Software Entrepreneur, Chennai, India
- Revisiting Immersive Technologies by Mr. Pradeep Khanna, Virtual Reality Augmented Reality Association, Australia
- Building a Promising Tech Product: The CredPad Experience by Mr. Pradeep Henry, CredPad, Chennai, India
- What Should be the Future of Virtual Work? Evolving a Post Pandemic Optimum by Dr. Sandhya Shekhar, Advisor and Strategy Consultant, Chennai, India
- Alignment for Business Transformation by Mrs. Poonam GK, Iyka Enterprises Inc. USA
- STEM Careers and Role of Women Coding Communities in Enabling Diversity and Inclusion by Dr. Renu Rajani, Women Who Code, Hyderabad Chapter, India

IEEEECS R10NL wishes to add that the veracity of the reports is not verified and the contributors are responsible for the same. Further, the views expressed in the articles are that of the author/contributor and the newsletter is not responsible for any consequences of using the information provided in them.

Our regular columns "Books" & "Information Resources" -- a compilation of interesting & reference value information from different reliable sources are included in the current issue along with the listing of several forthcoming virtual conferences and webinars being organised by IEEE CS for the benefit of our members.

Under the Announcements, we have included a note from Dr. Peter Mager, Chair, GAC on 2021 Chapter Grants Program and another note from Dr. Andre Oboler, Vice President, MGA related to IEEE CS organisational matters for the attention of the chapter leadership.

To realise our aim to make IEEEECS R10NL, a quality source of information to our members, we look forward to inputs from IEEE CS OUs, articles on current interest topics from academic community and professionals. We also encourage student members to contribute articles. Happy reading of IEEEECS R10NL 21Q3.

H.R. Mohan, Editor & Portfolio Member, IEEE CS R10 GAC, hrmohan.ieeecs@gmail.com

**R10 Webinar on Controlling Malaria with Agent Based Models**
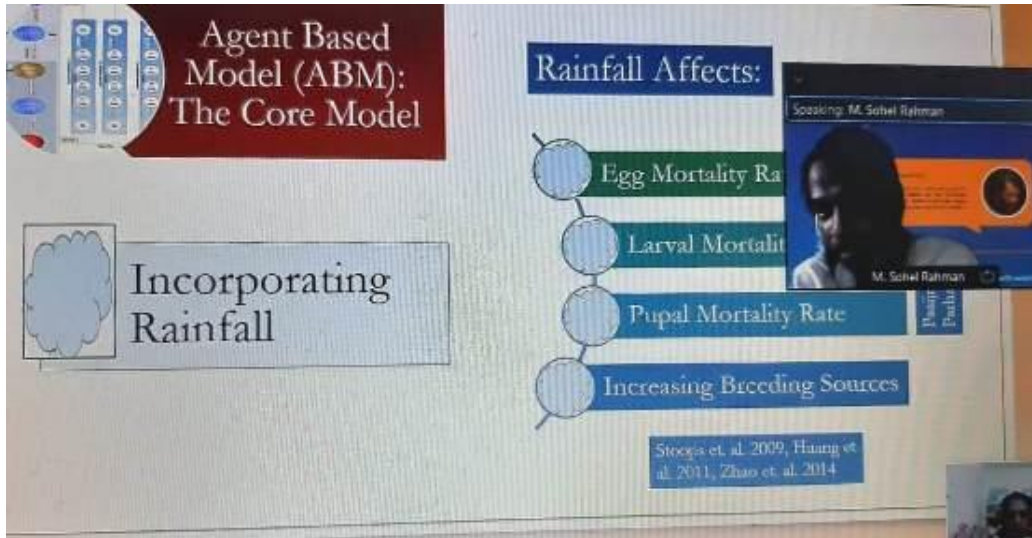


The fourth webinar of the IEEE Computer Society R10 Webinar Series was organized by the IEEE CS R10 GAC on Friday, Jul 30, 2021. The session was presented by Dr. M. Sohel Rahman [IEEE CS 2020–2022 Distinguished Speaker]. The talk revolved around the design and implementation of a spatial agent-based model based on the biological attributes of a Malaria vector called Anopheles vagus, which is widely distributed in Asia and a dominant vector in Bandarban, Bangladesh.

**R10 Webinar on Rise to the Challenge: Shaping Your Research Paper for Publication**



The fifth webinar of the IEEE Computer Society R10 Webinar Series was organised by the IEEE CS R10 GAC on Aug 31, 2021. The session was presented by Prof. San Murugesan, Director - BRITE Professional Services, Australia. In this talk, Professor San Murugesan discussed what makes a good paper and how to shape your paper for better appeal and success and highlighted the common shortcomings and offered practical guidelines for authors. He also discussed about the importance of obtaining Open Researcher Contributor ID, the purpose of literature review, plagiarism including self-plagiarism, adding references. The recording is available on-demand and can be viewed at https://bit.ly/ieeecsr10-aug-ondemand

*Report by: Mr. Saiteja Goud Karingu, saiteja.karingu@ieee.org*

**Member Notifications - Covid-19**

As a result of the Covid-19 crisis, IEEE Computer Society is offering a 50% discount on the Computer Society dues if you've suffered hardship as a result of the pandemic. If you have become unemployed, furloughed, or have become ill, please email membership@computer.org and a member service representative will guide you through the 2021 Covid-19 membership renewal. Reference: https://www.computer.org/membership

# Bangalore CS Chapter Activities

**List of events organized during May-Aug 2021**

| Sl. No | Type of Event | Start Date | Topic / Session Details | Speaker(s) |
|---|---|---|---|---|
| 1 | Talk | 04/05/2021 | Career Guidance | Dr. Srikanth Prabhu |
| 2 | Talk | 04/05/2021 | Emerging Trends in Computer Science | Narayanan Subramaniam |
| 3 | GirlGeeks2021 @NMIT | 15/05/2021 | Block Chain, DeFi & NFT, Identity Management, ETHEREUM | Ms. Swathi Pennapareddy Ms. Sanya Sareen Mr. Sanket Panchamia Dr. Rajendra Hegadi |
| 4 | IEEE CS - BITS APPCAIR Webinar Series | 18/05/2021 | Class Imbalanced Machine Learning: Recent Approaches and Future Challenges | Dr. Swagatham Das, ISI, Kolkata |
| 5 | Talk | 23/05/2021 | Edge Computing and Emerging Technologies | Mr. Ramneek Kalra |
| 6 | Talk | 24/05/2021 | Wireless IoT Network Protocols | Mr. Nagaraja G.S |
| 7 | IEEE CS - BITS APPCAIR Webinar Series | 28/05/2021 | Recent Research Topics in Evolutionary Multiobjective Optimization | Dr. Carlos Coello, UNSW, CINVESTAV, MEXICO |
| 8 | IEEE CS - BITS APPCAIR Webinar Series | 11/06/2021 | Learning an Optimal subsampling Policy for Tensor Sketches. | Dr. Chandrajit L Bajaj, Univeresity of Texas, Austin |
| 9 | Workshop | 16/06/2021 | "Getting to know Git" - A workshop on version control and Git | Mr. Anand Jagadeesh |
| 10 | IEEE CS - BITS APPCAIR Webinar Series | 18/06/2021 | Mahalanobis Distance and Classification in Dimensions 1,2,3 .... Infinity | Dr. Probal Chaudhuri, ISI, Kolkata |
| 11 | Hackathon / GirlGeeksHack | 19/06/2021 | Hackathon | |
| 12 | Student Chapters Meetup | 20/06/2021 | University Relations - Student Chapters Meetup | Dr. Vishwas Lakkundi Dr. Ramakrishna Hegde Dr. Abhishek Appaji Mr. Anand Jagadeesh |
| 13 | New Chapter Information Session | 03/07/2021 | University Relations Membership Recruitment Session at PES University | Dr Ramakrishna Hegde |
| 14 | Girlgeeks Talk @BMSIT | 17/07/2021 | Containers-Future of Hybrid Cloud | Dr.Sanjay H A |
| 15 | Girlgeeks Talk @BMSIT | 24/07/2021 | Cloud computing and distributed healthcare | Dr. Srikanth Prabhu |
| 16 | Symposium | 24/07/2021 | Computing and Communication Systems | Mr. Hemanth Kumar |
| 17 | Girlgeeks Talk @BMSIT | 31/07/2021 | Research challenges in Cloud Security and Trust Management | Dr. Nagaraja G.S |
| 18 | Girlgeeks Talk @BMSIT | 07/08/2021 | Cloud Computing and Cloud Security | Mrs. Sangeetha Shetty Architect, IBM |
| 19 | CS-SBC Inauguration | 24/08/2021 | Intro to Computer Society & Membership Benefits - MSRIT | Dr. Vishwas Lakkundi |

**Event Highlights**

**GirlGeeksHack2021:** A 24-Hour Hackathon was organised by Nitte Meenakshi Institute of Technology in association with IEEE CS Bangalore Chapter. The event was held on 19th and 20th June, 2021 using online platform. GirlGeeksHack is one of the flagship events conducted every year mainly to promote women participation and to bring talented teams of students and professionals, to compete over 24 hours and develop innovative solutions to real world problems. 10 teams registered under GirlGeeksHack track along with the other tracks. The winners were awarded with a cash prize of Rs. 10,000 and the runner-up team was awarded with Rs. 5,000 along with the certificates.

**GirlGeeks Event @ NMIT:** Another flagship event "GirlGeeks2021" was conducted by NMIT in association with IEEE CS Bangalore Chapter. The event included a series four online talks from 15th May to 5th June 2021. GirlGeeks series is intended to ignite the interest towards technology in every young woman through tech-talks & workshops.

- The first talk in the series was "Future of Industries with BlockChain", by Ms. Swathi Pennapareddy, Lead System Engineer, Boeing India Pvt. Ltd.
- The second talk in the series was "Will DeFi (decentralized finance) and NFT (Non-fungible tokens) rewrite the rules of Finance and Art", by Ms. Sanya Sareen, Software Developer at TCS.
- The third talk in the series was "Decentralized Identity Management" by Mr. Sanket Panchamia, Lead Architect, Emerging Technologies, Unisys India.
- The last talk in the series was "ETHEREUM - A robust Blockchain platform than Cryptocurrency" by Dr. Rajendra Hegadi, Associate Professor in the Department of Data Science and Intelligent Systems, Indian Institute of Information Technology, Dharwad.

**GirlGeeks Event @ BMSIT:** IEEE Computer Society Bangalore Chapter in association with Department of Computer Science and Engineering, BMS Institute of Technology and Management, Bangalore hosted, GirlGeeks Event on "Cloud Computing" from July 17th, 24th, 31st and 7th of August 2021.

*Report by: Dr. Vishwas Lakkundi, vishwaskl@ieee.org*

## IEEE CS Upcoming Event

## Mitigating Societal Harms in a Social Media World

### 21-22 Sep 2021 :: Virtual

The fast-paced development of innovative computing technologies that constitute truly societal-scale social media systems, and the equally large-scale impacts – good and bad – that those systems have on day-to-day life, are among the defining issues of our time.

The IEEE Computer Society's new Tech Forum on **Mitigating Societal Harms in a Social Media World** brings together policymakers and technologists to explore the intersection of current technical efforts with public policies, and the resulting impacts to society.

This event focuses on elemental contributors to societal harm that can be amplified by social media – Hate Speech, Terrorism/Radicalization/Exploitation, Misinformation, and Disinformation – by delivering insights from experts developing cutting-edge solutions built on promising technologies such as AI and machine learning. Hear about the latest approaches to these critical problems, join Q&A sessions with the speakers, and participate in small group discussions on each topic.

Benefits for Civil Attendees and Policy Makers

- Hear about existing technologies that could solve challenges presented by societal harms.
- Participate in break-out discussions that provide an objective space for civil attendees and policy makers to meet with technical professionals.
- Dispel myths through access to a baseline of knowledge suited for government officials and employees,and gain objective insights into the spectrum of challenges and solutions.
- Share concerns with technologists who are actively working on solutions.

More info at: https://tech-forum.computer.org/mitigating-societal-harms/

# Bangladesh CS Chapter Activities

**Membership Promotion Event**

IEEE Islamic University (IU) Student Branch along with the IEEE Islamic University of Technology (IUT) Student Branch & IEEE CS Bangladesh Chapter wrapped up the most startling event "Benefit and Scopes of IEEE and IEEE Computer Society Membership" on 3rd May 2021. Sadia Sharmin, Lecturer, Department of CSE from IUT hosted the event.

Prof M. S. Arefin, CSE, CUET also the Vice-Chair Aactivity) of IEEE CS Bangladesh Chapter, and Dr. M Shamim Kaiser, Special Technical Communities (STC) Coordinator SMIEEE, Department of IIT, Jahangirnagar University were the guest speakers at the event. The session started with a valuable speech by Prof. M. S. Arefin. After that Dr. M Shamim Kaiser highlighted about the benefits of IEEE as well as IEEE Computer Society membership. In his talk, Dr. Kaiser explained on why we join IEEE & IEEE CS, detailed the Mission and Vision of IEEE, listed the benefits and opportunities for student members, industry professionals.

The session was chaired by Professor Dr. Md. Zahidul Islam, Counselor, and IEEE IU SB. About 88 participants from IUT, IU, and other interested from different universities joined the event.

**Webinar on Big Data Analytics: Tools and Techniques**

An online webinar on Big Data Analytics: Tools and Techniques was organized by IEEE CS Bangladesh Chapter with the support of IEEE CS BD Team SPARK on 26th May 2021. The speaker, Professor Mohammad Shamsul Arefin, Vice-Chair (Activity) of IEEE CS Bangladesh Chapter, Professor Chittagong University of Engineering & Technology (CUET) took a beginner-friendly approach to assist the attendees in getting started with the vast world of data. Beginning with the basics of big data – what big data is, why and where we need it as well as the growing need for big data in this fourth industrial revolution, the speaker moved on to more complex topics like how to deal with big data. He further explained how to deal with big data with the help of HDFS, MapReduce framework, HBase, Pig, and Hive and Spark. He then addressed and introduced the attendees to the research and state-of-the-art big data topics. Lastly, he introduced some of the big data case studies so the attendees could get ideas about the practicality of big data. Students, academicians, some foreign researchers and professionals from different Universities and organizations especially who were keen on research attended the event. Over 100 IEEE and non-IEEE members attended the webinar.

**Summer Symposium 2021**

IEEE CS Bangladesh Chapter Summer Symposium 2021 (IEEE CS BDC SS 2021) organized on a virtual online platform in collaboration with IEEE CS BDC Youth Team SPARK during 4-5 June 2021. About 200 participants from seven different countries were present in different sessions of the symposium. In this symposium, 65 research papers were accepted among 91 submissions for presentation. There were 13 foreign papers including United States, Malaysia, India, Pakistan, Canada, and Nigeria in the total 91 submissions. Every submission went through double-blind review process by experts. About 67 Technical Program Committee Members from different countries contributed their scholarly efforts to provide expert guidance and opinions to improve their research ideas works.

## INAUGURATION SESSION

Chief Guest :
Prof. Dr. Md. Lutfar Rahman, Emeritus Professor
Vice-Chancellor, Daffodil International University

Special Guest :
Dr. Andre Oboler
Vice President for MGA, IEEE Computer Society

Ceremony Chair :
Prof. Dr. Md. Abdur Razzaque
Pro Vice-Chancellor, Green University of Bangladesh

TPC Chair :
Prof. Dr. Md. Saidur Rahman,
CSE, BUET

Dr. Md. Lutfar Rahman, Emeritus Professor and Vice-Chancellor, Daffodil International University was present as the chief guest in the inaugural session. Dr. Andre Oboler, Vice President for MGA, IEEE Computer Society was present as special guest in the inaugural session.

Two distinguished keynote speakers enriched the symposium and inspired the participants by giving a glimpse of cutting edge, state of the art issues. Dr. Debajyoti Mondal, University of Saskatchewan, Canada delivered his keynote speech on Algorithmic Aspects of Information Visualization and Prof. Dr. Mohamed Rawidean Mohd Kassim, SMIEEE, Coordinator, IEEE Region-10 delivered his keynote speech on Wireless Sensor Network (WSN) in Precision Agriculture Applications.

Authors presented their research works in the six Tracks/Themes: Track 1: AI, Machine Learning and Robotics; Track 2: Cognitive Science, Computational Biology and e-Health; Track 3: Internet of Things (IoT), Data Analytics and Cloud Computing; Track 4: 5G Internet and Security; Track 5: Signal Processing, Computer Vision and Optimization; and Track 6: Algorithms and Computation.

## CLOSING AND AWARD GIVING CEREMONY

Chief Guest :
Prof. Dr. Md. Zafor Iqbal,
CSE, SUST

Ceremony Chair :
Prof. Dr. Md. Abdur Razzaque,
Chair, IEEE CS BDC

Special Guest :
Prof. Dr. Mohamed Rawidean Mohd Kassim,
Coordinator, IEEE R10 CS

Special Guest :
Prof. Dr. Mohammad Shorif Uddin,
CSE, JU

Special Guest :
Peter Mager, GAC Chair,
IEEE R10 CS

Prof. Dr. Md. Zafar Iqbal, Dept. of CSE, SUST was present as the chief gust in the closing and award giving ceremony and Peter Mager, GAC Chair, IEEE R10 CS was present as special guest in the ceremony of the symposium.

The symposium aimed to provide a platform for the participants to share their ideas, discuss recent developments, research with eminent researchers and academicians to get expert guidance and opinions to improve their research ideas, works, and skills. They were also highly encouraged to consider submitting and presenting their (preliminary) research works in the symposium. The symposium, also allowed to present partial/final results of the research work or earlier published papers (on/after March 2020) to improve or extend the works.

The symposium, published all accepted abstracts in a book of abstracts without copyright and ISBN-number by the IEEE CS Bangladesh Chapter that has been distributed among the participants during the symposium. Publishing in this symposium will not prohibit participants to publish again in any other conference or journal.

Special features of the symposium, including no registration fee, e-certificate to all participants and ten special certificates with three best research awards were highly attracted the participants.

Md. Abdur Razzaque, Chair of the IEEE CS BDC and Pro-VC of the Green University of Bangladesh was the Organizing Chair of the symposium. Md. Saidur Rahman, CSE, BUET was the Technical Chair, Mohammad Shorif Uddin, CSE, JU and M Shamim Kaiser, IIT, JU were the Technical Co-Chairs, Mr. Sajeeb Saha, CSE, JnU was the Organizing Secretary, Md. Al Mamun, CSE, RUET was the Technical Secretary, Md. Ahsan Habib (Tareq), ICT, MBSTU and Md. Majharul Haque, Bangladesh Bank were the members of the Finance Committee, Md. Samin Rahman, EEE, BAMRAAU was the chair of the Publicity Committee, K. M. Azharul Hasan, CSE, KUET, Abdul Kadar Muhammad Masum, CSE, IIUC and Mustafa Habib Chowdury, EEE, IUB were the members of the Award Committee, Muhammad Aminur Rahman, CSE, GUB and Sadia Sharmin, CSE, IUT were the members of the Publication Committee, Md. Jamil Istiaq, CSE,AIUB was the Webmaster and Dewan Aminul Islam, EEE, NSU and Team SPARK was the Youth Partner of the symposium.

**Lecture Series on Artificial Intelligence in the Post COVID-19 Era**

The third lecture of the enlightening Lecture Series on Artificial Intelligence in the Post COVID-19 Era was organised the IEEE CS Bangladesh Chapter with the support of the IEEE CS BDC Team Spark on 6th Jun 2021 on virtual mode. The informative lecture took place in two sessions

Keynote Speaker:
Dr. Ford Lumban Gaol
Chair, IEEE Computer Society Indonesia Chapter
Associate Professor,
Informatics Engineering and Information System,
Bina Nusantara University

Session Chair:
Chowdhury Akram Hossain
Senior Assistant Professor,
EEE & CoE Dept., AIUB

Chowdhury Akram Hossain, Former Counselor, IEEE AIUB Student Branch; Senior Assistant Professor, Faculty of Engineering, AIUB inaugurated the session with a warm welcome and introduced the keynote speaker. Dr. Ford Lumban Goal, President, IEEE Indonesia Section Computer Chapter presented the sectors of applications and the utmost importance of AI technology with the broader prospects for continuing this phase of the COVID-19 pandemic and during the post-pandemic era. The participants were highly encouraged from this illuminating session to get engaged with several projects of AI to grasp this outstanding opportunity according to the crisis of the world.

The second started with the introduction of the keynote speaker, Dr. Shorif, by the session chair, Mr. Sajeeb Saha. Dr. Mohammad Shorif Uddin, SMIEEE; Professor, Dept. of CSE, Jahangirnagar University (JU), Dhaka portrayed the wider opportunities of Machine Learning and the vast contribution of ML against the COVID-19 pandemic situation in the sectors of medical, research, industry etc. He also encouraged the participants to start working in this sector with the engagement in several research works from their end, which will also pave the way for their higher education in this field. In the end, an interactive Q/A session took place where the speakers clarified all the queries of the fellow participants.

These sessions took place to share the thought and ideas related to AI and ML with the students of Computer Science and Engineering/Information and Communication Technology to sharpen their thinking and help them start research-works for handling the post-COVID challenges using AI/ML. Over 150 participants, including 102 IEEE members and 48 non-IEEE members, attended the lecture series to enhance their knowledge in their respective interested areas from this session.

Executive committee members of the IEEE Computer Society Bangladesh Chapter (IEEE CS BDC), including Prof. Dr. Md. Abdur Razzaque, Chair, Md. Ahsan Habib, Student Activity Coordinator, graced the webinar with their presence.

**Seminar on The Art of CV Writing**



IEEE CS Bangladesh Chapter arranged a seminar on "The Art of CV Writing" on 30th Jul 2021 with Munim Ahmed, Founder, Facilitator, OneXpress and Manager, HR Tech, and Talent Development, Robi as resource person. In the talk, the speaker focused on how to properly write a CV and how a CV can be more effective and impactful on the intended field. The participants learnt about what makes a CV stand out among others and how it helps to stay ahead in the recruitment procedure. The speaker showed a few demo CVs which helped the participants to realize how a corporate/business CV should be. The speaker also shared his experience in his field and how they approach. Students, as well as faculties from various Departments and Universities attended the event. At the peak of the session, 87 participants were present in the seminar virtual platform. Sajeeb Saha, Secretary of IEEE CS Bangladesh Chapter introduced the speaker.

*Report by: Prof. Sajeeb Saha, sajeeb.saha.bd@ieee.org*

# IEEE CS Forthcoming Conferences

| Date | Conference Name | Website | Location |
|------|-----------------|---------|----------|
| 20-23 Sep | 17th International Conference on eScience (eScience) | https://conf.researchr.org/home/re-2021 | Virtual |
| 20-24 Sep | 29th International Requirements Engineering Conference (RE) | http://re2021.org/ | Virtual |
| 26-29 Sep | 30th International Conference on Parallel Architectures and Compilation Techniques (PACT) | http://pactconf.org/ | Virtual |
| 27 Sep – 1st Oct | International Conference on Software Maintenance and Evolution (ICSME) | http://icsme2021.github.io/ | Virtual |
| 27-28 Sep | Working Conference on Software Visualization (VISSOFT) | http://vissoft.info/2021/ | Virtual |
| 27-30 Sep | ACM/IEEE Joint Conference on Digital Libraries (JCDL) | https://2021.jcdl.org/ | Virtual |
| 4-8 Oct | International Symposium on Mixed and Augmented Reality (ISMAR) | http://ismar.net/ | Virtual |
| 10-17 Oct | IEEE/CVF International Conference on Computer Vision (ICCV) | http://iccv2021.thecvf.com/ | Virtual |
| 18-22 Oct | International Conference on Quantum Computing and Engineering (QCE) | http://qce.quantum.ieee.org/ | Virtual |

# Hyderabad CS Chapter Activities

## Talk on "Universal Acceptance"

IEEE CS Chapter Hyderabad Section in association with Internet Corporation for Assigned Names and Numbers (ICANN), a body which manages the Internet Domain Names, NASCCOM CoE, IdealabsFutureTech Ventures, Internet Society of India, Hyderabad Chapter had organized a talk on "Universal Acceptance - Domain Name Service Challenges and Opportunities" on 18th Jul 2021. The talkwas aimed at creating awareness about the research opportunities for students and faculty members on Domain Name Service Challenges and Opportunities. Around 400 participants (about 200 IEEE and around 200 non-IEEE) attended the session.

## Talk on "Women in Computing: historical facts and current status"
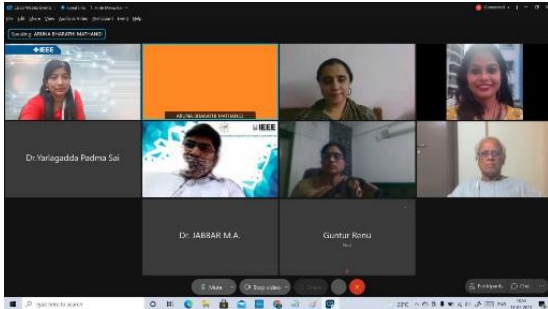


IEEE CS Chapter in association with Women in Engineering had organized an expert talk on "Women in Computing: historical facts and current status" on 31st Jul 2021.

Prof Dr Millie Pant, Department of Applied Science and Engineering, Indian Institute of Technology, Roorkee, addressed the participants.

Development and evolution of "Women in Computing", the challenges faced and the opportunities available were discussed during the talk.

## Coding Competition

IEEE CS Hyderabad Section Chapter in association with IEEE Hyderabad Section Student Activities Committee conducted a nine hours Coding Competition on 1st Aug 2021 on the theme "IEEE XTREME Unlock 15.0 Code Contest-1". This coding competition was aimed to prepare the students for IEEE Extreme 15.0.

## Distinguished Lecture

IEEE CS Chapter, Hyderabad Section organized the Distinguished Lecture on "Quantum Computing: A Disruptive New Paradigm in Computing" by Prof San Murugesan on 7th Aug 2021. Prof San Murugesan is a fellow of the Australian Computer Society, Institution of Electronics and Telecommunication Engineers and IICA. He is a Golden Core member of IEEE CS and Life Member of IEEE. In recognition of his "wide-ranging significant contributions to the Computer Society," he was awarded the Society's the highest service award, "T. Michael Elliott Distinguished Service Certificate." He is an adjunct professor at Western Sydney University and the CEO of BRITE Professional Services.

In this talk, San Murugesan explained what is quantum computing, the benefits associated with the technology, and its applications. He discussed its limitations and highlighted industry players taking lead in this area and identified opportunities that quantum computing presents.

## Forthcoming Event: Programming League

IEEE CS Chapter Hyderabad Section in association with IEEE CS Chapter Bombay Section is organizing Programming League on 5th Sep 2021. This programming league is a 12-hour coding competition and aimed to help the students to prepare for the IEEE Xtreme 2021 global competition in Oct 2021.

*Report by: Dr. M. A. Jabbar, akhiljabbar@ieee.org*

# IEEE CS Virtual Conferences

- 24-25 Oct: IEEE Workshop on Machine Learning from User Interactions (MLUI), https://learningfromusersworkshop.github.io/

- 25th Oct: IEEE 11th Symposium on Large Data Analysis and Visualization (LDAV), https://ldav.org/

- 25-29 Oct: IEEE 25th International Enterprise Distributed Object Computing Conference (EDOC), http://ieee-edoc.org/2021/

# Karachi CS Chapter Activities

**Webinar on Future Internet Architecture**



The online webinar on "Future Internet Architecture" was organized on 18th Jun 2021 from 3 pm to 4 pm (Pakistan time) in collaboration with ACM, IEEE UTHM Student Branch Malaysia, IEEE SMC Malaysia Chapter, IEEE WIE Karachi Section, Advanced Telecommunication Research Center (ATRC), Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, and Synergy Research Club, SMC PVT. LTD. Pakistan.

The webinar session was delivered by Dr. Rasheed Hussain, Associate Professor and Director, Institute of Information Security and Cyber-Physical System, and Head of Networks and Blockchain Lab, Innopolis University, Innopolis, Russia. Dr. Rasheed Hussain discussed about the Content-Centric Network (CCN) and Named Data Networking (NDN) that need to be implemented in both research and academia. The talk focused on wireless ad-hoc networks and more precisely on vehicular networks and its different breeds. After establishing the bridge between content-centric networking and current Internet, some technical solutions such as content caching and cache management were discussed and the talk concluded higlighting on current issues that need immediate attention and the future research prospects.



The webinar started with Dr. Sadiq Ali Khan, Vice-Chair, IEEE CS, Karachi reciting the verse from Holy Quran. Dr. Bhagwan Das, Chair, IEEE CS, Karachi introduced Mr. Helmy Abd Mohd Wahab from IEEE SMC-Malaysia Chapter who then introduced webinar speaker Dr. Rashid Hussain. After the talk, Dr. Bhawani Shanker Chowdhry, Chiar, IEEE Karachi provided concluding remarks and thanked the speaker. Mr. Helmy Abd Mohd Wahab presented the E-certificate to the speaker Dr. Rashid Hussain and then Prof. Dr. Bhawani Shanker Chowdhry presented E-certificate Mr. Helmy Abd Mohd Wahab.

Out of 120 registered, 102 attended the webinar and appreciated it very much since it was on recent developments in the field of Internet that will help students, professional, and faculty to engage themselves in the field of internet architecture research. At the end, E-certificates were distributed to all the participants.

*Report by: Dr. Bhagwan Das, engr.bhagwandas@hotmail.com*

## IEEE CS Forthcoming Webinars

30th Sep: Eight Key Ideas in Computer Architecture from Eight Decades of Innovation. by Behrooz Parhami, Professor of Electrical and Computer Engineering, and former Associate Dean for Academic Personnel, College of Engineering, at University of California, Santa Barbaray

11th Oct: Secure Sourcing of COTS Products: A Critical Missing Element in Software Engineering Education by Nancy Mead and Dan Shoemaker

14th Oct: Applying AI/ML to cybersecurity by Dejan Milojicic

2nd Nov: Moore's Law 1965 – 2016 by Thomas Misa

4th Nov: Big Stream Data Analytics and Applications by Latifur Khan

For more details & to register pl. visit https://www.computer.org/communities/distinguished-lecturer-webinars

# Kolkata CS Chapter Activities

**Summary of Events & Webinars**

| Sl. No | Activity Name | Organizer | Date | Links |
|---|---|---|---|---|
| 1 | STACK-2021 | IEM SB & IEM CS chapter | 30/04/21- 02/05/21 | https://ieeestack.com |
| 2 | Webinar Series on "Quantum Computing for Beginners: Academia & Industry" Lecture #1: "IBM Quantum 101 and Qiskit Translations" by Abhijit Mitra, Quantum Computational Scientist, IBM, USA. | NSEC CS CHAPTER | 10/04/21 | https://www.youtube.com/watch?v=_2vAFxjJQFo |
| 3 | Distinguished Lecture Webinar Series on "Quantum Computing for Beginners: Academia & Industry" Lecture #2: "Let's Code Quantum" by Prof. Amlan Chakrabarti, Distinguished Speaker of IEEE, University of Kolkata | NSEC CS CHAPTER | 17/04/21 | https://www.youtube.com/watch?v=QAEnLIBdpwo |
| 3 | Webinar Series on "Quantum Computing for Beginners: Academia & Industry" Lecture #3: "From Quantum Computing to Quantum Mechanics" by Seasun Kim, Qiskit Advocate & Research Assistant, University of Oklahoma, USA. | NSEC CS & CIS CHAPTER | 17/04/21 | https://www.youtube.com/watch?v=Y0j7GNyCBNo |
| 5 | Webinar Series on "Listening from the Budding Technocrats" Lecture # 1: "Simple, Fast and Practical Uncertainty Estimation in Deep Learning" by Jishnu Mukhoti, Oxford University, UK | CS Kolkata | 26/06/21 | https://bit.ly/3gWppbm |
| 6 | Double Slash - Update Details | JU SBC | 09/07/21 - 11/07/21 | https://doubleslash.ieee-jaduniv.in/ |
| 7 | Tech Talk Series. Lecture #1: "Aerial Humanoid Robots" by Daniel Pucci, Head, DIC-Lab, Instituto Italiano di Technologia. | IEM SB & IEM CS chapter | 16/07/21 | https://drive.google.com/drive/folders/1QGO96rw_5EzNJobRE8C_QX3pHwQV4v5_?usp=sharing |
| 8 | Webinar Series "ML Connect: Academia & Industry" Lecture #1: "Machine Learning in Pattern Recognition and Image Processing Applications - Current Research Trends" by Subhadip Basu, Chairperson, Computer Society Kolkata Section & Professor, JU, Kolkata, WB, India. | NSEC CS SBC & CIS SBC | 17/07/21 | https://www.youtube.com/watch?v=fHXtgxcSZvM |
| 9 | Webinar Series on "Listening from the Budding Technocrats". Lecture # 2: "Deep learning without labels" by Satyaki Chakraborty, Amazon Web Services, USA | CS Kolkata | 17/7/21 | https://bit.ly/36vYWwp |

## STACK 2021

IEEE IEM SB presented an online event STACK (Science Technology and Computing Knowledge), a 3-day event (30th April to 2nd May 2021). It consisted of both technical and non-technical events, known as TRACKS. It consisted of Talks, Panel Discussions, Competitions, Case Studies Internships, and Project Opportunities and reached out to students from all over the country through the website  https://www.ieeestack.com/ The entire event was organized virtually on the Cisco WebEx platform. This would have been impossible without the constant support of the volunteers and all the members of the IEEE IEM Student Branch. STACK was organized in association with IEM Kolkata and, IEEE Computer Society Kolkata Chapter, IEEE Collabratec, IEEE Women in Engineering, IEEE Student Branch of Kolkata Section, other organizations - ET CASES (an initiative of Times of India) and Saytrees.
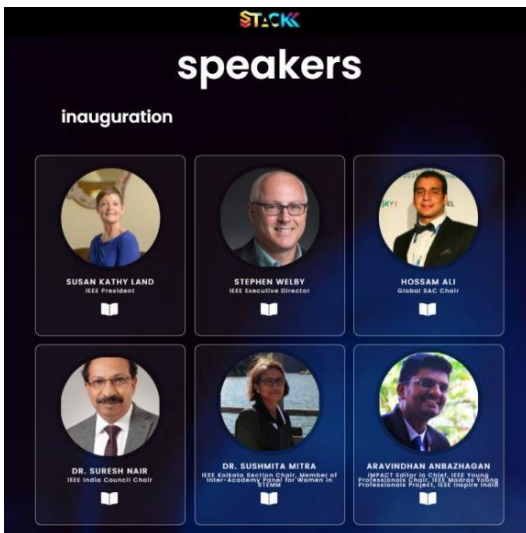
**DAY 1:** INAUGURATION: The inauguration was scheduled from 5:30 PM- 7:30 PM on 30th April. IEEE President Susan Kathy Land presided over the session. The other participated include: IEEE Executive Director Stephen Welby, IEEE India Council Chair Suresh Nair along with IEEE Madras Section YP Chair Aravindhan Anbazhagan, and Dr Satyajit Chakrabarti, Director of IEM Kolkata.

**DAY 2:** WEBINARS
• Webinar on 'Demystifying AI/ML - an industry deep drive' by Mr. Subodh Gajare, AI/ML expert at Cisco R&D.
• Webinar on the IoT Technical Track was conducted by Nagesh Setty, Founder and CEO, JLU Technologies.
• Webinar on the Kick Start in Cybersecurity was conducted by Mr. Hossam Ali, Chair, IEEE Student Activities Committee.
• Webinar on the Benefits of IEEE was conducted by the Keynote Speaker Dr. Mousiki Kar, Chair, IEEE Electron Devices Society, Kolkata Chapter and Associate Professor, Dept. of Electronics and Telecommunication Engineering HIT Kolkata.

• Webinar on the Life Lessons from the Army was conducted by the Keynote Speaker Col Amit Verma, South Asia Head Security, Varun Beverages and Biz Resilience.

**DAY 3** EVENTS
• IEEE & THE LEADERSHIP IT INCULCATES: The final day of our event STACK started with a non-technical track titled IEEE & THE LEADERSHIP IT INCULCATES, conducted by IEEE Madras Section YP Chair Mr. Aravindhan Anbazhagan. He elaborated on leadership and walked us through his presentation describing the importance of IEEE in inculcating leadership skills.

• Webinar on 'ML for medical image analysis' was conducted by Mr. Subhashis Banerjee, Uppsala University, Sweden.

• IEEE PANEL DISCUSSION: The panel discussion on WOMEN ACROSS GENERATIONAL WORKSTYLES focused on how women through ages were bearing the torch on education and enlightenment, how did women evolve from being housewives to rule the world and taught us many vital lessons on how to face the world. This discussion was moderated by Sushmita Mitra, Chair, IEEE Kolkata Section. Sudeshna Choudhury, IEEE Women in Engineering Kolkata Section, Sneha Chakraborty, Founder of Let's Bee Canvas, and Simran Khosla, Nutritionist were the panellists.

• COMPETITIONS: STACK organized two fascinating competitions namely: Business Study (sponsored by ET CASES an initiative of Times of India) and Project Presentation. In the Case Study, participants were given a business case – "IKEA IN INDIA: MARKET ENTRY STRATEGY" and asked to produce the best solution to a given set of questions in groups or individually. Their presentations were judged by Nagendra V Chowdary, Head ET CASES. The winning team members were Sumedha Ghosh, Diptashree Paul, and Raj Bose Roy from IEM Kolkata and the runner-up team included: Saranya Kumar, Srijita Sarkar, Tiyash Mukherjee, and Venkatesh Banerjee from IEM Kolkata. In the Project Competition, the contestants had to make a presentation with a voiceover on any one of the technical TRACKS of STACK. The panel of judges comprised Somak Bhattacharya (Assistant Professor, Electronics Engineering, IIT-BHU) and Amlan Chakrabarti (Professor and Director, AK Choudhury School of IT, CU). Sricheta Parui emerged as the winner and Deborsi Basu as the runner-up. In both the competitions, prize money of Rs.1500/- & Rs 1000/- presented to the winners and the runners-up respectively

## TECH-TALK: EPISODE-1
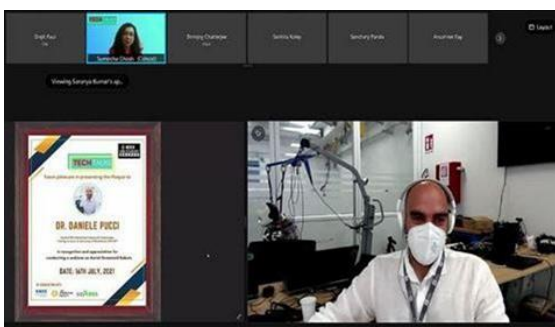


IEEE IEM SB along with IEEE IEM Computer Society inaugurated its much-awaited Tech-Talk series with a webinar on "Arial Humanoid Robot" by Dr. Daniele Pucci, Head of DIC-Lab, Instituto Italiano di Teachnologia. The Tech Talk was inaugurated by Dr. Subhadip Basu Sir the Chair of IEEE CS Chapter Kolkata Section along with Dr. Satyajit Chakraborty, Director, IEM-UEM Group.

Dr. Daniele Pucci enlightened all of us presenting about Arial Humanoid Robots. He cleared the doubts of the attendees through an interactive session. He also discussed about various technicalities involved in Robotics and also briefed about Artificial intelligence and Machine Learning implementations in the same, and highlighted the future of Ariel Humanoid Robots.

The event held in association with Saytrees under the guidance of Dr. Senjuti Khangra, Faculty Advisor and the cooperation of IEEE IEM Student Branch and IEEE IEM Computer Society had 155 attendees.

## DoubleSlash
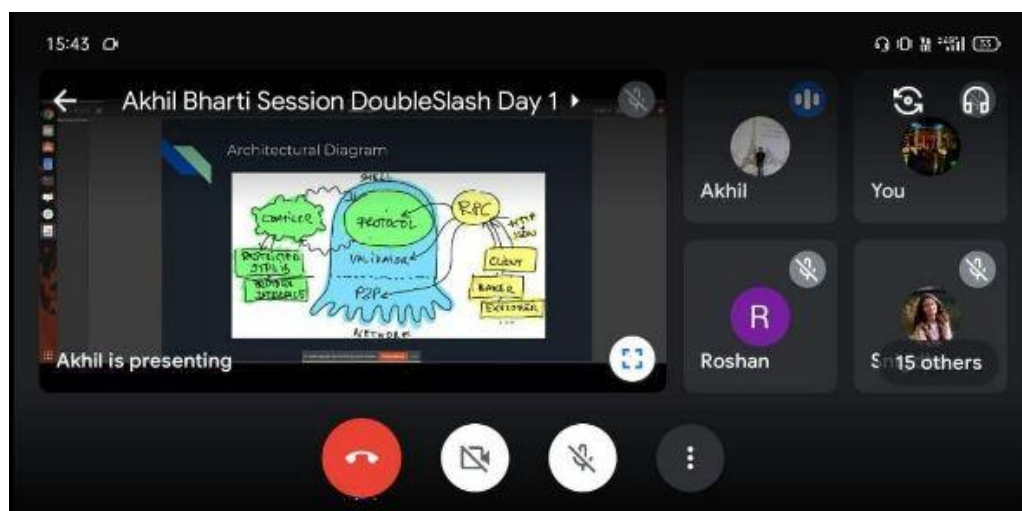


**Introduction:** "DoubleSlash - Code.Commit.Create" was a monumental 48-hour long Hackathon organized by the IEEE Jadavpur University Student Branch and IEEE Computer Society and held during 9-11 Jul 2021. The event was one of its kind, witnessing over 250 participants from different colleges across India. It had eminent speakers and guests who are experts in the fields of Machine Learning and Blockchain. The event started with the inauguration ceremony with guests of honor Prof. Subhadip Basu, Prof. Sarmistha Neogy. Prof. Sarbani Roy of JU CSE welcomed the participants. This was followed by the Devfolio check-in of our participants. After this, our mentors - the past and present members of IEEE JU SB introduced themselves to the participants and answered questions regarding the Hackathon.

**Speaker Session 1:** Mr. Akhil Bharti from Tezos India spoke on the booming field of Blockchain and provided the participants with a hands-on demo of a Blockchain transaction.

**Hackathon:** Participants started coding their projects and preparing detailed presentations on the same from 1 pm IST on 9th July. The participants were required to submit their projects by 1 pm IST on 11th July. They submitted their Github links and presentations at the DevFolio interface. The mentors evaluated the submissions according to a detailed rubric and announced the Top 15 teams who had to pitch their hack in front of our second speaker and judge Mr. Krish Naik, Youtuber and the Co-founder of iNeuron.ai.

**Speaker Session 2:** Mr. Krish Naik, Youtuber and the Co-founder of iNeuron.ai spoke about the growing field of Data Science and Artificial Intelligence.

The lecture sessions on Machine Learning and Blockchain had a great impact on the participants. The main focus of the event was to make the beginners acquainted with the fundamentals of a Hackathon and make them prepared for future such events. It also served as a platform for new ideas to emerge and successful implementation of those ideas. It allowed the exchange of ideas and knowledge among students and their mentors, inspiring them to collaborate with one another to implement projects for the greater benefit of society which is a far-reaching effect of this Hackathon.

The event was a huge success, seeing participation from various states such as Rajasthan, Kerala, Kolkata, etc. This was yet another successful event added to the list of achievements of the IEEE Student Branch of Jadavpur University, which inspires them to keep growing and working harder.

## Congrats to Mr. Prithhijit Nath

IEEE CS Kolkata Chapter & IEEE CS R10 NL congratulate Mr. Prithhijit Nath, the final year B.CSE student in Jadavpur University and the current Chairperson of IEEE CS-SBC JU Chapter for being offered the prestigious Richard E. Merwin Student Scholarship for spring 2021, in recognition of his exemplary involvement in student chapter activities, excellent academic achievement, and willingness to act as a student ambassador.

*Report by: Dr. Subhadip Basu, subhadip@ieee.org*

## Madras CS Chapter Activities

The IEEE CS Madras Chapter was quite active during Jun-Aug 2021 with 8 webinars and a seminar as detailed Below. All the webinars and the research symposiums were jointly organized by IEEE CS Madras chapter along with CSI & ACM Chennai chapters. In the book release events, we had partnered with the publishers who had offered special discounts to the books. In all the author speaker events, we provided a free pdf chapter excerpt from the book. All the events were well attended and appreciated by the participants. These events were coordinated by Mr. HR Mohan, Past Chair and Chair – Events, IEEE CS Madras and Dr. Sakthivel, Chair, IEEE CS Madras.
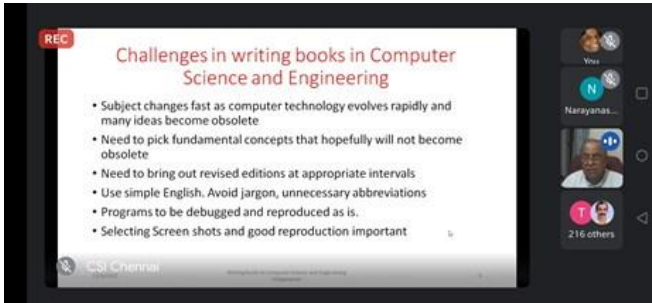


**12th Jun 2021: Writing a Textbook: Guidelines and Tips from Experienced Authors & Publisher's Perspective**. Resource persons included: Dr. R. Narayanaswamy, Prof. of Finance and Accounting, Indian Institute of Management, Bangalore & Author of a best-selling book on "Do's and don'ts of writing a textbook: My experience"; Dr. V. Rajaraman, Emeritus Prof. of CSE, Indian Institute of Science, Bangalore & Author of over 25 best-selling books in CSE, IT, ECE on "Authoring Computer Science & Engineering books"; and Ms. Shivani Garg, Senior Editor, PHI Learning, New Delhi on "Publisher's Perspective'.

Link to the invite: https://bit.ly/3bkuvvX ; Link to Presentation materials: https://bit.ly/3dftEOc
Link to the Video recording: https://bit.ly/3w0Igro
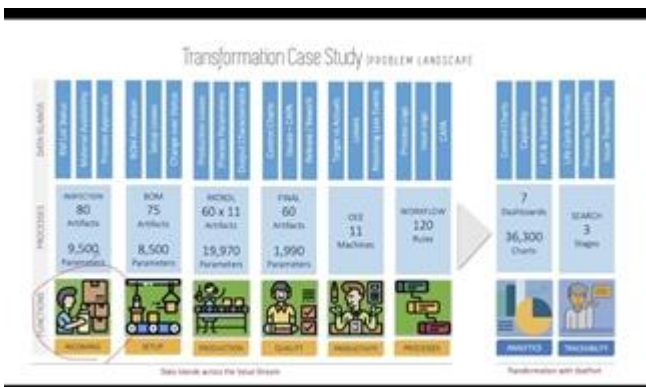


**21st Jun 2021: Ergonomics & Office Yoga** by Dr Prithika Chary, Sr Consultant, Neurologist, Neurosurgeon & Epileptologist, HOD, Neurosciences, Kauvery Hospital, Founder, Creative Karma. http://www.drprithikachary.com

Link to the Invite: https://bit.ly/3uWdEqw
Link to the Video recording: https://youtu.be/O2zfnRHoJ48



**26th Jun 2021: Surfing the Data Tsunami** by Mr Venkat Krishna, CEO, PQSI Digital, Chennai, India

Link to the Invite: https://bit.ly/3wsZBd7
Link to Reference materials: https://bit.ly/3i2A0TU
Link to the Video recording: https://bit.ly/3ByZ0K9



**10th Jul 2021: Release of the book "Software Design, Architecture and Engineering".** Prof. C.R. Muthukrishnan, Former Deputy Director & Prof. of CSE, IIT Madras formally released the book, offered felicitation and also speak on "Overview and Trends in Software Design, Architecture and Engineering". Following the book release, a short presentation was made by Dr. Pramod Chandra P. Bhatt, Former Prof at IITK, IITD, IIITB & IISc and Author of the book released on "Aim & Motivation of Writing the Book: Software Design, Architecture and Engineering". Link to the Invite: https://bit.ly/3gAHYBE ; Link to Reference materials: https://bit.ly/3BxWkMW
Link to the Video recording: https://bit.ly/2WhNzGH
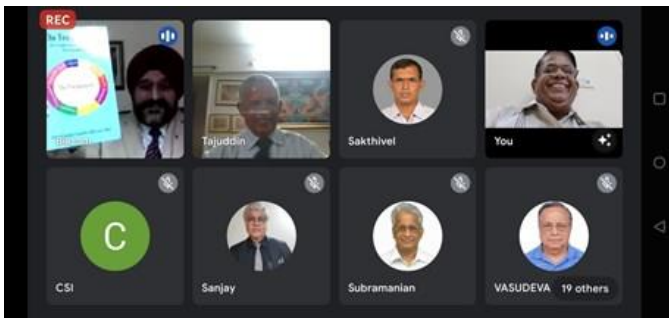
24th Jul 2021: **Release of the book "The Ten Quotients: A Complete Guide For Personality".** General Bikram Singh (Retd.), PVSM, UYSM, AVSM, SM, VSM, Former Chief of the Indian Army & Chairman Chiefs of Staff formally released the book, offered felicitation and address the participants. Following the book release, a presentation was made by Major General Tajuddin Moulali Mhaisale (Retd.), VSM & Former Chief Technology Officer, Chief 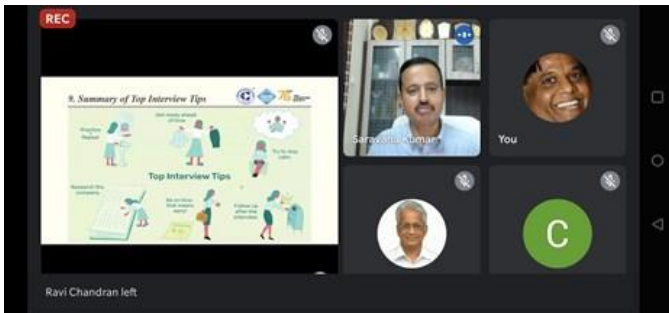Innovation Officer & Senior Systems Administrator, Indian Army & Author of the book released on "The Ten Quotients For Personality Development". Link to the

Invite: https://bit.ly/3xVVZB8 ; Link to Reference materials: https://bit.ly/3scANFe
Link to the Video recording: https://bit.ly/2VZ7Hxk



31st Jul 2021: **Soft Skills for Interview Success** by Mr. R Saravana Kumar, Former Director, Cognizant Technology Solutions.

Link to the Invite: https://bit.ly/3reWkNf
Link to Reference materials: https://bit.ly/3m4wJpI
Link to the Video recording: https://bit.ly/3yLUVR9



7th Aug 2021: **National Seminar on "Research to Publication: What Researchers should know"** with sessions on Research and Publication: An Overview, Quality Publication – Needs and Requirements, Why your does a paper get rejected? and What Researchers Should Know? Resource persons included: Dr San Murugesan, Adjunct Professor, Western Sydney University, Director, BRITE Professional Services, Sydney, Australia; Dr.T.Subbulakshmi, Professor, School of Computer Science and Engineering, VIT University, Chennai; and Dr.R.Ponnusamy, Dean, Professor & Dean, Dept of Computer Science and Engineering, Chennai Institute of Technology. The event was hosted by Center for Artificial Intelligence & Research (CAIR), Dept of CSE, Chennai Institute of Technology (CIT), Chennai, India.
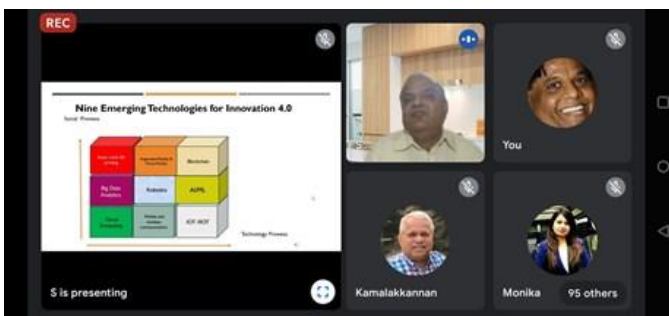


14th Aug 2021: **Emerging Technology and Innovation in Post COVID World** by Prof. Sanjiva Shankar Dubey, Prof. and Head IT & Chairperson, Centre of Online Studies, Birla Institute of Management Technology (BIMTECH), Greater Noida & Author of the book "Technology and Innovation Management".

Link to the Invite: https://bit.ly/3i5OG3t
Link to Reference materials: https://bit.ly/3iTnVRx
Link to the Video recording: https://bit.ly/3ARwuCC



28th Aug 2021: **Demystifying CI/CD and DevOps** by Mr. Sridhar Pandurangiah, Chief Technology Officer, Sastra Technologies Pvt Ltd.

Link to the Invite: https://bit.ly/3ercuxM
Link toRreference materials: https://bit.ly/3t4WpDT
Link to the Video recording: https://bit.ly/3mRGF69

*Report by: Mr. H.R. Mohan, hrmohan.ieeecs@gmail.com*

# Industry 4.0 @ Scale

**Dr. Sanjay K Prasad, Mr. Sunil D Patil, and Dr. Seshadri Subbanna**

sanprasa@in.ibm.com, patil.sunil@in.ibm.com and subbanna@us.ibm.com

Industry 4.0 is no longer a buzzword limited to analyst webinars and consultant's slides. Manufacturing CxOs are well aware of Industry 4.0 – concept and its transformative benefits. There will be hardly any large manufacturing enterprise that has not at least dipped its toes in Industry 4.0 – connected some sensors, ran some experiments around data visualization/analytics. However, when it comes to scaling these Industry 4.0 experiments to a companywide institutionalized capability, many of these firms find it hard to cross over from an Industry 4.0 experiment (a proof of concept or a pilot) to a business capability. Primary reason being that many of these experiments are started and conducted without a thought to how it will be scaled later. It takes a completely different skillset, culture and organizational processes and capabilities to drive Industry 4.0 projects at scale.

However, Industry 4.0 transformation is no longer an optional nice-to-have capability. It is really critical for the competitiveness, efficiency, productivity, and revenue growth. However, in a recent global survey by IBM Institute for Business Value (IBV), only 40% of industrial products executives surveyed say they are executing an enterprise-wide digital strategy. The same study identified a small group of industrial products organizations (called "frontrunners") that lead in revenue growth and profitability. These frontrunners are two times more effective, at developing and executing enterprise strategy, compared with their peers. Further, > 90% of frontrunners see higher than expected value from their digital initiatives. This is achieved by being focused on defining and executing a digital business blueprint, infusing processes with technologies and redefining experience for employees, customers, and ecosystems [1].

## Aspects of Scalability

Oxford dictionary defines scalability as "the capacity to be changed in size or scale" or "the ability of a computing process to be used or produced in a range of capabilities". Wikipedia defines scalability as "the property of a system to handle a growing amount of work by adding resources to the system".

In context of Industry 4.0, there can be multiple aspects of scalability. Most discussed aspect of scalability is horizontal on spatial dimension. Can we take AI algorithm developed in one mill to another mill with exponentially lesser efforts? Another aspect of scalability is Vertical. Most of the Industry 4.0 projects can fully realize its benefits only if it is fully embedded in an end-to-end intelligent workflow. Doing this requires vertical scalability. Can we quickly and easily take the technology to upstream and downstream processes and compose all of it in an intelligent workflow rather than it being a silo of technological excellence?

Other, probably most important, aspect is data volume. Whatever was done for a small data set and a small process, can it be scaled when data volume increases? As the data volume increases, it is not just about the algorithm, but ability to manage and govern that data volume in a secure and consumable manner determines whether that small project can keep up its performance on the big stage.

Another, very important, aspect is people skills. While it is one matter to create a silo of technological excellence working with few brilliant team members or external partners, it is a completely different matter to equip a team to undertake multiple such projects across the organization. A focussed approach on team reskilling along with giving them the right tools helps us to repeat that experiment across the company. Low code/no code tools for faster ramp-up on latest technologies, a data fabric for data democratization, and on-demand infrastructure and platform services go a long way to better equip team members at scale.

## Scalability Dimensions for Industry 4.0

Industry 4.0 scalability dimensions can be broadly categorized into as-a-service infrastructure, democratized data, agile and flexible computing, and resilient operations as depicted in *Figure 1*. In this section, we discuss the role of each dimension in detail.
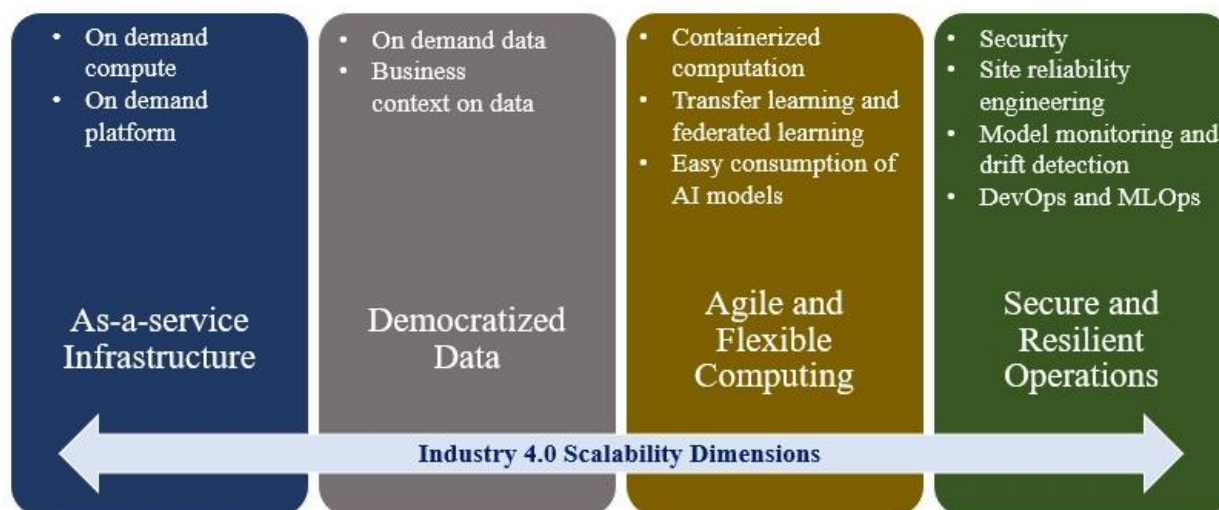
*Figure 1: Industry 4.0 Scalability Dimensions*

**As-a-service Infrastructure**

On-demand compute and on-demand platform as described below are two key capabilities to ensure that infrastructure services can be provisioned on-demand by developers and analysts, and team productivity is not lost due to large waiting time for infrastructure before starting any project or experiment:

- *On demand compute:* One of the overlooked aspects of scalability is the ease and speed with which business analysts, data scientists and developers can lay their hands on new infrastructure capacity to run new experiments/projects. In traditional world characterized by physical servers and centralized and capacitated data centers, this may mean months of wait for the developers from the time need for new compute capacity is determined. Public cloud is of course scalable and can provision compute on-demand, but not all experiments and data can go on public cloud due to security and latency reasons.

  In a hybrid cloud "Infrastructure as a Service" model, cloud like on-demand provisioning of compute is enabled on the shopfloor. This is enabled by providing virtualization and containerization capability where hardware and operating system is virtualized using technologies like Red Hat® OpenShift™, and additional compute nodes can be provisioned virtually on-demand. This of course is managed by having a strong forecasting process and sufficient headroom for unplanned asks.

- *On demand platform*: In continuation with the above point, platform availability is another key enabler for scalability. If it takes couple of months to procure licenses and install developer tools needed for a development project, it has a huge adverse impact on developer productivity and organizational agility. As in case of compute, a "Platform-as-a-service" model on the shopfloor will enable developers to provision platforms on demand in on-premises/edge systems and run experiments. There are efforts such as IBM Cloud® Satellite™, Google Anthos, AWS Outposts to enable manufacturers to consume public cloud services in edge systems on-demand. These technologies will bring lot of agility on the shopfloor while ensuring security and latency aspects do not get compromised.

**Democratized data**

Most important driver for scaling Industry 4.0 projects is democratizing data and making data available and interpretable for users and developers across the organization.

- *On demand data*: Artificial Intelligence/Machine Learning (AI/ML) drives most of Industry 4.0 applications. AI/ML applications need access to data. Timely access to data is one of the greatest blockers in many of Industry 4.0 projects. In industrial setting, it may be both due to lack of data acquisition (which can be handled by retrofitting of legacy systems) and due to lack of data connectivity. Our experience with large industrial customers is that only 10-20% of data captured/sensed in Programmable Logic Controllers (PLCs) make its way out of equipment /PLCs and are available for the data scientists to build models and develop insights. A related problem is that of dark data – there are huge amount of data, which is captured in equipment, but very few people are even aware of the data availability.

In many projects, a lot of time is spent initially to identify the right data needed for the data science project and then building the pipelines to extract and build history before modelling can be attempted. This adversely impacts time to market for Industry 4.0 projects and affects scalability.

- *Business context of data*: In addition to improving the ease of access to data, "Data-as-a-Service" needs to ensure that the data is secure and meaningful for various business users, and data understanding is not limited to small set of experts. To do this, we build a semantic layer on the disparate data sources to make the metadata meaningful and make data available to all developers using technologies like data virtualization while ensuring that there is a proper information governance mechanism.

IBM Data Fabric based on IBM Cloud Pak™ for data enables organizations to provide "Data-as-a-Service" to its business users.

**Agile and Flexible Computing**

"What took us to 1st billion dollars will not take us to 2nd billion dollars", a C-suite client once told this to one of the authors. One of the aspects that needs a paradigm shift is how the computing environment looks like and how the models get scaled from one mill to another mill. Some of the most relevant technologies for scalability on this dimension are as follows:

- *Containerized Computation*: Another aspect of scalability is ability to deploy applications in disparate systems, start small and scale on-demand in real-time as per the need. This is enabled by leveraging containers and microservices. Containerized Industry 4.0 applications can be deployed in any of the edge systems and can be scaled up and down in real-time.

  Further, containerized applications offer higher resilience and in-built high availability features. These applications are typically lightweight and can run on edge systems with a small footprint. Microservices based architecture not only ensures a fair amount of reuse of existing technology (and hence greater returns on technology investment), it also enables auto-scaling of only the components needing more resources, and thus is more energy-efficient.

- *Transfer learning and federated learning*: Machine learning (ML)-based model implementations play a significant role in Industry 4.0. However, scaling these implementations are stalled with two challenges: a) The volume and variety of training data needed as well as the need to continuously re-calibrate as the use case changes over time and b) storing and communicating the data to the cloud and end device leads to issues in preserving privacy. Both of these problems can be addressed with the help of transfer learning and federated learning respectively.

  Transfer learning is a ML technique where a model trained for one problem domain is reused on a second related problem domain. Transfer learning provides opportunity to rapidly scale up pre-trained models to production for new problem domain. Federated learning is the distributed form of ML where models are trained on the edge, and model parameters are shared across multiple such edge models. This ensures that no resident sensitive information is exchanged, models are specific to the equipment/edge endpoints, and insights get shared widely across organizational units.

  IBM's data science platform Watson Studio incorporates transfer and federated learning capabilities that can be utilized for Industry 4.0 applications [2]. IBM also released a Python framework for federated learning (FL) in an enterprise environment on GitHub. *IBM federated learning* provides a basic fabric for FL, to which advanced features can be added; and is not dependent on any specific ML framework and supports different learning topologies, e.g., a shared aggregator, and protocols.

- *Easy Consumption of AI models*: As per recent global survey by IBV, more than 50% of those responsible for AI strategy acknowledge that they are not clear on what their AI data needs are. And 39% of IT professionals report that analysing data to build and scale trusted AI is the most difficult part of their organization's AI journey, while 32% say that data complexity and silos are a top barrier to AI adoption [3]. Organizations need to invest on platforms which help simplify how businesses build and deploy AI-infused applications; and help users access, analyse, and take action on the vast amounts of data that is scattered across hybrid cloud environments – without the need for deep technical skills. IBM and Palantir Technologies partnership is one example of such a platform [4].

**Secure and Resilient Operations**

Digital transformation of the industrial organization enables a novel level of automation in production processes. While earlier software used to be only part of the production process, nowadays software increasingly defines the production process itself, so that the resulting software systems inevitably become more complex. In order to ensure a smooth production process these software systems have to be designed with a special focus on reliability, scalability, and adaptability [5]. Therefore, another important aspect of scalability is security, across various operational environments, and resiliency – resiliency not just in steady state, but resilience in change management, resiliency in model accuracy, so on and so forth.

- *Security*: Industry 4.0 setup scattered across global facilities is facing numerous cyberthreats. Industry control systems, IoT gateways, sensors and actuators are presently judged to be the most critical by IBM Security. Anticipating the impact of an attack can be significant – from production outage to severely damaging resources – it's worth paying the most attention to this topic [6].

  Companies addressing operational technology security in industrial environments today will largely benefit from those with experience in security for Industry 4.0 needs. IBM is part of the Industry 4.0 Security Workgroup, which develops security best practices. The best practices for securing Industry 4.0 infrastructure combine policy, organization, and technology [6].

- *Site Reliability Engineering*: Site Reliability Engineering (SRE) is an approach to operations that ensures that continuously delivered applications run efficiently and reliably by using software engineering and automation solutions. The key concept is engineering, which includes a data-driven approach to operations, a culture of automation to drive efficiency and reduce risk, and hypothesis-driven methodology in incident, performance, and capacity tasks [7]. With these approach and concepts, SRE plays a crucial role in scaling Industry 4.0 applications.

  IBM Cloud Pak™ for Watson AIOps pulls together operations data across siloed IT stacks and tools, to give SRE team a holistic view of organization's entire IT environment. It also provides powerful artificial intelligence (AI) for predicting and proactively resolving problems before they become incidents.

- *Model Monitoring and Drift Detection*: In order to scale AI in Industry 4.0, automation of decisions and business process is required by deploying predictive models. ML models are intrinsically probabilistic in nature and their behaviour or patterns are learned from data. Once these models get deployed in production, their behaviour or patterns can change if the data in production deviate from the training data, and this deviation implies the degradation of model. This phenomenon of model degradation is termed as 'drift' and it could occur due to multiple reasons. Irrespective of the cause, it is crucial to detect this drift in timely manner with the help of model monitoring algorithms and best practices.

  Successful implementation of automated model monitoring, auditing and drift detection capability leads to successful scaling of AI in Industry 4.0. IBM Watson OpenScale™ is one such platform that offers transparency and explainability into AI outcomes, helping to ensure fair outcomes while giving business-process owners greater trust in AI's ability to augment decision-making, and confidence to scale it across their workflows.

- *DevOps and MLOps for faster error free deployment*:  Industry 4.0 is not a static capability – rather it's a dynamic state that asks organization to continually learn and update its applications, algorithms based on what data is suggesting. Scaling Industry 4.0 solutions entails creating a DevOps capability (consisting of people, process and technology capabilities) that can ensure faster error-free delivery of higher quality software through capabilities like test, build and deploy automation [8].  IBM has been named a leader in The Forrester Wave™ for Continuous Deployment and Release Automation for its agile practices, cloud-native tools and DevOps tools needed to help improve the entire DevOps lifecycle [9].

  Businesses are innovating with the emerging practice of MLOps (blend of "machine learning" and information technology "operations") to address the challenges associated with AI deployments [10]. MLOps deals with collaboration and communication between data scientists and operations professionals, and it spans the entire AI/ML model development lifecycle, from data/hypothesis exploration to production as depicted in *Figure 2*. Equipped with emerging tools and technologies, MLOps offers container support for deployments across edge, hybrid cloud and multi cloud [10].
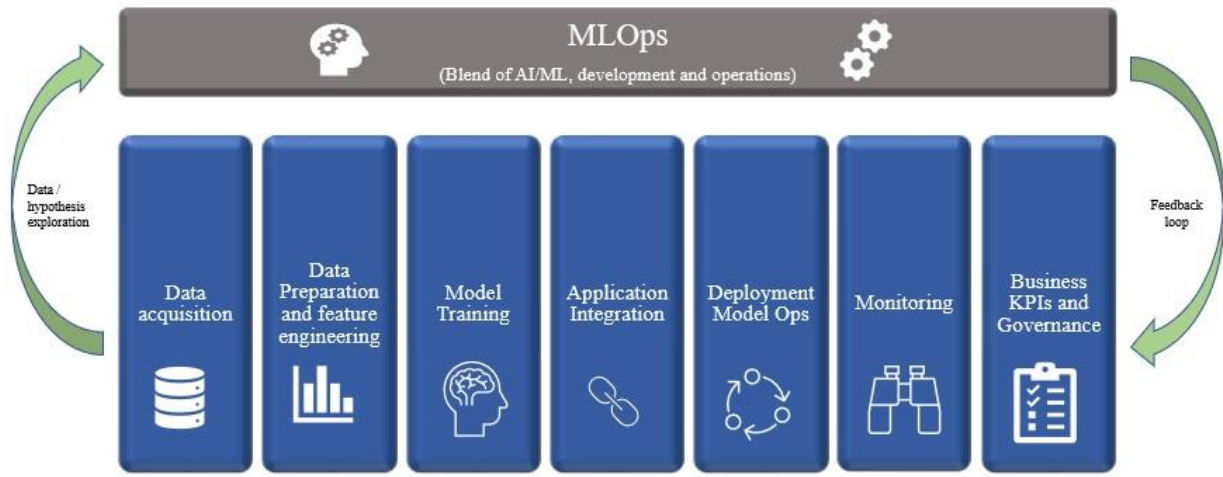
*Figure 2: MLOps Spans AI/ML Lifecyle (based on IDC report [10])*

## Architecture for Designing Industry 4.0@Scale

To create a concrete implementation for Industry 4.0 terms, such as smart factory, digital twin, and cyber-physical systems, some specifics in manufacturing environments must be regarded. In particular, you must consider the autonomy and self-sufficiency of each production site and any security, latency, and regulation requirements that don't allow the lift-and-shift of plant functions to a cloud environment for ease of deployment, maintenance, and operations. The 3-layered distributed IBM Industry 4.0 reference architecture (as depicted in *Figure 3*) is the continuous representation of IBM's experience in applying technology and running IT projects in manufacturing environments with these key features such as Open, Standards-based, Modular, Replaceable, Plant-specific, Vendor-independent, etc. [11].

To speed up the architecture elaboration and design process, IBM proposes leveraging one of its specific intellectual property assets. The IBM Architecture Center offers reference architectures that are based on our expert team's interaction with our clients. The solutions and samples in each architecture provide a roadmap to build, extend and deploy an application. To find out more about the IBM Architecture Center and the Industry 4.0 reference architecture diagram, please visit at https://ibm.biz/BdqwHH [6].
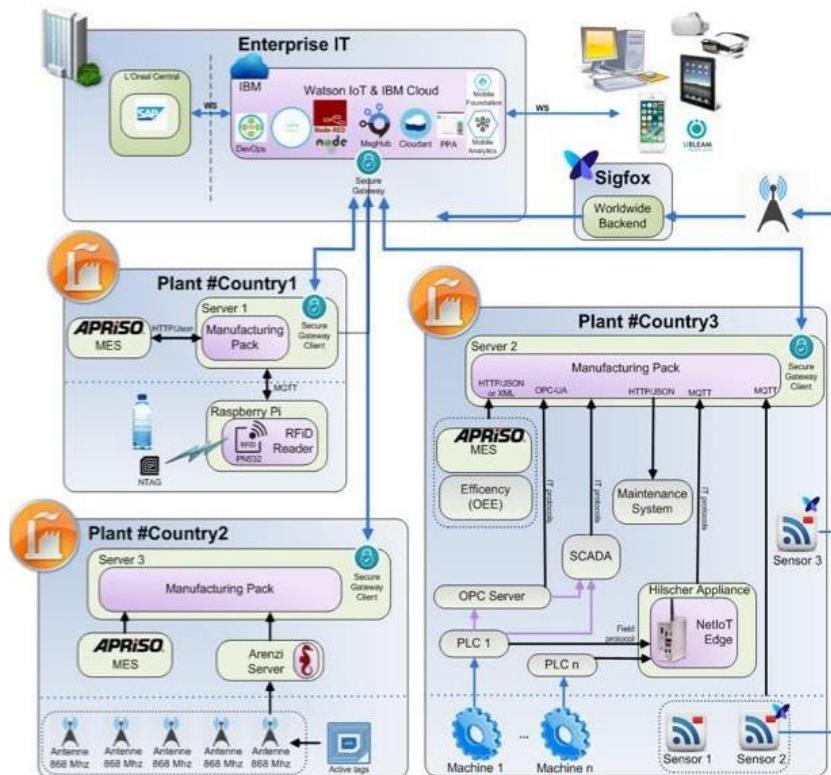


*Figure 3 Industry 4.0 typical architecture [6]*

## Conclusion

Industry 4.0 and Digitalization has become a key component of technology and business strategy for almost all manufacturing firms. However, scalability still remains a key obstacle in realizing the full benefits of Industry 4.0. Need of the hour is that manufacturing CxOs should shift the focus from creating some technology showcases to building the organizational capability for undertaking Industry 4.0 projects at scale and infusing digital technologies in every aspect of its operations. It will need CxOs to think platform vis-à-vis standalone tools, reskilling across the organization vis-à-vis just a Digital CoC (centre of competence) working in isolation and rethink all processes in terms of intelligent automated workflow, as much as possible. This will require new tools, new infrastructure, different skills and a completely different mindset towards Industry 4.0 projects. New technologies will bring lot of agility on the shopfloor while ensuring security and latency aspects do not get compromised.

## References

1. Dickson D., Garg G., Kaijim W. S., Lin S and Pritu P (2021). Digital transformation at scale for industrial products, IBM Institute for Business Value.
2. ESG Technical Validation, Hybrid Multi-cloud Artificial Intelligence (AI): IBM Watson Studio and Watson Machine Learning, (2019). Retrieved from https://www.esg-global.com/hubfs/images/LabReports/IBM-Watson-Studio-Feb-2019/ESG-Tech-Validation-IBM-Watson-Studio-Feb-2019.pdf)
3. Haydock M., Eliuk S., Heever S.: Dealing with the AI data dilemma, IBM Institute for Business Value Jun'2021. Retrieved from https://www.ibm.com/thought-leadership/institute-business-value/report/ai-data-integration
4. IBM and Palantir Partner to Help Businesses Easily Deploy Powerful and Open AI Applications; Unlock Valuable Data Across Hybrid Cloud Environments, (2021). https://newsroom.ibm.com/2021-02-08-IBM-and-Palantir-Partner-to-Help-Businesses-Easily-Deploy-Powerful-and-Open-AI-Applications-Unlock-Valuable-Data-Across-Hybrid-Cloud-Environments
5. Hasselbring W., Henning S., Latte B., Möbius A., Richter T., Schalk S. and Wojcieszak M. (2019). Industrial devops, Proc. IEEE International Conference on Software Architecture Companion (2019), pp. 123-126, 10.1109/ICSA-C.2019.00029
6. Bonnaud S., Didier C. and Kohler A. (2018). "Industry 4.0 & Cognitive Manufacturing.". Retrieved from https://www.ibm.com/downloads/cas/M8J5BA6R
7. Steve S. (2017): "Site Reliability Engineering, the cloud approach to operations," IBM Cloud Blog, 15, 2017. Retrieved from https://www.ibm.com/blogs/cloud-archive/2017/08/site-reliability-engineering-cloud-approach-operations.
8. Haughian B. and Johnson, T. Scalable Software with Devops for Industrial IoT (2020). Retrieved from https://www.iotforall.com/iiot-software-devops
9. DevOps tools and software (2021). Retrieved from https://www.ibm.com/in-en/cloud/devops
10. R. Jyoti (2020): Accelerate Your AI Journey with a Hyperconverged Data and Analytics Platform, Cloud Pak for Data System Whitepaper, Retrieved from https://www.ibm.com/downloads/cas/ENDG17K3
11. Industry 4.0, Architecture Center. https://www.ibm.com/cloud/architecture/architectures/iot_industrie_40/

## About the authors

Dr. Sanjay K Prasad has over 26 years of experience across industries and technology areas. He is an IBM Distinguished Engineer and currently works as Chief Technology Officer for IBM's Industrial products industry globally. In this role, he is responsible for setting technology strategy for the industry. Additionally, he leads the Data and AI technology vertical for Chemicals, Petroleum and Industrial products industry.

Mr. Sunil D Patil has over 17 years of experience in various fields of research and analytics. He currently works as a Sr. Managing Data Scientist at IBM India Pvt Ltd. Sunil have detailed exposure in providing advanced analytics/ AI/ML solutions, insights and strategic recommendations, to help quick data driven decision making by combining data and information. He holds credentials in developing AI/ML and big data solutions towards Industry 4.0.

Dr. Seshadri Subbanna is currently Director of Innovation and Technology Evaluation, IBM Corporate Strategy. He is involved in working on developing innovative solutions with and for clients, especially financial and industrial clients. Focus areas are Industry 4.0, Cognitive, and innovation culture. He also works on IBM strategy for future technology development and evaluation, using innovation in technology and business models. His focus is in the area of analytics solutions, client experience, reconfigurable computing systems and IT future workload acceleration.

# Application of Machine Learning in Life Sciences

**Dr. Jayaraman Valadi**
valadi@gmail.com

The advent of Next Generation Sequencing (NGS) methods and improved algorithms in conventional Machine learning (ML) and Deep learning have made a great impact in the advancement of Life sciences. ML, a subset of Artificial Intelligence (AI), derives its strength from various fields like statistics, optimization, control, neurosciences, statistical learning theory etc. ML can be categorized broadly into Supervised Learning, Unsupervised Learning and Reinforcement Learning. In supervised learning, for a certain number of instances the algorithm is given a set of attributes/features/patterns (Input) extracted from domain knowledge, along with their respective outcomes (Output). The learning algorithm discovers the functional mapping/relationship between the inputs and outputs. This functional relationship can then be used to discover respective outputs for any given query input (Fig 1). In unsupervised learning for the given data set we only have input features. A ML algorithm groups this input data into clusters. Similar instances cluster into the same group. Inspection of a cluster can reveal structure and provide valuable information (Fig 2). Apart from clustering, unsupervised learning is used for dimensionality reduction and data visualization. In Reinforcement Learning (RL) the learning process is through a series of moves by rewarding and punishing improvement and degradation in performance respectively (Fig 3). Supervised learning algorithms include K-Nearest Neighbour classification and regression algorithms, Bayesian Classifiers, Support Vector Machines (SVM), Decision tree and Random Forest (RF) algorithms and Neural Networks and different Deep Neural Network architectures. SVM, a maximum margin-based hyperplane algorithm and RF, an ensemble of decision trees, perform very well for small to fairly large sized datasets. For very big data sets and for handling image data Deep learning architectures outperform conventional ML algorithms. Different Learning algorithms and their illustrative applications in life sciences are shown in (Fig 4). This article aims to highlight the impact of ML in different areas of Life Sciences.
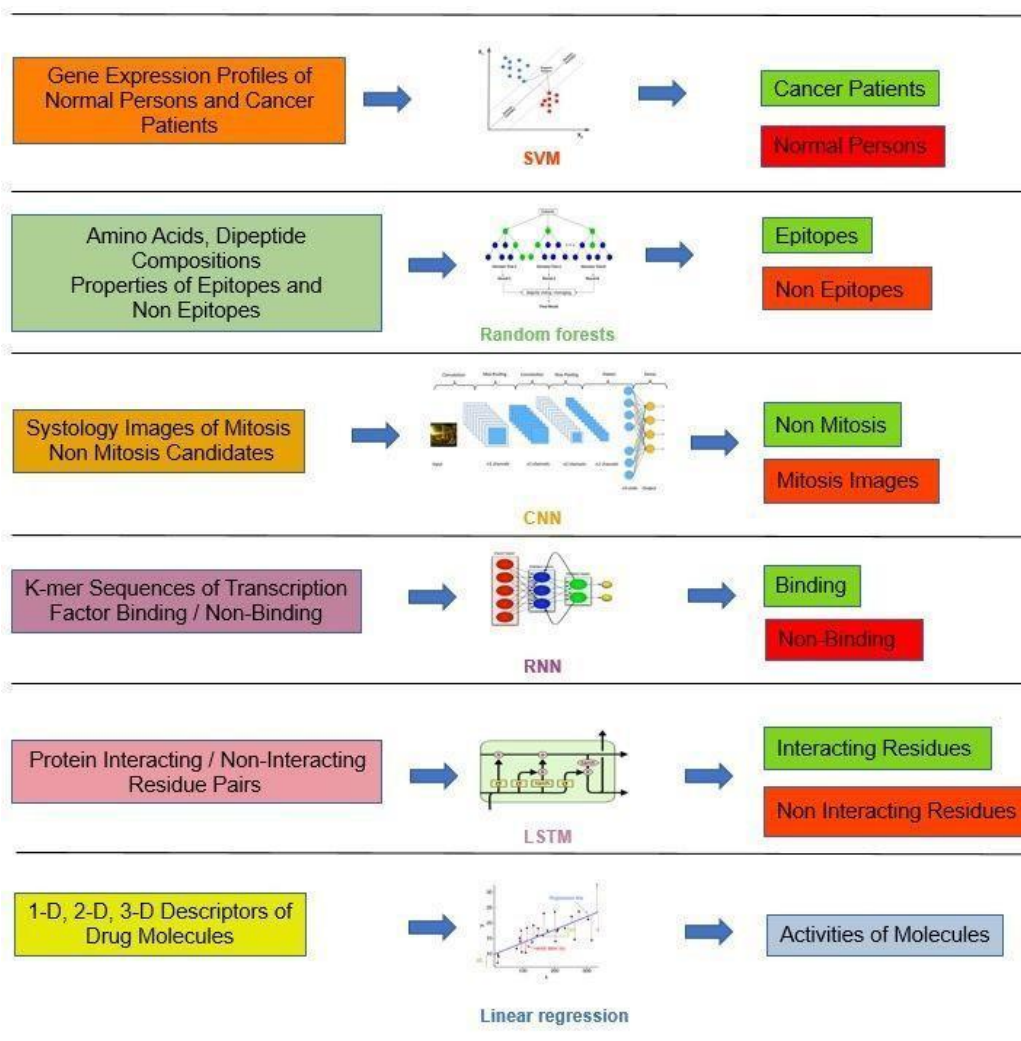


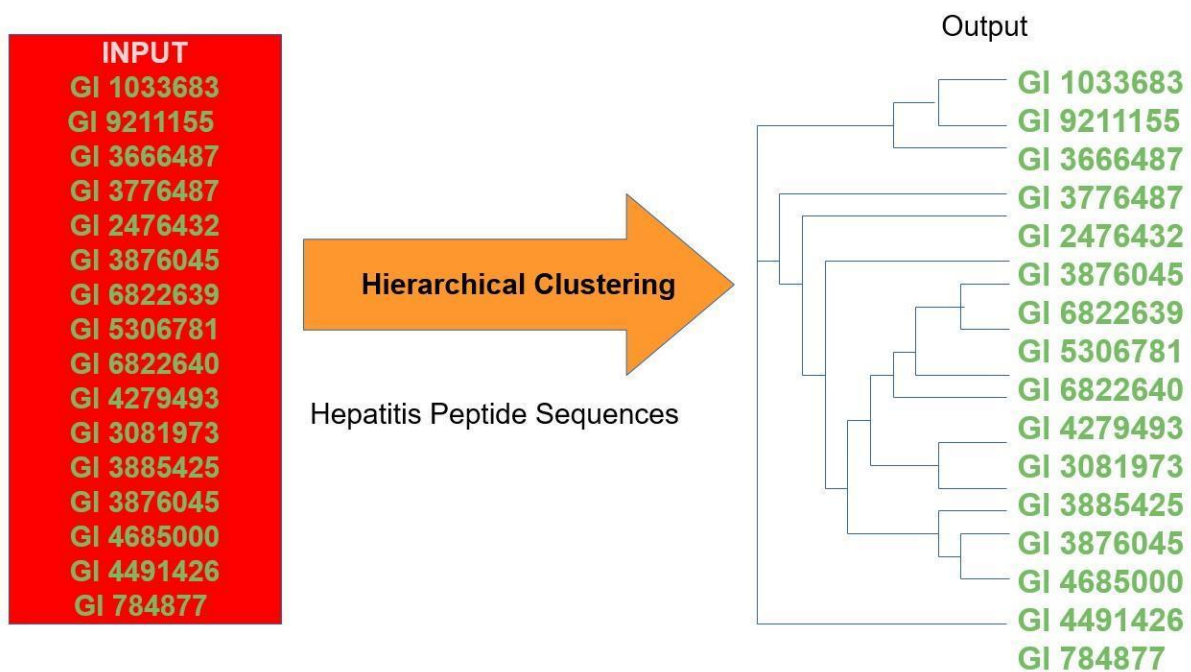*Fig. 1. Illustrative Examples for Supervised Learning*

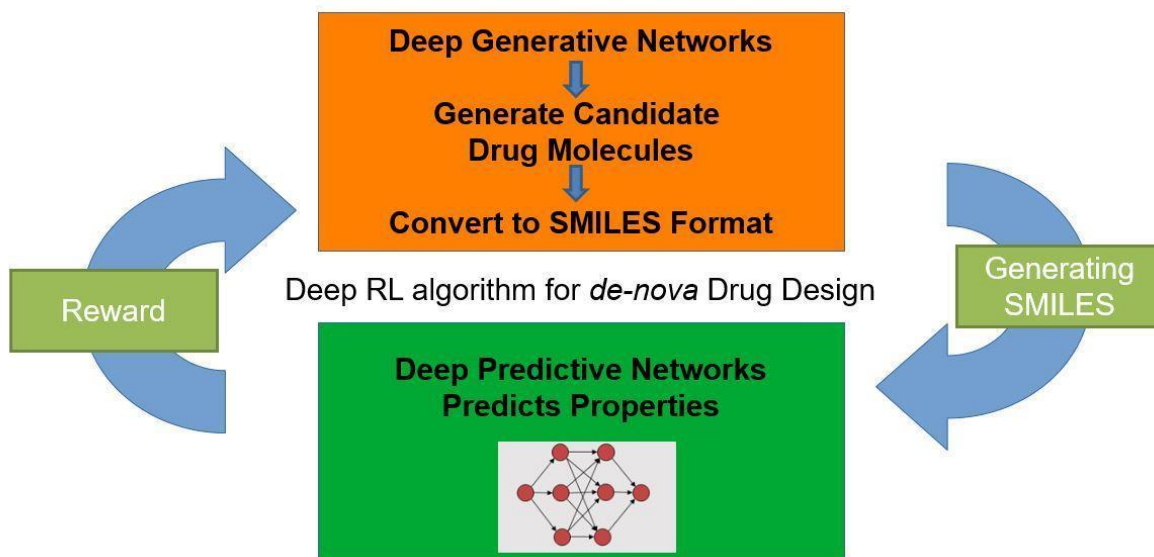*Fig. 2. Illustrative example for Unsupervised Learning*



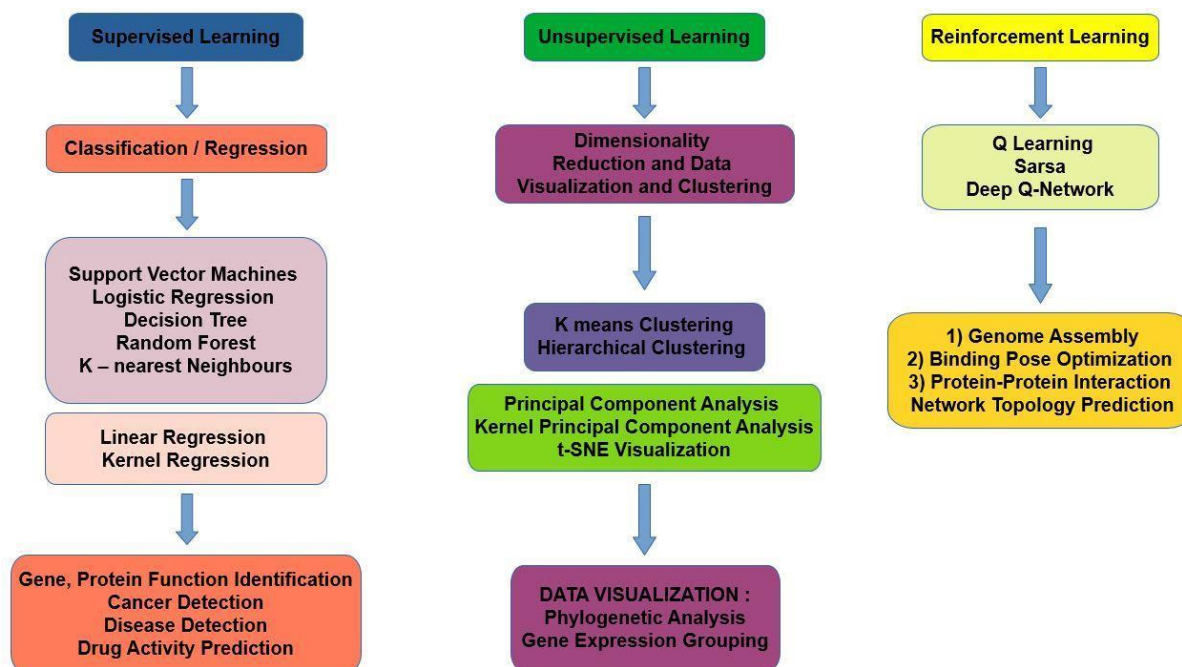*Fig. 3. Illustrative example for Reinforcement Learning*

*Fig. 4. Types of Machine Learning Algorithms*

**In Genomics:** Genomics is the field of study of genes and their interactions. In genomics, ML applications can be broadly categorized into two classes, viz. annotation of genomes and phenotype prediction/selection. Recently, deep learning methods have been developed to improve cross-species annotation of genes, eliminating the need for closely related gene models. ML algorithms with their excellent capabilities to decode hidden patterns, are well suited for prediction of regions that are susceptible to epigenetic changes. Genome Wide Association Studies (GWAS) is a powerful technique which is used to identify genetic variants associated with multiple diseases. In the case of plant genomics, ML and deep learning approaches have been found useful for genomic selection in breeding Wheat, for rust resistance and for predicting grain protein content and grain yield in Spring Wheat.

**In Proteomics:** Another important level of organization of biological systems is the proteome – the repertoire of proteins in a given sample. ML approaches in proteomic data have been used for biomarker discovery and to identify and distinguish between most common causes of Chronic Kidney Diseases. ML methods facilitate differential early-stage diagnosis, which helps to avoid invasive intervention and provides appropriate treatment strategies. ML has also enabled identification of prognostic markers in case of Covid19 patients to distinguish severe and non-severe patients – an important finding in this pandemic situation. It has also been used in the identification of microbial species. For instance, researchers used ML methods for identifying bacterial species in urine specimens using specific LC-MS/MS peptide signatures. Thus, both proteome profiles as well as the raw proteomic data (LC-MS/MS spectra) have served as useful tools for ML applications.

**In Metabolomics:** Experimental Techniques for Metabolomic studies can accurately quantify amino acids, fatty acids, carbohydrates and other products of cellular metabolic functions. Levels of many of these and other metabolites and relative ratios have been used as domain descriptors to identify different disease conditions. ML methods applied to MS-based metabolomics are capable of providing accurate clinical decisions and catalyse developments in metabolic engineering.

**In Multi-omics:** The progress made in understanding and utilizing the data from individual levels of organization of the biological system, viz., genomics, proteomics etc., have only revealed the need for an integrated approach to understand the biological system. ML and Deep learning approaches, needless to say, have been used in the analysis of multi-omics data – ranging from biomarker discovery, disease subtype analysis, survival analysis and clinical outcome prediction. For instance, researchers have integrated DNA methylation, gene expression, miRNA data combined with deep learning approaches to identify markers associated with recurrent prostate cancer. They also generated metabolic flux models based on integrating genomic data. They further used quantified transcripts, proteins, metabolites and lipids to predict the clinical severity. Recently, they have successfully employed deep learning based multiomics integration of RNA sequencing, miRNA sequencing and methylation data to predict survival in Liver cancer patients. The integration of somatic mutation, copy number aberration and gene expression data using neural networks achieved higher prediction accuracy for drug response than that of state-of-the-art single-omics approaches. Several deep learning-based architectures have also been employed with multiomics signature as informative domain input to predict the drug response in different cancer types.

**In Immunoinformatics:** Antigens are recognized as foreign substances by the human body and stimulate an immune response. Majority of antigens are proteins but there are also many antigens which are carbohydrates, lipids, and nucleic

acids. Our immune system recognizes the specific 3D shapes of antigenic regions known as epitopes or the antigenic determinants. An epitope is able to bind to or interact with a specific antibody. The immune system is divided into two types, innate immunity and adaptive immunity. Innate immunity, also known as natural, native, or nonspecific immunity, denotes a first line of defence against harmful agents. Adaptive or acquired immunity includes highly specific immune responses that are generated against specific pathogens. These immune responses are either cell mediated or antibody mediated (humoral) and executed by specialized lymphocytes (T-cells) or immunoglobulins (antibodies), respectively. In the last few years, the major focus of immunoinformatics has been on the design and development of novel and efficient algorithms for identifying potential B- and T-cell epitopes using ML approaches. These algorithms have the potential to reveal newer binding sites in a variety of antigens for the development of vaccines. This methodology is referred to as "reverse vaccinology". Numerous algorithms have been developed for prediction of B-cell epitopes by employing a variety of ML methods like neural networks, SVMs, HMMs and Random Forests etc. There are also tools available for predicting the antibody class to which the epitope can potentially bind. Similarly, several algorithms have been developed for T-cell epitope prediction which consist of methods for prediction of both MHC I and MHC II binding peptides. In addition to handling epitope prediction problems, ML has also been applied in so many other areas of immunoinformatics. These include identification of tumor antigens and cancer biomarkers, toxin prediction, prediction of antimicrobial peptides, prediction of vaccine adjuvants, prediction and design of interleukin inducing peptides etc. ML based methods have also contributed significantly in tackling the recent Covid-19 (SARS-CoV-2) pandemic.

**Genomic Medicine Leveraging Electronic Health Records:** Digitization of health records of patients over the years has resulted in the availability of huge amounts of health data. Harnessing this wealth of information can provide insights for personalized treatment plans. It can also be used for early detection, warning and improved diagnosis. Combined with genomic information such as the presence/absence of genes and mutations, artificial intelligence and ML can help the medical community to understand disease aetiology better as well as treat and even eradicate diseases. For example, in the case of Cystic Fibrosis, a hard-to-treat disease whose progression in an individual is often not clear, researchers at the Cambridge Centre for AI in Medicine have developed a ML method that can make dynamic predictions of individual trajectories, competing health risks and comorbidities. In fact, in the ongoing Covid19 pandemic, ML models trained on the electronic health records have enabled mortality risk prediction in Covid19 patients. Recently, Deep learning approaches have also been applied in analysis of electronic health records. They are found to be very efficient in tasks such as detecting markers involved in prediction of human chronological age based on simple blood tests and analysing large-scale datasets on hypertension and other diseases. Thus, leveraging ML methods on the electronic health records can offer immense value to the growing healthcare industry that is increasingly reliant on data.

**Precision Medicine:** With changes in life styles and environmental conditions, medicines have become more personalized than ever before. Patients can be personalized by demography, medications, comorbidities, disease trajectories and genetics. An individual patient's multiomics profiles and molecular data play a crucial role in personalized treatment. Advanced multiomics information organized through different layers and detailed electronic records provide large amounts of data. Big data handling and mining capabilities of advanced deep learning algorithms and tools have indeed made a rationalised personalized treatment possible. Several start-ups have already succeeded in personalized medicine solutions. For e.g., AUM Biosciences is creating biomarker cancer therapeutics. Ace Tech specializes in providing precision medicine software tools for supportive care. Precomb Therapeutics provides drug profiling solutions.

**In Drug Discovery:** Drug discovery comprises of the process of identifying chemical entities or molecules which possess the potential to become therapeutic agents. The classical steps involved in a conventional drug discovery approach are: target identification and validation, compound screening and lead discovery, pre-clinical development and clinical development. ML algorithms have significantly advanced the process of drug discovery in recent years, which has resulted in greater benefits for pharmaceutical companies.

ML algorithms are applied in all the steps of the process of drug discovery. For example, in the target identification and validation process, an integrated approach using support vector machine (SVM) classifier was developed for classification of proteins into drug targets and non- drug targets for breast, pancreatic and ovarian cancers. Here, features such as existence of mutation, mRNA expression, DNA copy number and protein–protein interaction network topology were used to identify targets for breast, pancreatic and ovarian cancers. ML based methods have been found to be very useful in compound screening and lead discovery. An example can be seen in an approach employing Random Forests in combination with quantitative structure-activity relationship (QSAR) and docking that was used for screening and searching alternative antichagasic drugs for therapeutic use in Chagas disease. Here, a dataset derived from the ChEMBL database was used to develop RF models that were observed to identify several candidate drugs with a very low false positive rate. Identification of tissue specific biomarkers denotes a critical component of pre-clinical development in a drug discovery. An example of application of ML method for this can be seen in the study that deals with identification of tissue-specific biomarkers of aging. In this work, ML methods such as Support Vector Machines, k-Nearest Neighbours, Random Forests and feed-forward neural networks are utilized to analyse publicly available gene expression profiles of young and old tissue from healthy donors. The study helped build a panel of tissue-specific biomarkers of aging that can be useful for detecting new targets for tissue-specific anti-aging therapies. Similarly, ML is also employed for prediction of a drug response which is important in the clinical development step.

In drug discovery applications, the predictive efficiency of a ML algorithm is highly dependent on the quality of data used. Therefore, data curation and cleaning constitute very important steps of ML algorithm development. Availability of high volumes, accuracy and completeness as well as the homogeneity are some of the desirable characteristics of the data.

**ML-based *in silico* Drug Repurposing Workflow:** Drug discovery is a costly and tedious process and repurposing known medicines/drugs for new diseases is an alternate way to hasten this process. One of the promising approaches for drug repositioning is to employ a ML algorithm to learn the pattern of cheminformatics data related to a drug and then link them up to the potential of treating specific disease. A recent example includes computational identification of several antiviral drugs including Remdesivir. Since the pandemic was novel, humanity was not prepared and ML based repurposing drugs were employed as the first line of defence for critical patients.

**ML in Psychiatry and Mental illness:** Identifying mental illnesses have become easier with the advent of advanced Omics and GWAS technologies, proteomics, neuroimaging techniques like precision MRI and fMRI scanning. Researchers are currently using these data to gain insights into the social behaviour of healthy individuals and contrast it with that of diseased patients, with the hope to improve diagnosis and timely interventions. These methods have also shown promise in providing insights into how individuals make decisions.

**ML in Animal Behaviour:** Tracking animal movement in National parks is a tedious process because countless number of aerial photographs have to be used for this purpose. ML has come to aid in counting the population of animals. For instance, the number of Wildebeest in Serengeti National Park in Tanzania is monitored through ML methods. Such monitoring is essential for not only keeping track of the health of the population but also for the ecosystem in general. ML-based methods have also been used to monitor endangered species in controlled environments such as zoos. ML methods have also been used in decoding the activities of several other animals including Cheetah, Penguins and Vultures. In the dairy industry, animal-mounted sensors to track the activities of cattle around parturition have incorporated such high technologies as well.

**ML in Plant Breeding Studies:** Food requirements have been on the rise due to the continuously increasing population. Traditional plant breeding experiments rely on choosing plants with desirable characteristics. Advancements in biotechnology have resulted in use of methods like micropropagation. However, improvement in characteristics often revolves around a combination of different factors including culture medium, plant growth regulators, age of explant, concentration of carbohydrate source etc. ML methods come to rescue the curse of dimensionality in such studies.

**ML in Animal Breeding:** Breeding of animals, for example in the dairy industry, has traditionally relied on pedigree analysis based on complex traits (milk production and fertility traits). However, ML-based models have great potential to improve the reliability of genetic predictions by incorporating the ever-growing genomics, transcriptomics and proteomics data. In addition, ML-based methods have also been used to predict the results of insemination, feed intake and increase production. Animal-mounted sensors have also been used to monitor the activity and health of animals.

**Identification of Cells using ML:** Identifying the cell type and its phenotype is important in biological research and medicine. For instance, tasks like identification of cancer cells as distinct from normal cells, identification of cells such as lymphocytes, granulocytes and erythrocytes have traditionally been done with human expertise. However, the availability of imaging data provides immense opportunities for automated recognition of these cell types in medicine. Further, in biotechnology research, automated identifying and picking only those cells that produce antigens of interest is of crucial importance to preserve the sterile conditions of growth. ML methods such as support vector machines, neural networks greatly aid in these applications and utilize various features such as cell size, shape, and texture of the nucleus and cytoplasm.

**In Public Health:** Public health deals with prevention of diseases, prolonging and improving quality of life as we promote healthcare. This is achieved by analysing the spread of disease in communities and social behaviours in relation to specific environmental factors. Several ML based methods, especially deep learning methods have been found useful in public health applications. For instance, deep learning has been applied in monitoring and predicting the concentration of air pollutants, tracking disease outbreaks and modelling disease progression using data from social media etc.

**In Medical Imaging Analysis:** Medical imaging refers to different technologies that are employed to view the human body and its parts to diagnose, monitor and treat medical conditions. Automatic medical imaging analysis has become a very essential part of modern medicine and ML has been found useful here too. For example, deep learning approaches based on CNNs have been utilized for classification of interstitial lung diseases using computed tomography (CT) images and classification of tuberculosis manifestation by analysing X-ray images.

Advances in ML approaches continue to make lasting impacts in all domains of life sciences. Rigorous algorithms coupled with big data handling capabilities have paved the way for successful handling of bioimages, signals, multiple omics data and text. This ML revolution has catalysed rapid developments in advanced experimental and theoretical research. Focus and research efforts on model interpretability and explainability of these algorithms will further benefit mankind.

# References

Vamathevan, J., Clark, D., Czodrowski, P., Dunham, I., Ferran, E., Lee, G., Li, B., Madabhushi, A., Shah, P., Spitzer, M. and Zhao, S., 2019. Applications of machine learning in drug discovery and development. Nature Reviews Drug Discovery, 18(6), pp.463-477.

Holder, L.B., Haque, M.M. and Skinner, M.K., 2017. Machine learning for epigenetics and future medical applications. *Epigenetics*, *12*(7), pp.505-514.

Lin, H., Chen, W., Anandakrishnan, R. and Plewczynski, D., 2015. Application of machine learning method in genomics and proteomics.

Reel, P.S., Reel, S., Pearson, E., Trucco, E. and Jefferson, E., 2021. Using machine learning approaches for multi-omics data analysis: A review. *Biotechnology Advances*, p.107739.

Bzdok, D. and Meyer-Lindenberg, A., 2018. Machine learning for precision psychiatry: opportunities and challenges. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, *3*(3), pp.223-230.

Niazian, M. and Niedbała, G., 2020. Machine learning for plant breeding and biotechnology. *Agriculture*, *10*(10), p.436.

Nayeri, S., Sargolzaei, M. and Tulpan, D., 2019. A review of traditional and machine learning methods applied to animal breeding. *Animal health research reviews*, *20*(1), pp.31-46.

Kumar, N., Bhatia, S., Sood, R., Pateriya, A.K. and Malik, Y.S., 2019. Immunoinformatics: where immunology meets bioinformatics. *Journal of Immunology and Immunopathology*, *21*(2), pp.55-67.

Meijering, E. and Munoz-Barrutia, A., 2018. Spotlight on Bioimaging and Signal Processing [In the Spotlight]. *IEEE Signal Processing Magazine*, *35*(6), pp.128-125.

Sunil Krishnan, G., Joshi, A. and Kaushik, V., 2021. Bioinformatics in Personalized Medicine. In *Advances in Bioinformatics* (pp. 303-315). Springer, Singapore.

## About the author

Dr Jayaraman had done his Bachelor's and Master's degrees in Chemical Engineering from Madras University and doctorate in chemistry from Pune University. He had been associated with National Chemical Laboratory, Pune, a constituent laboratory of the Council of Industrial and Scientific Research (CSIR), India since 1976. Starting as a junior scientist in the chemical engineering division of the National Chemical Laboratory, Pune, he worked there for 33 years and retired as a Deputy Director in April 2009.

After retiring from NCL, Dr Jayaraman was a CSIR Emeritus Scientist at the Center for Development of Advanced Computing, Pune till January 2013 and a consultant thereafter till 2015. He had been an Adjunct Professor at the Center for Modelling & Simulation, Savitri Bai Phule Pune University from 2016 to 2021. Currently Dr Jayaraman is a Visiting Professor at Shiv Nadar University and a Distinguished Professor at Flame University.

His research areas of interest include: Modeling and Simulations, Optimization and Applications of Machine Learning & Artificial Intelligence to different disciplines including core computer science, process fault detection and monitoring, Information Security & Chemo & Bioinformatics. Dr Jayaraman has taught several courses including computational Biology, Evolutionary Computing and Machine Learning subjects at various universities. He has around 100 papers in reputed international journals to his credit.

---

## IEEE CS Forthcoming Virtual Events

- 25-29 Oct:  9th International Conference in Software Engineering Research and Innovation (CONISOFT), http://www.conisoft.org/2021/

- 27-30 Oct: International Conference on Cloud Computing in Emerging Markets (CCEM), https://2021.pcw.ieeeccem.org/

- 27th Oct: Symposium on Visualization for Cyber Security (VizSec),  https://vizsec.org/vizsec2021/

# Massive Training and Collaborative Content Creation through Free/Libre and Open-Source Software (FLOSS)

**Dr. Kannan M. Moudgalya**
kannan@iitb.ac.in

**Abstract**

A brief description is provided on the Free/Libre and Open-Source Software (FLOSS) promoted by the FOSSEE project, namely eSim, FOCAL, OpenFOAM, OpenModelica, Osdag, Python, QGIS, R, and Scilab. How training is provided on these topics to students across the country is explained in this article. Collaborative content, such as Textbook Companion and Lab Migration, created by students and faculty from colleges, are made available as free resources to all through the FOSSEE website https://fossee.in. Content creators are recognised through URLs that points to their contribution, which in turn help enhance their potential for higher studies, internship or jobs.

## 1. Introduction

FOSSEE stands for Free/Libre and Open-Source Software for Education. It is a project supported at IIT Bombay by the National Mission on Education through ICT, Ministry of Education, Govt. of India. Initially, the focus of FOSSEE used to be on engineering education - so, two e's in the name. Because of the successful work done by FOSSEE, the Ministry asked us to expand our horizon, and to work with all sectors of education; but the name FOSSEE has remained the same. At least 100,000 students, and possibly even a million students, have benefited by FOSSEE. More than 10,000 students have actively participated in FOSSEE's collaborative content creation activities. They have also benefited significantly, as can be seen from the testimonials given by them [1].

Different FLOSS promoted by FOSSEE are explained first. The method followed to train students in a big way, and the techniques employed to make them contribute to collaborative content creation are explained next [2, 3, 4]. To what activities they contribute is the topic of the next section. The final section is devoted to conclusion.

## 2. Promoted FLOSS

As mentioned above, the work done by FOSSEE on all of the software and hardware discussed in this section can be accessed from https://fossee.in. A summary of it can be found in Table 1.

**DWSIM:** DWSIM is a chemical process simulator, also known as a flowsheeting tool. It is a FLOSS alternative to commercial software, such as Aspen Plus. It has CAPE Open Thermodynamics, with a database of a large number of molecules. It has a large number of property estimation correlations. DWSIM has a large library of unit operations that the user can click, drag, drop, connect, and simulate. It is a modern tool. It is possible to add custom models using Python.

The FOSSEE team has been working on collaboratively created flowsheets, custom models, lab migration and conferences based on DWSIM. These will be discussed below.

**eSim:** eSim is an electronic circuit design and simulation software [5]. It is a FLOSS alternative to commercial software, such as PSpice. FOSSEE created eSim using KiCAD and Ngspice. eSim has a collection of large number of building blocks in its library. eSim has the capability to create and use subcircuits. The FOSSEE team has created converters that can automatically translate PSpice and LTSpice schematics to eSim. The most intersting capability of eSim, however, is the ability to carry out mixed mode simulation, involving analog and digital circuits. This is achieved by incorporating the digital simulation capability using GHDL using the Ngspice's Xspice infrastructure. Mixed mode simulation involving microcontrollers is also enabled. This is achived by coding instructions of microcontrollers through C code [5]. FOSSEE has collaboratively created circuits and lab migration, and migrated circuits from PSpice and LTSpice to eSim.

**FOCAL:** FOCAL is an acronmym that stands for Free and Open Creative Art Library. Under FOCAL, FOSSEE supports Synfig Studio, Blender 3D, GIMP, Inkscape and Scribus. Synfig Studio is a 2-D animation tool. Blender 3D is a 3-D animation tool and editing software. GIMP can be used to edit photos and so on, and is a FLOSS alternative to Photshop. Inkscape can be used create banners, posters, etc., and is a FLOSS alternative to Corel Draw. Scribus can be used for typesetting, and is a FLOSS alternative to Page Maker. We have conducted hackathons, fellowships and internships in the FOCAL area, some of which will be discussed below.

**OpenFOAM:** OpenFOAM is a computational fluid dynamics software. It is a FLOSS alternative to ANSYS Fluent. OpenFOAM comes with a large number of solvers that are suitable for different types of problems. It is possible to define any geometry and solve the tranderlying problems in OpenFOAM. It is used extensively in ISRO, BARC and DRDL. The FOSSEE team has been coordinating case study and lab migration using OpenFOAM.

**OpenModelica:** Modelica is a general-purpose object-oriented modelling langauge. It implements the equation oriented (EO) solution strategy. That is, it collects equations from all the building blocks and solves them simultaneously. Although the learning curve is steep, the EO strategy is preferred for design problems and for dynamic simulation. OpenModelica is a FLOSS implementation of Modelica. It is an alternative to commercial implementations of Modelica, such as Dymola. The following collaborative activities are available in OpenModelica: textbook companion, flowsheeting and electrical power system simulation.

**Osdag:** Osdag is another tool developed by the FOSSEE team. Osdag is a cross-platform free/libre and open-source software for the design (and detailing) of steel structures, following the Indian Standard IS 800:2007. It allows the user to design steel connections, members and systems using a graphical user interface. The interactive GUI provides a 3D visualisation of the designed component and an option to export the CAD model to any drafting software for the creation of construction/fabrication drawings. The design is typically optimised following industry best practices. Osdag is primarily built upon Python and other Python-based FLOSS tools, such as, PyQt, OpenCascade, PythonOCC, and svgwrite. It uses SQLite for managing steel section databases. Osdag is currently under development. A beta version of Osdag containing some shear connection design modules was released in June, 2017.

**Python:** One of the leading activities of FOSSEE is Python. It is promoted as a topic of importance on its own. It is used as glue language in other projects FOSSEE, such as eSim and Osdag. Activities undertaken in Python are textbook companion, conferences, and workshops.

**QGIS:** QGIS is a mapping software. It is a FLOSS alternative to commercial GIS systems, such as ArcGIS. FOSSEE undertakes Hackathon and Lab Migration using QGIS.

**R:** R is used for statistical computations. It is an amazing FLOSS alternative to SPSS. The following activities are carried out under R: Textbook Companion and Lab Migraiton.

**Scilab:** Scilab is an amazing FLOSS alternative to the extremely popular, but expensive (especially to the industry), software, Matlab. Scilab comes with a GUI based simulator Xcos, not too different from Matlab's Simulink. The following activities are carried out under the Scilab effort: Textbook Companion, Lab Migration, Toolbox Development, etc.

### FLOSS, application area, and commercial equivalent

| FLOSS | Application Area | Commercial equivalent |
|---|---|---|
| Scilab | General computation | Matlab |
| Xcos | Graphic front end for the above | Simulink |
| Python | General computation and glue language | |
| OpenFOAM | Computational Fluid Dynamics | Fluent |
| DWSIM, OMChemSim | Chemical process simulation | Aspen Plus, Aspen HYSYS, CHEMCAD, Simsci PRO/II, gPROMS |
| OpenModelica | General purpose modelling | Dymola |
| eSim[a] | Electronic circuit design | ORCAD, PSpice, LTSpice |
| R | Statistics | SPSS |
| Osdag[a] | Steel structure design | |
| FOCAL | Graphics and animation | Maya, 3D Max, Corel Draw, Photoshop, PageMaker |
| Arduino, OpenPLC[a] | Open source hardware | Many commercial PLC |

[a] Developed by FOSSEE

### 3. Crowdsourced Content Creation

**Training through Spoken Tutorials:** The FOSSEE team creates Spoken Tutorials on the FLOSS discussed in the previous section. Spoken Tutorials are created for self-learning, dubbed into all 22 of our languages, and usable offline [2]. Although it takes a long time to create, spoken tutorials can be used to train a large number of people. For example, one can see from [6] that we have trained 300,000 students on Scilab and 200,000 students on Python, and similarly for other software. Training a large number of people is a prerequisite for crowdsourcing [3].

**Motivating the crowd to participate:** In the next section, we discuss many activities that depend on participation by the public. In fact, without crowd contribution, many of those activities would not have succeeded. When FOSSEE started, we used the honorarium as the main motivation for people to contribute. Later on, when we started recognising students for their

contribution, we realised that it was more valuable to the contributors. We provide certificates for their work. More importantly, the URL of their work can be used for summer internship, job applications, and when they apply for higher studies. Some of these testimonials can be found in [1, 3, 4]. Writing about the contributions [7, 8, 9] creates a buzz and makes students contribute in a big way. This also helps publicise our work in a big way, which is generally a shortcoming of Government funded projects.

## 4. Activities

**Textbook Companion:**  Textbook companion (TBC) is a collection of code for all solved numerical examples of a standard textbook of science or engineering. If it is Scilab code, it becomes a Scilab TBC, if Python code, Python TBC, and so on. A TBC is a crowd sourced inverse documentation project that helps create documents through coding by students, as explained in [3].  One may use a code from a TBC for the following:

1. By executing the code and comparing with the results in the text, one can verify the calculations shown in the book.
2. Through parametric sensitivity studies, one can get a better understanding of the underlying concepts. This is especially useful to instructors in classrooms.
3. A solved example serves as the document for the code under discussion.
4. It is possible to search for the usage of any command in the collection of examples in a TBC. For example, [10] is the facility to search for Scilab commands within the 75,000 examples available through the Scilab TBC.

Prof. R. D. Braatz, the editor of the very popular IEEE Control Systems Magazine, has the following to say about Scilab TBC [11]: *A compelling feature of the Scilab textbook companions, whose development is led by Prof. Kannan M. Moudgalya at the Indian Institute of Technology Bombay, is their impressive scope.*

It is important to point out that there is no violation of copyright in a TBC. Nothing from the book is reproduced. Only code for solved examples is given. FOSSEE has developed TBC using Scilab, Python, OpenModelica and R.

**Flowsheeting:**  The objective of this exercise is to give an opportunity to the public to demonstrate their skills in flowsheeting. Any process that is not already modelled or not already in progress can be taken up for this activity. Any flowsheet from research articles or books or from any other simulator can be taken up for this activity. Using DWSIM a large number of students mainly from India, but also from overseas, have created flowsheets on many interesting and important chemical processes. At the time of writing this report, there are more than 225 flowsheets completed [12] and another 100 are in progress [13]. As already mentioned, this activity is based on Sequential Modular Simulation.

A big parallel effort in flowsheeting is done through OpenModelica (OM). FOSSEE has made a property database, thermodynamic correlatins and a library of unit operations available OM [14, 15]. Using these, an attempt is made to collaboratively port the DWSIM flowsheets of [12] to OM, with a good success, see [16]. Unfortunately, this is an order of magnitude more difficult, as OM uses equation-oriented approach that solves all the equations of all building blocks simultaneously. Nevertheless, even large flowsheets consisting of ten thousand equations or more have been solved successfully by bright students across the country, who in turn get trained on advanced topics. The benefit is that this approach can be used for dynamic simulation and to solve design problems.

**Custom Models:**  Although DWSIM has many unit operations, such as reactors and distillation columns, available as library elements, it is also possible for the user to develop their own models and integrate them.  DWSIM being a modern simulator, provides this facility through Python coding. We have a Spoken Tutorial that explains how to create custom models in DWSIM [17]. We encourage students and professionals to contribute to this activity by porting any process from any source as a custom model. We have more than 10 custom models at present [18]. This will be a useful activity to the industry too, as their processes can be made available as custom models through crowdsourcing.

**Case Study:**  Just as the flowsheeting project in DWSIM, we have the Case Study project in Open-FOAM. Anyone can propose a CFD problem from any source to be solved using OpenFOAM. CFD is offered as a course in most standard postgraduate programmes, and as an elective in undergraduate programmes. We have more than 115 Case Studies in OpenFOAM [19].

**Circuit Simulation:**  In objective and scope, this is similar to the Flowsheeting and Case Study projects described above.  A student can propose any circuit from any source to be simulated through eSim.  We have about 175 circuits already designed and simulated in eSim [20].  From the same URL, one can also locate an additional 100 circuits migrated from PSpice to KiCAD.

**Lab Migration:**  So long as a commercial software is used in lab courses, it will be difficult to replace it. To address this difficulty, we introduced the Lab Migration project. We encourage lab course instructors to migrate their labs to equivalent FLOSS discussed above.  We follow mainly two approaches for this migration: (1) Asking the instructors to migrate by themselves (2) Identify experts in other colleges who can help with this migration. In exceptional cases, the FOSSEE team

also contributes to the migration. All participants get recognised, and possibly get an honorarium. We have the lab migration possibility in Scilab, DWSIM, OpenFOAM and R, with the most popular being Scilab [21].

**Summer Fellowship and Semester Long Internship:** To bring to light the capabilities of good and motivated students from various colleges, FOSSEE conducts these activities. To get selected for these, students have to learn one of the FLOSS mentioned above, and execute a screening task. Usually, students have the option to solve one of about 20 screening tasks. As these tasks are related to the actual work done during the Fellowship/Internship, this mode of selection has turned out to be better than the usual method of selection, namely through tests [4]. Not surprisingly, many useful products also came out of these activities.

**Open-Source Hardware:** The FOSSEE team works in the general area of open-source hardware as well. Its current focus is on Arduino and Programmable Logical Controller. In these areas, the FOSSEE team is creating instructional material, such as Spoken Tutorials and books, and also open-source hardware. This LinkedIn Post explains the availability of four free books that explain how to use Arduino with Scilab, Python, Julia and OpenModelica [22].

**Conferences:** The FOSSEE team has been conducting a conference Scipy for the past eleven years, details of which can be accessed from [23]. It is a popular conference with a large attendance. FOSSEE also conducted a conference on Scilab and DWSIM [24] once.

**Hackathons:** One of the popular activities of the FOSSEE project is the Hackathon, which attempts to solve a particular problem in a limited time. Four hackathons were completed successfully in the recent past:

**Scilab Toolbox Hackathon:** The objective of this effort was to make available useful FLOSS as tool-boxes within Scilab. About 1,000 people participated in this hackathon and 40 teams completed the work. Five of them are adjudged as winners, and four received consolation prizes. Details of the hackathon and the prize-winning entries, and how to access them, are available in this LinkedIn Article [7].

**Mapathon:** The objective of this effort was to create a map on diverse themes, including but not limited to: agriculture, climate change, transportation, natural resources, child care, medical, education, and rural and urban development. Participants had to create maps using the FLOSS, QGIS. About 10,000 people participated in this hackathon, and submissions from the top 200 teams got recognised. Details of this activity are in this LinkedIn Article [8].

**eSim Marathon:** The objective of this Marathon was to design circuits using eSim and Skywater 130nm technology. FOSSEE team conducted this two-week Marathon jointly with VLSI System Design (VSD) Corp. Pvt. Ltd. About 3,000 students participated in this Marathon, and 138 teams were adjudged as outstanding, excellent, very good, and good. Details can be found in this LinkedIn Article [9].

**Synfig Studio 2D Animation Hackathon:** The objective of this Hackathon is to create a 2D animation, not exceeding three minutes, on any Panchatantra Tale using the FLOSS, Synfig Studio [25]. This Hackathon was done jointly with AICTE and Whistling Woods International. More than 1,000 students participated in this hackathon through 450 teams, with 70 of them producing animations of acceptable quality. A notable contribution was from a 10-year-old school student Sanvi, who explains [26] in a video how she learnt Synfig Studio using Spoken Tutorials, and created this animation [27].

## 5. Conclusion

This article summarises how FOSSEE used FLOSS to train a large number of people, who in turn created collaborative content useful to the entire community. More than 10,000 people, mostly students, have actively participated in FOSSEE's activities. Going by the typical statistics in any crowdsourcing activity, it is fair to say that this points to 100,000 to a million people, getting benefited. Many users have also given excellent feedback on FOSSEE activities, how they were benefited, etc. [1]. Number of people trained on FOSSEE's topics, available at [6] confirms this. It is worthwhile at this juncture to recall the quote by our former President Dr. Abdul Kalam here:

The most unfortunate thing is that India still seems to believe in proprietary solutions. Further spread of IT which is influencing the daily life of individuals would have a devastating effect on the lives of society due to any small shift in the business practice involving these proprietary solutions. It is precisely for these reasons open-source software needs to be built which would be cost effective for the entire society. In India, open-source code software will have to come and stay in a big way for the benefit of our billion people.

**FOSSEE activities in a nutshell**

| No. | Software | Textbook Companion | Lab Migration | Case Study | Spoken Tutorials | Workshops |
|---|---|---|---|---|---|---|
| 1 | Scilab | ✓ | ✓ | | ✓ | ✓ |
| 2 | Python | ✓ | ✓ | | ✓ | ✓ |
| 3 | eSim | | ✓ | ✓ | ✓ | ✓ |
| 4 | DWSIM | | ✓ | ✓ | ✓ | ✓ |
| 5 | OpenFOAM | | ✓ | ✓ | ✓ | ✓ |
| 6 | OM chemical process flowsheeting | | ✓ | ✓ | ✓ | ✓ |
| 7 | OM power system simulation | | ✓ | ✓ | ✓ | ✓ |
| 8 | OM | ✓ | | | ✓ | ✓ |
| 9 | R | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | Arduino | | ✓ | ✓ | ✓ | ✓ |
| 11 | Inkscape | | | ✓ | ✓ | ✓ |
| 12 | GIMP | | | ✓ | ✓ | ✓ |
| 13 | Synfig Studio | | | ✓ | ✓ | ✓ |
| 14 | Blender | | | ✓ | ✓ | ✓ |
| 15 | QGIS | | ✓ | ✓ | ✓ | ✓ |

**References**

[1]     Learners. Testimonials on FOSSEE activities. https://fossee.in/testimonials   Last seen in August 2021.

[2]     K. M. Moudgalya. IT Skills Training through Spoken Tutorials for Education and Employment: Reaching the Unreached. CEC Journal of Digital Education, 1(1):19-62, 2017.  http://spoken-tutorial.org/media/CEC.pdf

[3]     K. M. Moudgalya. Crowdsourced Information Technology Content for Education and Employment. In 18th IEEE International Conference on Advanced Learning Technologies (ICALT 2018), pages 39-41, 2018.

[4]     K. M. Moudgalya, U. Viswanathan, and V. Ghavri. Fossee fellowship 2019: Results of crowdsourcing and performance-based selection. In 2019 IEEE Tenth International Conference on Technology for Education (T4E), pages 94-101, Goa, 2019. T4E, IEEE.

[5]     R. Paknikar, S. Bansode, G. Nandihal, M. P. Desai, K. M. Moudgalya, and A. Jha. eSim: An Open-Source EDA Tool for Mixed-Signal and Microcontroller Simulations. In 4th International Conference on Circuits, Systems and Simulation, pages 212-217. IEEE, 2021.

[6]     Spoken Tutorial Team. Statistics of People Trained through Spoken Tutorials. https://spoken-tutorial.org/statistics/training/   Last seen in August 2021.

[7]     Kannan M. Moudgalya. Results of Scilab Toolbox Hackathon. https://www.linkedin.com/pulse/results-scilab-toolbox-hackathon-kannan-moudgalya/   Last seen in August 2021.

[8]     Kannan M. Moudgalya. QGIS Mapathon by IIT Bombay, ISRO, AICTE. https://www.linkedin.com/pulse/mapathon-iit-bombay-isro-aicte-kannan-moudgalya/   Last seen in August 2021.

[9]     Kannan M. Moudgalya. eSim Circuit Simulation Marathon. https://www.linkedin.com/pulse/esim-circuit-simulation-marathon-kannan-moudgalya/   Last seen in August 2021.

[10]     Scilab-Team. Search within Textbook Companion Examples. https://scilab.in/tbc_solr_search   Last seen in August 2021.

[11]     R. D. Braatz. Scilab textbook companions. IEEE Cont. Syst. Mag., page 76, June 2014.

[12]     DWSIM Team. Completed DWSIM Flowsheets. https://dwsim.fossee.in/flowsheeting-project/completed-flowsheet   last seen in August 2021.

[13]     DWSIM-Team. 100 Flowsheets in Progress. https://dwsim.fossee.in/flowsheeting-project/flowsheet-progress last seen in August 2021.

[14]     R. Jain, P. Nayak, P. Dalvi, K. M. Moudgalya, P. R. Naren, D. Wagner, and P. Fritzson.  Implementation of a Property Database and Thermodynamic Calculations in OpenModelica for Chemical Process Simulation. I&EC Research, 58(18):7551-7560, 2019.

[15]     P. Nayak, P. Dalve, A. S. Rahul, R. Jain, K. M. Moudgalya, P. R. Naren, P. Fritzson, and D. Wagner. Chemical Process Simulation Using OpenModelica. I&EC Research, 58:11164-11174, 2019.

[16]     OpenModelica Team of the FOSSEE Project. Flowsheets in OpenModelica. https://om.fossee.in/chemical/flowsheeting-project/completed-flowsheet last seen in August 2021.

[17]     DWSIM-FOSSEE Team. Dwsim spoken tutorials for self-learning. https://spoken-tutorial.org/tutorial-search/?search_foss=DWSIM&search_language=English Last seen in August 2021.

[18]     DWSIM Team. Custom Models. https://dwsim.fossee.in/custom-model/completed-custom-models Last seen in August 2021.

[19]     OpenFOAM Team.   Case Study Project.    https://cfd.fossee.in/case-study-project/completed-case-studies Last seen in August 2021.

[20]     eSim Team.   Completed eSim Circuit Simulations. https://esim.fossee.in/circuit-simulation-project/completed-circuits Last seen on 17 May 2020.

[21]     Scilab Team. Labs migrated to Scilab. https://scilab.in/lab_migration/completed_labs Last seen in August 2021.

[22]     Kannan M. Moudgalya.   Four books on Arduino. https://www.linkedin.com/posts/kannan-moudgalya-4998a546_nmeict-ministryofeducation-govtofindia-activity-6815463519023095808-kD2F/ Last seen in August 2021.

[23]     PythonTeam. Python webpage. See http://python.fossee.in Last Seen in August 2021.

[24]     K. M. Moudgalya, P. R. Naren, and D. Wagner, editors. National conference on chemical process simulation - 2018. Shroff Publishers, 2018. https://fossee.in/nccps-2018

[25]     FOSSEE.  Synfig Studio Animation Hackathon.    https://focal.fossee.in/synfig-studio-animation-hackathon Last seen in August 2021.

[26]     Sanvi.  Youngest Participant in the Synfig Studio Animation Hackathon.  https://fossee.in/events/videos Last seen in August 2021.

[27]     Sanvi. The heron that liked crab meat. https://static.fossee.in/focal/videos/SS2DH0209.mp4 Last seen in August 2021.

**About the author**

Dr. Kannan Moudgalya is the Erach and Meheroo Mehta Education Technology Chair Professor at IIT Bombay. He received a B.Tech and a Ph.D for his work in Chemical Engineering at IIT Madras and Rice University, respectively, and a Master of Electrical Engineering from the latter. He was a visiting professor at University of Alberta. He works in areas of modelling, control and simulation. He has written two textbooks Digital Control, published by Wiley, and Optimization: Theory and Practice, published by Narosa. He has written several papers in reputed journals and refereed conferences. He is a member of IEEE and a life member of ISTE and CSI.

Lately, Kannan has been focusing on massive IT skills education through Spoken Tutorials, open-source software and affordable laptops. He is extending the Spoken Tutorial approach to other skills topics, such as health, nutrition, and breastfeeding. Kannan received the Google MOOCs Research Award for the online capability in Spoken Tutorials. He was nominated for the HT for Mumbai 2015 award. The Spoken Tutorial project received the best prize in the Reimagine Education Award 2015 in the Nurturing Employment category. He received the Pt. Deen Dayal Upadhyaya Recognition for Reengineering India 2020.

# Migrating University Campus Networks to IPv6 Challenges and Opportunities

**Dr. Mohit P. Tahiliani**
tahiliani@nitk.edu.in

IPv6 is one of the building blocks for new protocols being developed at the Internet Engineering Task Force (IETF). For example, much of the new work in the domain of Internet-of-Things (IoT) and Machine-to-Machine (M2M) communication requires IPv6. Besides solving the address depletion problem, IPv6 brings several other advantages like delay-efficient routing and packet processing, better security measures, simplified network configuration, and true end-to-end connectivity for peer-to-peer applications. Having said that, migration, especially for large end-user organizations, comes with some challenges in revising operational procedures and understanding the complexities of the new protocol. This article presents the motivation to migrate university campus networks to IPv6, the significance of being IPv6-ready, and the challenges and opportunities depending on the experience gained while migrating a university campus network to IPv6 in India. These might as well apply to other universities in the Asia Pacific region and other countries.

The IPv6 deployment is rising globally, and India has been ranked first in IPv6 adoption in the world with a rate of 61% as per the latest numbers maintained by Google and Akamai in 2021 [1]. One of the largest Internet Service Providers in India has an IPv6 adoption rate above 90% [1]. However, the IPv6 adoption in Indian Universities has lagged, especially on internal networks.

## Motivation to migrate Universities to IPv6

Managing university campus networks is challenging due to a large variety of user requirements ranging from accessibility to basic Internet services to providing highly customized features for academic research and development. Due to COVID-19, universities have adopted new teaching-learning methodologies which include virtual and remote-triggered laboratories [2][3]. These methodologies are Internet-based and require multimedia support and scalability. Thus, there has been an enormous increase in Internet usage in the university campus networks and the need for ultra-low latency transport has become apparent. Migrating university campus networks to IPv6 can significantly simplify the network and service architectures such that the requirements of ultra-low latency can be met. One such example is the elimination of Network Address Translation (NAT) boxes which can minimize the packet processing overheads and improve the responsiveness of multimedia and streaming traffic. Another important aspect of the services provided by university campus networks is that some of these are cloud-based services, e.g., Moodle (a popular open-source learning management system) instances may be hosted in the cloud for scalability purposes because the load on servers increases significantly during online examinations or assignment submissions. In the future, it seems inevitable that cloud providers will begin to charge directly for IPv4 addresses due to their scarcity. Universities (and enterprises) can lease IPv6 address blocks from an Internet registry to have better flexibility in managing cloud-based services and to minimize expenses.

## Significance of IPv6 readiness

Although migrating to IPv6 might not be on the list of universities' top priorities, being IPv6-ready can be immensely beneficial and lead to technological advancements. It can directly impact the Research & Development budget of the university. For example, one of the review criteria in the Campus Cyberinfrastructure - Infrastructure, Innovation, and Engineering (CC*IIE) Program of the National Science Foundation (NSF) was that the proposals seeking funding through CC*IIE should describe the plan for campus IPv6 deployment [4]. The Government of India is enthusiastically supporting the adoption of IPv6 [5], such initiatives are likely to be introduced as driving factors for IPv6 deployment in universities. Being IPv6-ready provides a competitive advantage in obtaining research partnerships with international universities/enterprises. Funding for R&D and partnerships are key parameters in national and international university ranking frameworks (for example, National Institute Ranking Framework by the Ministry of Education, Government of India). Hence, the consequences of not being IPv6-ready can be more severe than universities might anticipate.

However, simply adopting IPv6 does not make a university IPv6-ready. It is equally important to evaluate the security and effectiveness of the services deployed over IPv6, otherwise, it could lead to security vulnerabilities and poor performance. An international study carried out to evaluate the quality of IPv6 enablement on the top 1000 universities listed by the Center for World University Rankings (CWUR) [6] in 2014 reveals that 87.5% of university websites were not accessible to the end-users connecting over IPv6, 11.5% of university websites were accessible over IPv6 but not effective when compared to accessed via IPv4 and 1% of university websites were highly effective when accessed over IPv6 than IPv4 [7]. Thus, it is recommended that the Indian universities start adopting IPv6 because migration is only the first step, the actual journey to become IPv6-ready might take more time and effort than anticipated.

**IPv6 Migration: Challenges and Potential Solutions**

The IPv6 migration process has its fair share of challenges as discussed below:

1. Limited training resources

   One of the major factors in the lagging adoption of IPv6 in universities is that the network administrators have limited knowledge of how IPv6 works. Moreover, there is a lack of motivation from the university administration to provide training to network administrators because adopting IPv6 is not a priority. Hence, the process to initiate IPv6 deployment keeps getting pushed to the list of activities to be done at some unknown future date.

   However, this problem is gradually getting resolved nowadays because several organizations like Asia-Pacific Network Information Centre (APNIC) [8], India Internet Engineering Society (IIESoc) [9], and Industry Network Technology Council (INTC) [10] provide basic training on IPv6 via free webinars (theory and practical) that are recorded and made openly available [12]. APNIC provides free access to remote labs to perform hands-on exercises on IPv6-related services, like installing a Kea DHCPv6 server [12]. Apart from utilizing the training material mentioned above, it is highly recommended to set up a local testbed in the university and perform preliminary experiments to gain sufficient knowledge of IPv6 prior to choosing an IPv6 migration strategy (discussed below) or testing it on a live campus network.

2. Choosing an IPv6 migration strategy

   The network administrators often wonder which of the two popular migration strategies would be most suitable for their universities: transition mechanisms like IPv6-to-IPv4 or dual-stack (embrace IPv6 in parallel with IPv4) [13].

   Depending on some of the experiences shared by the universities like the University of Iowa, USA [14] and National Institute of Technology Karnataka (NITK), Surathkal, India [15], it is recommended to adopt the dual-stack approach from the start. Most of the applications (e.g., wget, youtube-dl) default to using IPv6 if it is working correctly. If IPv6 does not work correctly, the dual-stack approach allows a fast fallback to IPv4, thus avoiding disruptions for the end-users while IPv6 migration is in process.

3. Address planning

   Address planning is one of the most crucial and time-consuming activities in the process of IPv6 migration. It answers an important question: how should the network administrators allocate IPv6 addresses to different parts of the campus networks (for example, different VLANs).

   It is recommended that the network administrators study sample address plans (for example, the ones demonstrated in the webinars conducted by IIESoc and INTC) before getting started with the planning for their university. Several iterations might be needed to finalize the address plan. An important aspect to consider during address planning is to predict the growth of campus network (in terms of size, services, and applications) several years from now and accordingly plan to lease the appropriate number of IPv6 address blocks.

4. Leasing IPv6 addresses

   Assuming that most of the Internet Service Providers (ISPs) in India have adopted IPv6, there are several questions about leasing IPv6 addresses that must be answered before initiating the deployment: the university should use IPv6 addresses provided by the associated ISP or lease the IPv6 addresses from the local Internet registry? What are the recurring expenses to lease IPv6 address blocks?

   The answers to these questions depend on several factors: does the university prefer to retain the IPv6 address blocks while moving to a different ISP in the future? Is the university spread across multiple campuses that are geographically apart (for example, located in different states of India)? Are some of the services provided by the university hosted on the cloud? If the university uses IPv6 addresses provided by the ISP(s), it is important to take note of the charges (if any) being levied by the ISP for providing IPv6 addresses. As an alternative, the university may lease the IPv6 address block(s) from the National Internet Exchange of India (NIXI) [5]. All the necessary details, including the cost of leasing, are provided on the NIXI website [5].

5. Migrating network services and applications to IPv6

   Migrating the campus network to IPv6 would require migrating basic network services like DNS, DHCP, SNMP, and web applications (for example, Nginx servers) to IPv6. The questions that are most frequently asked are about the best practices to be followed to migrate these services/applications and monitor and manage the IP infrastructure.

   Past case studies of IPv6 migration from enterprises and universities show that it is safe to migrate these services/applications to IPv6, one at a time. There are several open-source and commercial tools available for migrating DNS, DHCP, SNMP, and other services to IPv6 (for example, Kea is an open-source DHCPv6 server from Internet Systems Consortium [16]). Similarly, there are tools available for IP Address Management (IPAM)

that help the network administrators to perform end-to-end planning, deployment, management, and monitoring of IP address infrastructure.

6. Securing the network

    IPv6 provides a true end-to-end connectivity solution. However, it opens up potential security threats that require extra attention from the network administrators. The question that is most frequently asked is about the best practices to be followed to ensure the security of the campus network.

    The network administrators can refer to the guidelines provided in RFC 9099 (Operational Security Considerations for IPv6 Networks) to analyze the operational security issues associated with different types of networks, and technical and procedural mitigation techniques for the same.

**IPv6 Migration: Opportunities for Indian universities**

Indian universities can greatly benefit from migrating to IPv6 in terms of offering a better quality of service to their end-users, providing cost-effective and scalable solutions to the administration, and consequently contributing to the efforts led by the Government of India to increase IPv6 adoption in India. Besides developing a roadmap, the Government of India has initiated funding programs to foster the deployment of IPv6 in India. The experience gained by the universities in migrating to IPv6 can immensely help to work on these funded programs and contribute significantly to the adoption of IPv6. The frequent use of IPv6 addresses in the university campus network can help bring more awareness and familiarity to the students, thus creating a natural manpower base that is trained to work with IPv6. The courses can be amended with laboratory exercises to provide IPv6 training to the students.

**Acknowledgments**

**References**

[1] India Tops In IPv6 Adoption Rates Across The Globe (August 2021)
Link: https://fossbytes.com/india-tops-ipv6-adoption-rate/

[2] Shetty, S., Shetty, A., Hegde, A., Salian, A. B., Umesh, P., & Gangadharan, K. V. (2020, July). Experiential Learning of Strength of Materials and Fluid Mechanics using Virtual Labs. In 2020 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT) (pp. 1-6). IEEE.

[3] Shetty, S., Shetty, A., Hegde, A., Salian, A. B., Umesh, P., & Gangadharan, K. V. (2020, October). Experiential Learning of Physio-Chemical and Bacteriological Properties of Water using Virtual Labs. In 2020 IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER) (pp. 273-278). IEEE.

[4] Campus Cyberinfrastructure - Infrastructure, Innovation and Engineering Program (CC*IIE), National Science Foundation (NSF) (March 2014)
Link: https://www.nsf.gov/pubs/2014/nsf14521/nsf14521.htm

[5] National Internet Exchange of India (NIXI) IP Index. Link: https://ipv6.nixi.in/

[6] Center for World University Rankings (CWUR). Link: https://cwur.org/

[7] Pickard, J., Patrick, A. Y., & Stocks, D. (2015, June). Quality of IPv6 Enablement of Universities: An International Study. In 2015 ASEE Annual Conference & Exposition (pp. 26-1292).

[8] Asia-Pacific Network Information Centre (APNIC). Link: https://www.apnic.net/

[9] India Internet Engineering Society (IIESoc). Link: https://www.iiesoc.in/

[10] Industry Network Technology Council (INTC). Link: https://industrynetcouncil.org/

[11] IPv6 Webinars by IIESoc and INTC. Link: https://www.iiesoc.in/ipv6-webinars

[12] APNIC Virtual Labs on IPv6: https://academy.apnic.net/en/virtual-labs/

[13] G. Fioccola, P. Volpato, N. Elkins, J. Palet Martinez, G. Mishra, C. Xie (2021, June). IPv6 Deployment Status. Internet-Draft, Internet Engineering Task Force (IETF).
Link: https://datatracker.ietf.org/doc/html/draft-ietf-v6ops-ipv6-deployment-02

[14] Case study: IPv6 at the University of Iowa.
Link: https://blog.apnic.net/2018/06/26/case-study-ipv6-at-the-university-of-iowa/

[15] Migrating a University Campus Network to IPv6 in India: A Case Study
Link: https://conference.apnic.net/52/program/speakers/#/mohit-p-tahiliani

[16] Kea DHCP by Internet Systems Consortium. Link: https://www.isc.org/kea/

**About the author**

Mohit P. Tahiliani is an Assistant Professor of Computer Science and Engineering at National Institute of Technology Karnataka (NITK), Surathkal, India, and a Member of the Board of India Internet Engineering Society (IIESoc). He obtained Ph.D. in the area of Congestion Control Mechanisms for the Next Generation Internet from the NITK Surathkal, India in 2013. His areas of interest include Network Congestion Control, Queue Disciplines, Network Function Virtualization, Deterministic Networking, IPv6 deployments, Named Data Networks, and Distributed Ledger Technology. He has executed projects in these areas that have been funded by Intel Technology India Pvt. Ltd., Bangalore, ABB Global Industries and Services Pvt. Ltd., Bangalore, Robert Bosch Engineering and Business Solutions Pvt. Ltd., and Futurewei Technologies, Inc., USA. Mohit received the EMC Young Achiever of 2015 Award from EMC Corporation, Bangalore, and the Outstanding Young Professional Volunteer Award of 2021 by IEEE Bangalore Section.

Mohit has contributed to open-source projects for more than a decade. A packet scheduler developed by his team at NITK Surathkal to fight the Bufferbloat problem got merged in the mainline of the Linux kernel (v5.6). He is a Member of the Steering Committee of the ns-3 consortium, and a co-maintainer of traffic-control and TCP modules in ns-3. He served as a Member of the PC for Workshop on ns-3 (WNS3) for the past eight editions. Besides, he served as a Mentor for Google Summer of Code (GSoC) from 2017 - 2020 for the ns-3 organization and is one of the Organization Administrators for 2021. He also served as an Organization Administrator for ns-3's participation in Google Code-In (GCI) during 2018 and 2019.

He has 45+ technical publications in peer-reviewed international conferences and journals. He is a Reviewer for IEEE Internet of Things, IEEE Transactions on Cloud Computing, Elsevier Journal of Network and Computer Applications, Computer Communications, Inderscience journals, IEEE Communication Letters, and held several other roles in IEEE and Springer conferences. He served as a Guest editor for Annals of Telecommunications, Springer journal. He is a Senior Member of IEEE and was a Student Activity Chair of IEEE Mangalore Sub-Section during 2015-2017, and a Member of the Executive Committee of IEEE Mangalore Sub-Section for six years. He is the current Secretary of IEEE Mangalore Sub-Section. He is also a member of ACM.

## IEEE Open Journal of the Computer Society (OK-CS)

The IEEE Open Journal of the Computer Society (OJ-CS) is our Gold Open Access journal, launched in 2020, and is 100% open access. Be among the first to be published on OJ-CS and benefit from rapid publication.

The Open Journal of the Computer Society is dedicated to publishing articles on the latest emerging topics and trends in all aspects of computing. The scope of the Society shall encompass all aspects of theory, design, practice, and application relating to computer and information processing science and technology.

OJ-CS complements existing IEEE Computer Society publications by providing a rapid review cycle and a thorough review of technical articles within the open-access-only framework. Our goal is to publish quickly; the rapid peer-review process is targeting a publication time frame of 10 weeks for most accepted papers. This journal is fully open and compliant with funder mandates, including Plan S.

Sign Up for Alerts about the IEEE Open Journal of the Computer Society. Be among the first to learn the latest news about our new open access journal. https://www.computer.org/resources/newsletters/sign-up-for-open-journal-of-the-computer-society-alerts

# Technology in Telehealth

**Dr. K. Ganapathy**
drkganapathy@gmail.com

When I was invited to submit an article on Technology in Telehealth for this issue my immediate response was to subdivide "Technology" into its various components as enumerated in Fig 1 and elaborate each one of them, spelling out advantages, disadvantages, limitations of each component, necessity to integrate the devices etc. This would be followed by a ritualistic description of the basic components necessary for facilitating a teleconsultation (Fig 2), the primary objective being to produce a "wow" effect for the beneficiary. To complete the article and show the potential of technology I would use Fig 3 to illustrate technology at its highest. However, I subsequently felt that readers of this issue should not be exposed to technology *per se* particularly from a non-technologist!! Rather they need to know the views of a medical doctor, a clinician who belonging to the BC era (Not Before Covid but Before Computers!) has during the last 46 years, been convinced that technology in health care is only a tool, a means to an end and not an end by itself. Solutions should not go in search of problems. Statistically significant scientific evidence is required to prove that use of the technology has made a difference in the ultimate outcome and was better than intervention with reduced or no technology. To quote Lars Leksell the inventor of the Gamma Knife, which 50 years ago was the most sophisticated technology in healthcare. "A fool with a tool is still a fool". After all, when one has a hammer everything around you looks like a nail, particularly if it is an expensive hammer!!

One needs to be future ready, complying and adhering to all technical standards and regulations. All components need to be interoperable and scalable. Use cases in deployment of technology include care coordination during a Natural Disaster, a pandemic and routine health care. First aid kits today should have rugged *Tablets* which can improve communication, clinical decision support and data capture. Wireless devices can capture pulse rate, BP, Oxygen saturation, transmit heart sounds, lung sounds, ECG etc. Healthcare providers and response teams need to set up a broadband network to facilitate communications and share data, from the disaster area with health systems providing emergency care from a distance. In early 2018, AMD Global Telemedicine and Jenisys Global joined forces to create a rapid response telehealth clinic – basically a specially equipped storage container – that could be either transported on a truck or ship or airlifted into a disaster zone. The so-called "specialized health pods" come with their own power source and satellite-based broadband connection, HVAC (Heating, Ventilation and Air Conditioning systems) and waste disposal units and clean water source. The pods can be set up in 15 minutes.

It has been estimated that at least 300 million wearable devices were sold in 2020. Varying from sensors during pregnancy through baby monitors and fitness trackers the scale of digital health devices for the family is widening. Smart textiles monitoring ECG, respiration, and movement have been used to provide virtual remote health care in extreme environments. In one study signal quality was adequate in 111 out of 115 recordings and 90% of the subjects found the vest comfortable. We now have access to more data than ever. A smart watch displays heart rhythm and oxygen saturation levels. Non-invasive methods for determining blood sugar are now available. Blue tooth enabled POCD (Point of Care Diagnostics) can with a drop of blood estimate renal, liver and cardiac functions. 42 tests can be done with results similar to those obtained with giant analysers. 12 years ago, I had written articles on "A doctor in your pocket, a lab in your pocket, a hospital in your home". I would never have foreseen that this would be a reality in my home town in my life time and the best is yet to come!! Useful and actionable data is everywhere. A truly integrated experience is now possible, by connecting the dots leading to predictive analysis.

The Teleconsultation Process: Teleconsultation refers to the process of linking a patient and a doctor who are physically separated using Information and Communication Technology. I have repeatedly stressed that virtual interaction on any health-related issue cannot be compared to an eCommerce transaction. It is essential to know as much as possible about the individual having the problem as dissecting the problem itself. A live real time consultation should simulate to the maximum extent possible what the patient has been accustomed to so far. Lighting of the teleconsultant's chambers, professional attire and a body language which assures the beneficiary, that for the next 10 minutes the reason for the teleconsultant's existence, is only the patient! History taking, clinical examination and review of investigations all needs to be from a distance. Compliance and adherence to regulations will require getting an informed consent and ensuring privacy and security. Documentation of the teleconsultation process, with permission, is recommended. The patient needs to have basic digital literacy. Most are familiar with digital payment. To individuals like me, trained in the 20th century, the terms "client" "consumer" "health care industry" appear to diminish the sacrosanct individualised *one is to one* doctor patient relationship. In the last century health care was never viewed as an industry!!

There is an erroneous perception that widespread adoption, upscaling and deployment of Telehealth is solely related to availability of cost effective, affordable, accessible, user-friendly technology. There is no doubt that technology acceptance and behavioral modification, which we are witnessing particularly after the onset of Covid-19, has a major role to play. "Customer delight" is what every e Commerce platform aims for. The Amazons, Flipkarts and Googles of the world package their products in such a way that even octogenarians from rural backgrounds get hooked to an incredible experience. Whom

are we selling telehealth to? Who needs to get "hooked on" to experience virtual remote health care? How do you convince a worried or sick patient tens, hundreds, thousands of kilometers away that the specialist on the screen can do as good a job or even better than if he is holding your hands directly? How do you excite every individual doctor to evangelise Telehealth? This will happen only when his/her patient is convinced that telehealth is as good or better than a face-to-face consultation. 5G, bandwidth of 100 Mbps, a 55" hi resolution screen, a future ready voice activated EMR where images uploaded with ease at the remote end and  digitally manipulated by the consultant, playing videos, a wide choice of highly secured payment gateways etc – the list can be never ending. All this hi tech no doubt will help, but are we not missing the wood for the trees.

What does a patient using Telemedicine really want, even in 2021? He wants TLC (Tender Loving Care) "Listen, listen, listen he is telling you the diagnosis" said Sir William Osler 150 years ago. When I give a teleconsult I still listen!! *Patients do not care how much you know. They want to know how much you care*.  Healthcare is personal - it is very hard to feel your experience was excellent, when those treating you don't introduce themselves, or make eye contact, or say what they are doing to you and why. The doctor's body language says it all. No AI, no technology will ever substitute for a doctor who empathises, sympathises with his far away patient, wiping the patients tears albeit virtually.

Alas the powers that be, including teleconsultants forget that providing remote health care is not like selling/ buying a pizza online or booking a train ticket.   Technology helps in producing remarkable solutions. Telehealth will come centre stage in the core of the health care delivery system only if there is "Customer delight". No doubt technological advances are critical. An app a day may keep the doctor far away but I would still like my tech savvy doctor to be commiserating, to understand what *I* the patient wants, so that   the right apps will be prescribed!  Worldwide remote health care is driven by technologists, software/ hardware entrepreneurs, communication engineers, mobile network operators, CEOs of startups. manufacturers of peripheral medical devices, wearables etc. During the last 21 years 95% of the numerous talks, I have given and articles contributed (including IEEE!)  have been requested not by health care providers *per se* but by the equally important support system stakeholders in the Telehealth  ecosystem!!  Medical colleges, medical associations, clinical societies seldom include Telehealth in a CME program. IEEE is more interested in Telehealth than IMA!! It is unusual to find a clinician giving up a lucrative medical or surgical career to embrace and evangelize telehealth. Mad Doctors and their happy patients propagating Telehealth can do wonders in promoting acceptance.

The clinician should be the first among equals if patients are to get excited about telehealth. It is the clinician and the patient who should primarily be taking the initiative to promote virtual consultants. Today it is the telehealth "industry" that is in the forefront for promoting digital health. A reproducible business model which takes into account "WiiFM" of every stakeholder in the Telehealth ecosystem is essential. "**W**hat **i**s **i**n it **F**or **M**e" cannot be brushed aside. Technology developers get their payment upfront. The success of a Telemedicine project – does not depend on technology alone. Behavioural modification and technology acceptance by senior citizens primarily depends on the enthusiasm of the teleconsultant.

When users are presented with a new technology, several factors influence their decision about how and when, they will use it. These include Perceived Usefulness (PU) – "the degree to which a person believes that using a particular aid would enhance his/her efficiency. Perceived ease-of-use (PEOU) is "the degree to which a person believes that using a particular system would be free from effort", If the technology is easy to use, then it is more accepted Perceptions are individualistic, depending on age, gender, circumstances and time to device use. People over 65 generally use fewer new technologies—including the Internet, smartphones, and other digital devices—and use them less frequently than younger people. Older, less educated, and less affluent people, as well as people with disabilities, appear to use them even less often.

A recent McKinsey report (https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/telehealth-a-quarter-trillion-dollar-post-covid-19-reality) indicates that strong continued uptake, favourable beneficiary perception and tangible investment in Telehealth is resulting in exponential growth of telehealth.  Analysis in July 2021, indicates telehealth use has increased 38x from the pre-COVID-19 baseline. This stabilisation was after an all-time high of 78x in April 2020 compared to February 2020. This dramatic *necessity enforced change,* was enabled by increased consumer and provider willingness to use telehealth and regulatory changes enabling greater access and reimbursement. Perceptions of technology security needs to be addressed to sustain consumer and provider virtual health adoption. Models are likely to evolve to optimize hybrid virtual and in-person care delivery. In the USA maximum use of virtual consults is in psychiatry (50 %) and substance abuse treatment (30 %) .40 % opined that they would continue to use telehealth compared to 11% in the pre COVID-19 era. As of April 2021, 84 % of physicians in the USA were offering virtual visits. 57 % opined that they would prefer to continue offering virtual care. Venture capitalist digital health investment in 2020 was 3x the level in 2017. In the first half of 2021 alone it was $14.7 billion, compared to $14.6 billion in whole of 2020 and $7.7 billion in 2019.
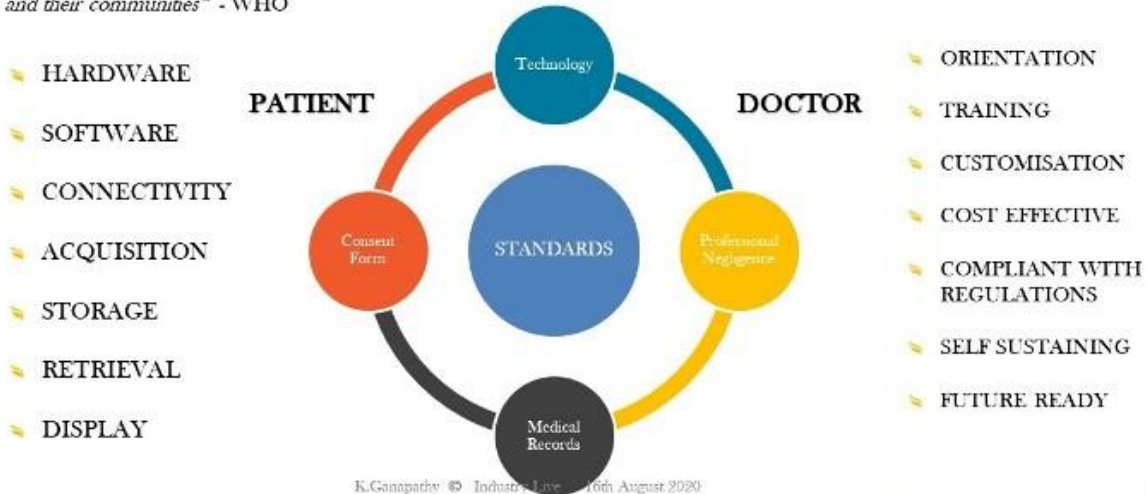
"Customer delight" is not just a cliché   used as marketing ploy. We need to develop tools to address specific problems never forgetting that the world has turned upside down.  Digital natives and millennials need to get into the minds of octogenarians who appear to have come from another planet! The ultimate illustration of technology in Telehealth would be monitoring and providing healthcare 200 km above the earth to India's three Vyomanauts during the Gaganyaan mission (Fig **3** shows the author @ the Johnson Space Centre in Houston in Dec 2019). Circumstances and necessity will make all players understand that telehealth a tool for connecting and ensuring a continuum of care, will no longer be a choice but

will become a differentiator. Once a new technology rolls over you, if you are not part of the steamroller, you are part of the road. The writing is on the wall! Distance today is meaningless. Geography has become History! The sky is no longer the limit for Telehealth!



*Fig 1 enumerates various components required to facilitate a teleconsultation*



*Fig 2 shows basic technical requirements and set up required to ensure "customer delight" during a Teleconsult*

Closely interacting with Flight Surgeons monitoring the healthcare of astronauts on board the ISS and later with other astronauts who had stayed for months on the ISS was indeed a memorable experience - Astronaut on ISS seen live on the middle panel

*Ultimate in deploying technology in Telehealth would be monitoring astronauts on mission to Mars*

*Fig 3 Author @ Johnson Space Center Houston in Dec 2019*

**About the author**



Dr. Krishnan Ganapathy Former Secretary and Past President Neurological Society of India, Telemedicine Society of India & Indian Society for Stereotactic & Functional Neurosurgery is a Hon Distinguished Professor @ The TamilNadu Dr. MGR Medical University. Member Roster of Experts Digital Health WHO. Director, Apollo Telemedicine Networking Foundation & Apollo Tele Health Services. During the last 46 years, he has presented 558 papers in national conferences and 175 in international meetings. He has published 268 scientific papers & 21 chapters in books URL: www.drkganapathy.com  EMail: drkganapathy@gmail.com

## IEEE SA Healthcare and Life Sciences Practice

The IEEE SA Healthcare and Life Sciences Practice is a global platform of excellence bringing together committed volunteer stakeholders to evaluate, validate, and develop solutions for establishing trust in new technology applications that will afford the right to safety, security and protection of life. The practice is focused on three main priority areas - clinical health, bio/pharmaceutical value chain, and wellness - designed to address the obstacles to universal and sustainable quality of care for all individuals.

WAMIII VIRTUAL TALK SERIES: The IEEE SA WAMIII (Wearables and Medical IoT Interoperability & Intelligence) Virtual Talk Series features global experts introducing challenges and opportunities, sharing insights on latest technology developments, and outcomes standards adoption in the connected wireless medical devices domain. Topics of discussion focus on communication and connectivity challenges for devices in, on and around the patient, data portability, validation and interoperability, patient data agency, and frameworks needed for mobilizing critical and urgent care units to the home. The series kicked off in March 2020 and is ongoing with new live sessions added monthly. Register free for access to on-demand and upcoming live broadcasts. https://standards.ieee.org/events/wamiii/virtual-talk-series-2020.html

Global Connected Healthcare Cybersecurity Workshop Series: Join us for this exciting series of five webinars that will delve into challenges and opportunities in connected healthcare security, privacy, ethics, trust and identity, including data and device validation and interoperability. https://standards.ieee.org/practices/healthcare-life-sciences/gchc.html

PANDEMICS & ETHICS: CAN CONTACT TRACING APPLICATIONS ADDRESS BOTH EFFECTIVELY?: Contact tracing applications and contact tracing technologies (CTA/CTT) continue to be cited as approaches to help manage the spread of COVID-19. View the latest whitepaper from the IEEE SA ECPAIS community for addressing transparency, accountability, ethical considerations, and privacy. https://engagestandards.ieee.org/ECPAIS-CTA-TAPEFR-Report.html

# Unlock the power of AI with IBM Watson

**Mr. Vidyasagar Machupalli (Vidya)**
vidyasagar.msc@in.ibm.com

Artificial Intelligence (AI) is everywhere. Everyone is putting AI to work to turn our most valuable resource — data — into new ways of doing business. With AI, we are no longer wrestling with data, but using it to recommend with confidence, accelerate research and discovery, and enrich interactions with customers on their terms. The purpose of AI systems is to augment human intelligence, and the next step on our journey to make AI more accessible for everybody with IBM Watson starts here.

## What is IBM Watson?

IBM Watson is an IBM's portfolio of business-ready tools, applications and solutions, designed to reduce the costs and hurdles of AI adoption while optimizing outcomes and responsible use of AI.

Watson is helping everyone put AI to work. The Watson portfolio is designed to make it easy for you to use data from diverse sources, trust the recommendations and predictions from your AI models, and get more value from your AI, faster. With Watson, you have access to the most complete portfolio of AI capabilities for business, whether it's tools for building your own models, pre-built applications to accelerate time to value, or access to a robust ecosystem of partners across multiple industries.

## Why IBM Watson?

Watson is built on an ethical foundation. For AI to thrive and for businesses to reap its benefits, it needs to be built on principles of trust. Watson is AI that you can understand and feel confident about because it provides the tools to help explain and manage AI-led decisions in your business. At IBM, your data and insights belong to you, and transparent processes crack open the black box of AI, giving you confidence in the technology and decisions being made. That's confidence you can pass onto your team and your customers.

## Common AI use cases

AI is a powerful toolbox that has many applications in domains far and wide. The types of problems that the AI toolbox is best equipped to solve can be split into six core intents, as described on IBM's Watson site:

1. Accelerate research and discovery
2. Enrich your interactions
3. Anticipate and preempt disruptions
4. Recommend with confidence
5. Scale expertise and learning
6. Detect liabilities and mitigate risk

Some of the most common tasks AI performs — and their corresponding subfields — include:

- Extracting information from pictures (computer vision)
- Transcribing or understanding spoken words (speech to text and natural language processing)
- Pulling insights and patterns out of written text (natural language understanding)
- Speaking what's been written (text to speech, natural language processing)
- Autonomously moving through spaces based on its senses (robotics)
- Generally looking for patterns in heaps of data (machine learning)

To address these AI use cases, IBM offers the Watson products as easy-to-use services on IBM Cloud.

## Artificial intelligence and IBM Cloud

IBM has been a leader in advancing AI-driven technologies for enterprises and has pioneered the future of machine learning systems for multiple industries. Based on decades of AI research, years of experience working with organizations of all sizes, and on learnings from over 30,000 IBM Watson engagements, IBM has developed the AI Ladder for successful artificial intelligence deployments:

- Collect: Simplifying data collection and accessibility.
- Organize: Creating a business-ready analytics foundation.
- Analyze: Building scalable and trustworthy AI-driven systems.
- Infuse: Integrating and optimizing systems across an entire business framework.
- Modernize: Bringing your AI applications and systems to the cloud.
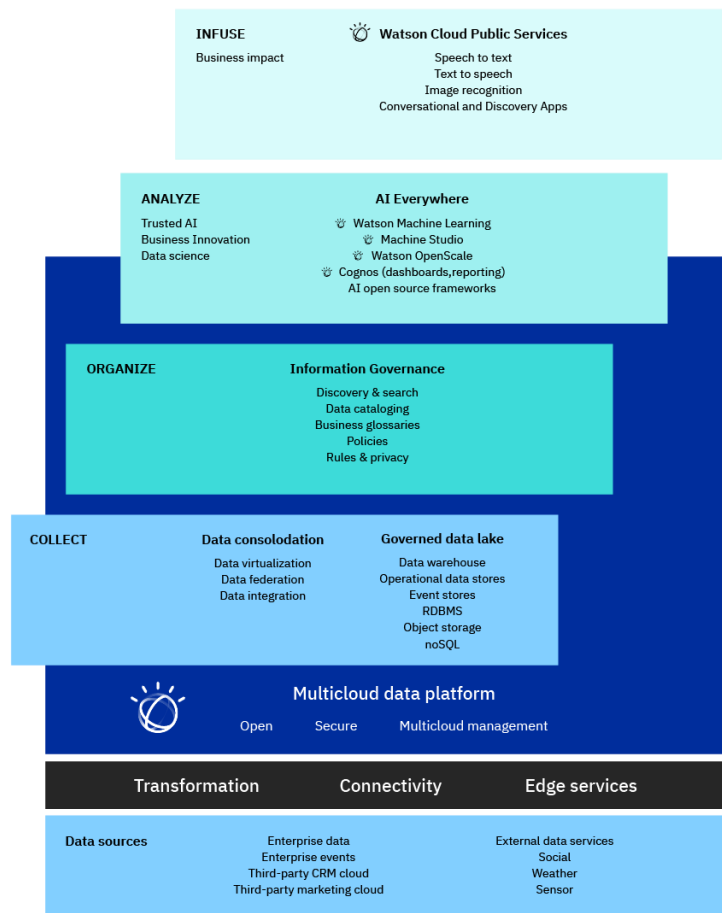


*Image source: IBM Cloud Architecture Center*

IBM Watson gives enterprises the AI tools they need to transform their business systems and workflows, while significantly improving automation and efficiency. For more information on how IBM can help you complete your AI journey, explore the IBM portfolio of managed services and solutions.

**Bringing the Watson AI services together to solve a real-world problem**

IBM Cloud hosts a wide range of Watson services that can be helpful for creating chatbots, virtual assistants and conversational agents. Natural language understanding (NLU), speech to text, text to speech, and conversation services could all play roles in your project.

The Watson AI services on IBM Cloud can work together and also work with other cloud services to solve any business problem. The challenge can relate to healthcare, financial operations, customer service, IT operations, video streaming and hosting, risk and compliance, advertising and many more.

The problem can be as simple as building a voice-enabled chatbot to building, deploying, testing and monitoring a predictive machine learning model.
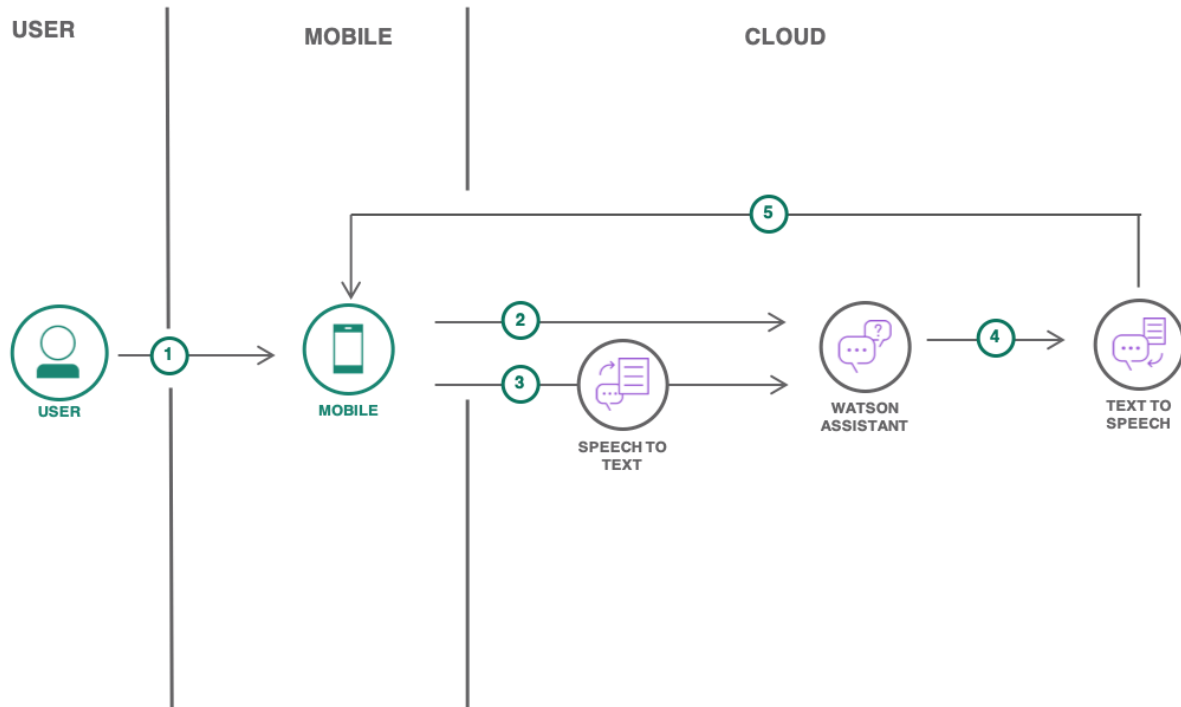
IBM has pioneered the development of Speech Recognition tools and services that enable organizations to automate their complex business processes while gaining essential business insights.

- IBM Watson Speech to Text is a cloud-native solution that uses deep-learning AI algorithms to apply knowledge about grammar, language structure, and audio/voice signal composition to create customizable speech recognition for optimal text transcription.
- IBM Watson Text to Speech generates human-like audio from written text, increasing customer engagement and satisfaction by improving accessibility across languages and interaction modalities.

IBM Watson Assistant is a powerful cloud service for building an intelligent chatbot. It delivers a robust, interactive experience through API endpoints, streamlines development and helps enhances solutions by offering easy-to-use tools, ways to simplify dialog, pre-built content, analytics capabilities and more.

IBM offers a catalog of pre-configured customer service and industry-specific content packs. For example, if you're building a chatbot to provide a personalized experience for hotel guests, the Watson Assistant for Hospitality can help you speed development.

There are simple tutorials that will teach you how to build a kind of chatbot, a Slackbot that uses cloud services like IBM Watson Assistant, IBM Cloud Functions (a function-as-a-service platform), and IBM Db2 Warehouse on Cloud.

**Watson AI technology for advanced Machine learning and Data science**

IBM Cloud Pak for Data is a fully integrated Data and AI platform that modernizes how businesses collect, organize, and analyze data and infuse AI throughout their organizations. Built on Red Hat OpenShift Container Platform, IBM Cloud Pak for Data integrates market-leading IBM Watson AI technology with IBM Hybrid Data Management Platform, DataOps, and governance and business analytics technologies. Together, these capabilities provide the information architecture for AI that meets your ever-changing enterprise needs.

**IBM Cloud Pak for Data**
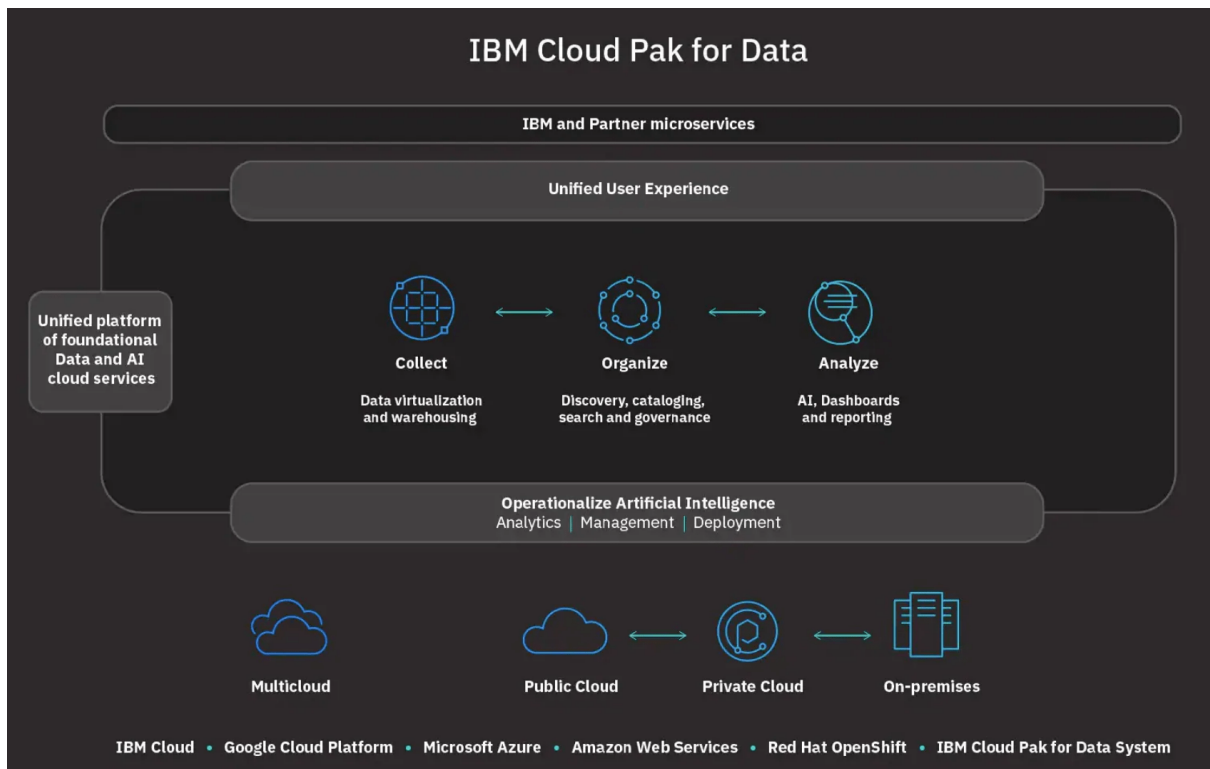
**Cloud Pak for Data**

Cloud Pak for Data are offered as software that you must install and maintain. You can install Cloud Pak for Data on your own on-premises hardware, on IBM Cloud, or on other cloud platforms. Cloud Pak for Data as a Service on the other hand is a set of IBM Cloud services.

Cloud Pak for Data as a Service is a cloud native modular service platform for all your data governance, data engineering, data analysis, and AI modeling tasks. Cloud Pak for Data as a Service includes an integrated data fabric with which you can logically collect and organize all of your data so that your data consumers have instant and secure access to trusted information. Supported by the data fabric, Cloud Pak for Data as a Service includes a suite of data science and AI tools so that your data consumers can analyze your data and infuse your applications with AI for better business outcomes.

If you provision Cloud Pak for Data as a Service, the product brand is always Cloud Pak for Data, regardless of which services you include.
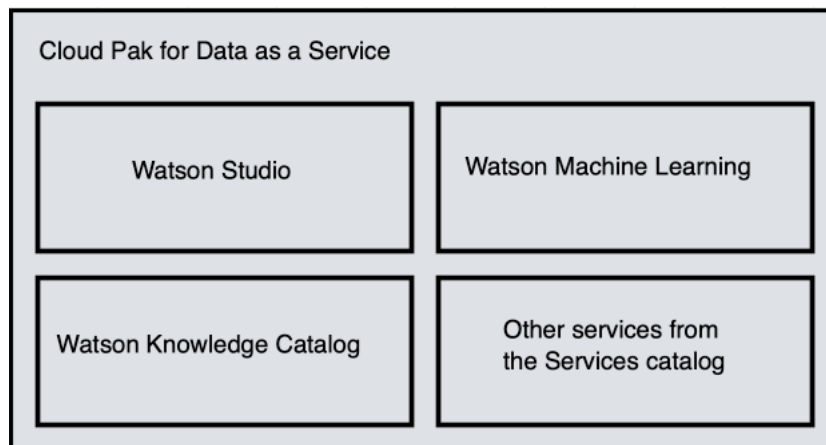


With IBM Cloud free tier, create your account at no charge. Try over 40 always-free products with no time limit including IBM Watson APIs. Sign up for an IBMid and create your IBM Cloud account at https://cloud.ibm.com/registration

## References

1. About IBM Watson - https://www.ibm.com/watson/about
2. IBM Watson stories - https://www.ibm.com/watson/ai-stories
3. IBM Research Pioneers Technologies Behind New AI for IT Capabilities - https://www.ibm.com/blogs/research/2020/05/ibm-research-pioneers-ai-for-it-capabilities/
4. Build a voice-enabled Android chatbot - https://cloud.ibm.com/docs/solution-tutorials?topic=solution-tutorials-android-watson-chatbot
5. Build, deploy, test, and monitor a predictive machine learning model - https://cloud.ibm.com/docs/solution-tutorials?topic=solution-tutorials-create-deploy-retrain-machine-learning-model
6. IBM Cloud managed AI services - https://cloud.ibm.com/catalog?category=ai#services
7. IBM Cloud Architecture Center
8. Build a database-driven Slackbot - https://cloud.ibm.com/docs/solution-tutorials?topic=solution-tutorials-slack-chatbot-database-watson
9. Scaling the AI Ladder - https://www.ibm.com/blogs/think/2018/02/ibm-ai-ladder/
10. IBM Cloud Pak for data as a service documentation - https://dataplatform.cloud.ibm.com/docs/content/wsj/getting-started/welcome-main.html?context=cpdaas
11. AutoAI tutorial: Build a binary classification model - https://dataplatform.cloud.ibm.com/docs/content/wsj/analyze-data/autoai_example_binary_classifier.html?audience=wdp

## About the author

Mr. Vidyasagar (Vidya) is a polyglot and pragmatic programmer, who loves technologies changing lives, an AI Enthusiast mastering Machine Learning and Data Science. He has an impressive work profile with 14+ years of industry experience and a broad set of skills in software development and design. Currently, he is the Senior Product Manager & Developer Advocate at IBM. His role involves exploring & defining cloud solutions, tutorials & products, working closely with product teams, coding code samples, enabling SIs and startups on IBM Cloud, presenting at conferences covering Cloud, AI, DevOps, and Mobile. Prior to this, he was with DELL, INDECOMM, CDC SOFTWARE and MAHINDRA SATYAM.

Mr. Vidya is an adjunct faculty at the Christ University, Bangalore and teaches Cloud Computing and Machine Learning in master's level courses. He is well-known blogger and speaker at various technical conferences, meetups, and events. On his personal blog on WordPress, he writes on subjects from Cloud to AI to Gaming. Additionally, he is a regular contributor in platforms such as Medium, DZone, Dev.to, IBM Cloud Blog.

Mr. Vidya is a constant learner, and a technology enthusiast, loves exploring new cloud paradigms, programming languages, and technologies. He is a core Member and Organiser of BlueCoders Meetup Group. Mr. Vidya has several accomplishments to his credit. Some of them include: DZone Most Valuable Blogger; Intel Software Innovator – RealSense; Dell-Silver Award – Breakthrough Thinker; Microsoft Most Active Individual in the gaming community; Microsoft Most Valuable Professional – Gaming, Xbox & Visual Studio Tools; Indecomm Top Gun Award for Innovation and Excellence; IBM eXtra Miler award; and DZone Core member.

## Additional Readings

Tomorrow's AI Will Reason Like Humans, IBM Watson Developer Predicts: David Nahamoo says machines will grok us. https://spectrum.ieee.org/tomorrows-ai-will-reason-like-humans-ibm-watson-developer-predicts

IBM Watson Overpromised and Underdelivered on AI Health. https://spectrum.ieee.org/how-ibm-watson-overpromised-and-underdelivered-on-ai-health-care

Learn IBM Watson with Online Courses and Lessons | edX. https://www.edx.org/learn/ibm-watson

IBM Watson: A cheat sheet: This comprehensive guide covers how the IBM Watson data analytics processor works, and how it helps customers in various industries make critical decisions. https://www.techrepublic.com/article/ibm-watson-the-smart-persons-guide/

IBM Watson: How is It Changing The Industry Today? https://www.jigsawacademy.com/ibm-watson-changing-industry/

# It is not your parents Windows anymore!

**Mr. T. N. C. Venkatarangan**
venkatarangan@gmail.com

## Windows 11

What does a designer of children's books and biscuit tins, or a psychology major got to do with Windows, the operating system from Microsoft?

The two, Priya Chauhan and Dorothy Feng are from the team that designed the new, signature feature for Windows 11 – the widgets, available next to the start button widgets provide you with a quick glance to information you need to know and care about, without you opening individual apps. Unlike the infamous business metrics like KPI, Chauhan and Feng are measured by how it can make the users happy. And that is a common theme you will hear nowadays from the Windows team, calmness, happiness, less stressful are the emotions they went for – words we normally don't associate with a software, that too something that is being used by over 1.3 billion users around the worldwide.

Building on the foundation of Windows 10, Windows 11 is the next version that is expected to be released by the end of 2021. At first new PCs will be shipping with Windows 11, followed by free upgrade options to users of Windows 10, provided their machines meet the hardware requirements – which are PCs with Intel Core 8th Generation or newer CPUs and AMD's Athlon & Ryzen CPUs released in the last few years, UEFI Secure Boot Capable Motherboard, TPM (Trusted Platform Module) version 2.0 enabled in the system BIOS and with DirectX 12 supported GPU. If you have an eligible PC to spare, you can sign up for free to Windows Insider program from Windows 10 settings app and then upgrade to Windows 11 Beta to give the OS a try. Since the OS is in development, currently I will not recommend this to be done on your primary work PC. For instructions on how to enable TPM feature in your PC's motherboard or laptop search in my blog (address in the references section).

A few weeks ago, I gave Windows 11 a spin on my PC using Microsoft's virtualization Hyper-V platform. The insider preview was looking gorgeous.
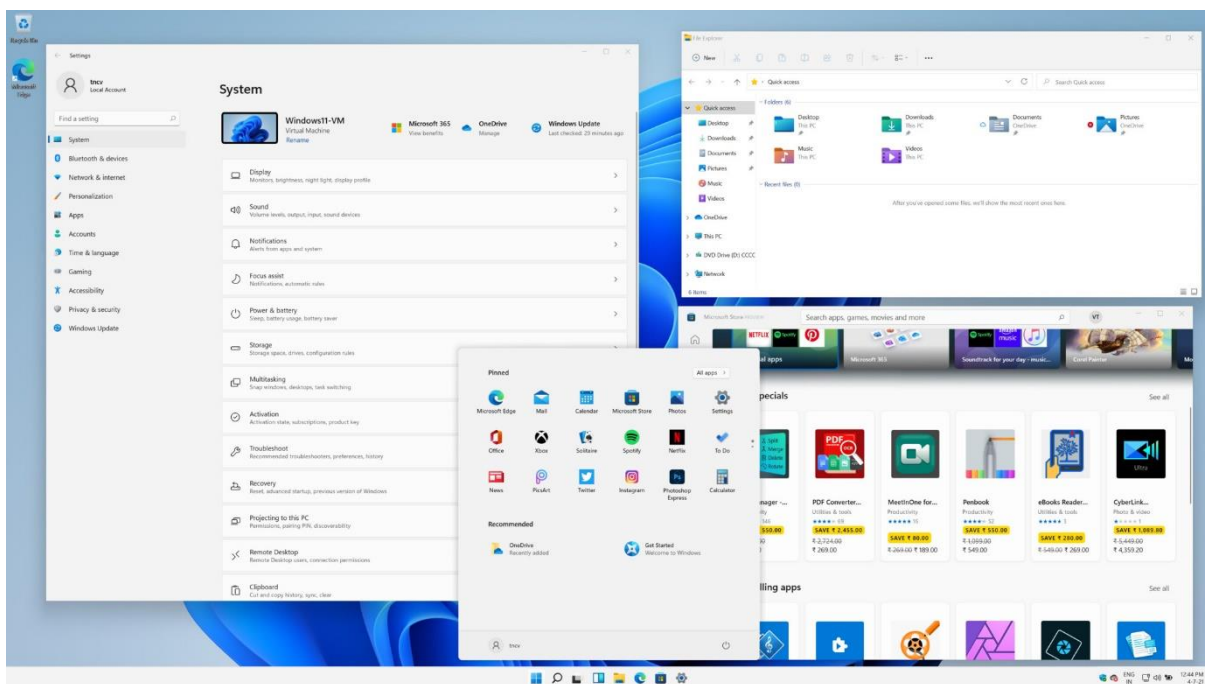


*Figure 1: Windows 11-The all-new rounded-corners and fluent design, seen here are the Settings app, File Explorer, Dock, and the Microsoft Store.*

I like the colour palette of the new File Explorer, the simplicity of the dock, the cleaner settings, a better Microsoft Store, and having as default Windows Terminal instead of the legacy Command Prompt & Winget as the app installer. In this early build the desktop, the dock (launcher) & the settings screen have been changed to the fluent UI with rounded corners.

Let us start with the improvements made to the most used app in Windows, the File Explorer. In the last twenty-five years from Windows 95, the File Explorer in Windows has got cluttered so much that when you right-click on a file, you see a screen-long list of items – I tried it now and got thirty-four options – there is no way a normal user will be able to find anything in this mess. While some of them are useful, most of the options, often don't make any sense.
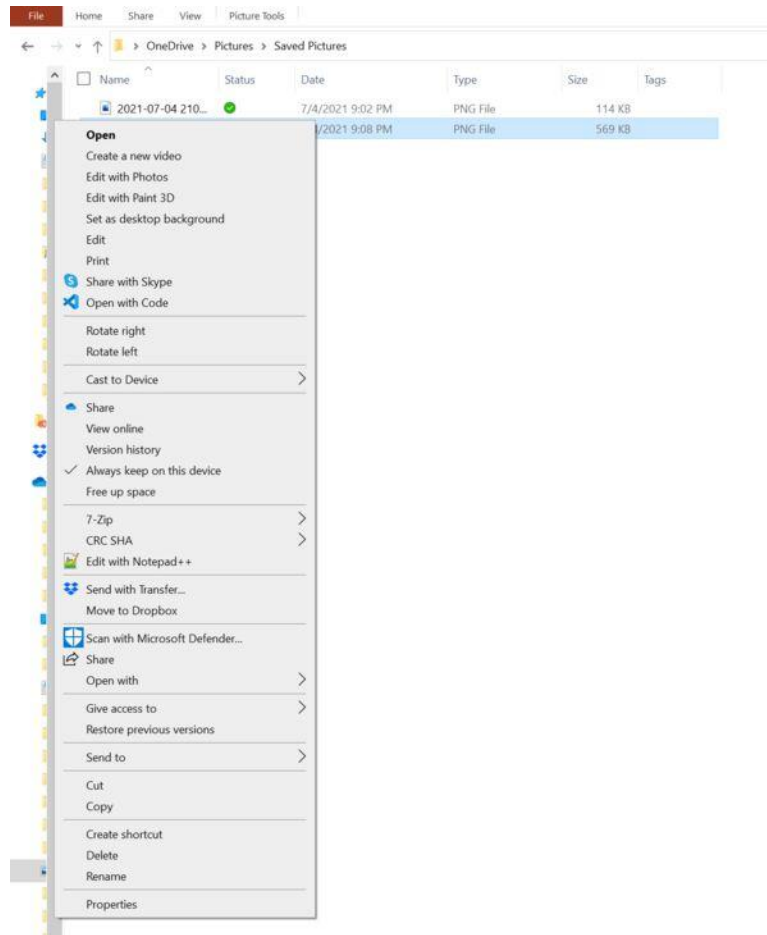
*Figure 2: Windows 10 File Explorer, Right-Click options*

Now, compare the above with the de-cluttered interface of the new File Explorer in Windows 11, it is remarkably clean. I will go on a limb here and say this looks simpler than the options list in the Finder app in macOS.
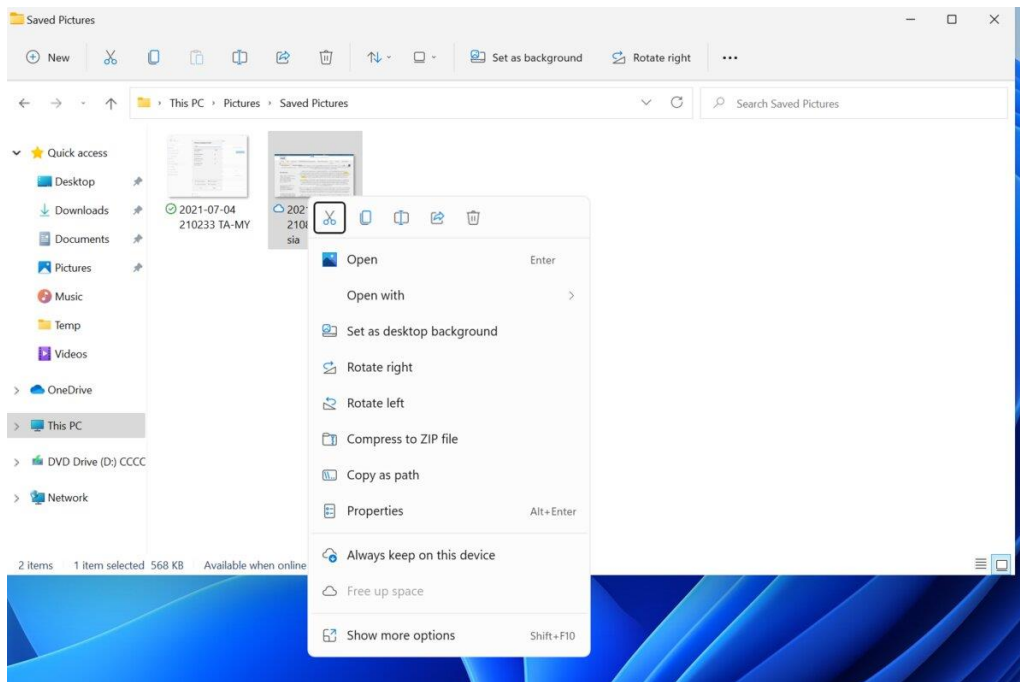


*Figure 3: Cleaner looking File Explorer in Windows 11*

Next to the File Explorer, the settings app has been streamlined. I was curious to check out whether any improvements have been made to the language support. I noticed the language and region settings have been cleaned and unified – it looks good. In my limited tests, third-party keyboard apps continue to work in Windows 11.
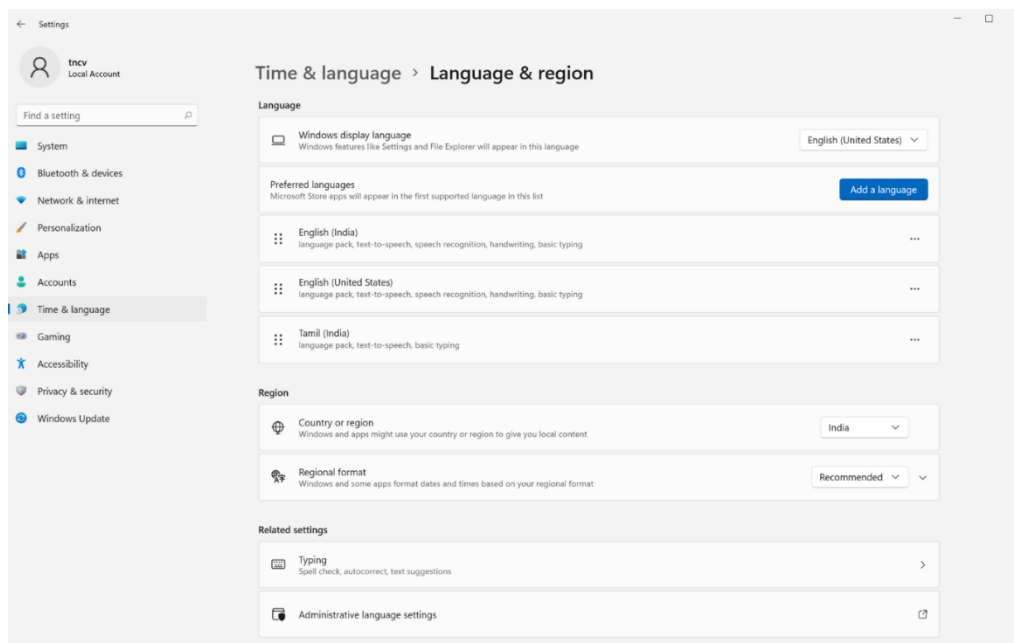


*Figure 4: Windows 11 – Time & Language – Language & Region*

One of the topics often discussed about Windows 11 was its requirement of a TPM 2.0 to run. Let us see what this is. Trusted Platform Module is a hardware module that has been shipping in most of the PCs sold in the recent years, but unfortunately most OEMs had it disabled in the BIOS, now Microsoft is requiring it is enabled before you can upgrade to Windows 11. The purpose of a TPM chip is to protect encryption keys, user credentials, and other personal data with the help of hardware, making it impossible to be altered unlike those stored in software. This provides a protective layer against malware and attackers from tampering with that data. Microsoft says that "Requiring the TPM 2.0 elevates the standard for hardware security by requiring that built-in root-of-trust."

For a few years I have been using password-less login to my Windows 10 PC using Windows Hello face authentication (which works just like in the latest iPhones or Samsung Galaxy phones) and Bitlocker encryption in my laptops to secure them from bad actors even when they have physical access to the device. With TPM 2.0 enabled, Windows 11 takes it to the next level.

Microsoft is making changes to the out of the box apps that get shipped with Windows 11. The infamous Internet Explorer (IE) web browser and Paint 3D apps are not installed by default. The popular drawing app, Microsoft Paint is getting a fresh design with new toolbars. Productivity apps like the Mail, Calendar, People, Clock and Calculator are also seeing improvements made.

Today's computer monitors and laptop displays are large, but most of the time we are having only a single window open on top, and not utilizing the real estate effectively. For most users multi-tasking with many apps open side-by-side has been difficult to discover and learn. Windows 11 hopes to solve it with the introduction of new features like Snap Layouts, Snap Groups and Virtual Desktops – these help you organize your app windows and improve your productivity significantly while keeping the visual layout clean.

The pandemic and the resulting lockdowns have shown us the importance of keeping in touch with friends, family, co-workers and partners through video calls. Windows 11 makes organizing a meeting or chatting super easy with the integration of Microsoft Teams, an app that has over 145 million daily active users.

Apart from the above, Windows 11 also comes with a redesigned and a new Microsoft store that makes discovering and installation of apps easy. Microsoft has also partnered with Amazon and Intel to make it possible for users to install and run Android apps in their PCs seamlessly – this opens a huge selection of millions of apps ranging from your favourite smartphone game to the secure banking app that you use. Developers and independent software vendors (ISVs) can now bring their apps regardless of whether they are Win32 apps or Progressive Web Apps (PWA) or Universal Windows App (UWP which was popularised with Windows 10) to Windows 11.

Windows 11 will be available through a free upgrade for eligible Windows 10 PCs and on new PCs beginning this year end.

## Windows 365

Early July 2021, Microsoft introduced Windows 365. What is it, how is it different from Windows 11?

Microsoft calls Windows 365 as the world's first cloud PC, no doubt this is a marketing claim, nevertheless this is a significant step for how businesses use Windows in the future. A cloud PC is your personalized desktop, apps, settings, and content streamed securely from the cloud to your devices. Simply put it is a copy of Windows 10 (later Windows 11) running securely in Microsoft's Azure cloud infrastructure exclusively for you. You can connect to it from a wide variety of endpoint devices including PC, Apple Mac, Smartphones, Tablets or even Chromebooks. What you need is a decent Internet connectivity and a web browser. All your files and data are preserved in the Windows instance running in the cloud.

 "Just like applications were brought to the cloud with SaaS, we are now bringing the operating system to the cloud" says Microsoft's CEO Mr Satya Nadella while he introduced the offering to the public on 14th July 2021. Apart from the convenience of not needing to do any maintenance (which Microsoft takes care in the background), a Cloud PC facilitates you to upgrade or downgrade the resources available easily. For example, when you require more CPU cores or memory, you can get them with a click and on extra cost(!) without having to invest a huge sum upfront.

The ability to run Windows remotely was available through products like Microsoft's own Azure Virtual Desktop or Citrix and other vendors. They were difficult to procure and required an IT team to setup and maintain. Windows 365 aims to alleviate the complexities through predictable, flat pricing based on usage.

Windows 365 is available on two editions: 1) Windows 365 Business is for small & medium businesses who have less than 300 users, they require no other Microsoft licenses, and can get started with a credit card. 2) Windows 365 Enterprise is for large organizations of any size who want to deploy Cloud PCs and manage it with Microsoft Endpoint manager, this requires the organization to have existing licenses for Windows 10 Enterprise.  The price for Windows 365 starts with INR 1,865 per user per month (plus GST) for a Single CPU core, 2 GB RAM, 64 GB storage cloud PC. It goes all the way to INR 12,605 (plus GST) for the top-end which comes with Eight CPU cores, 32 GB RAM and 512 GB storage.
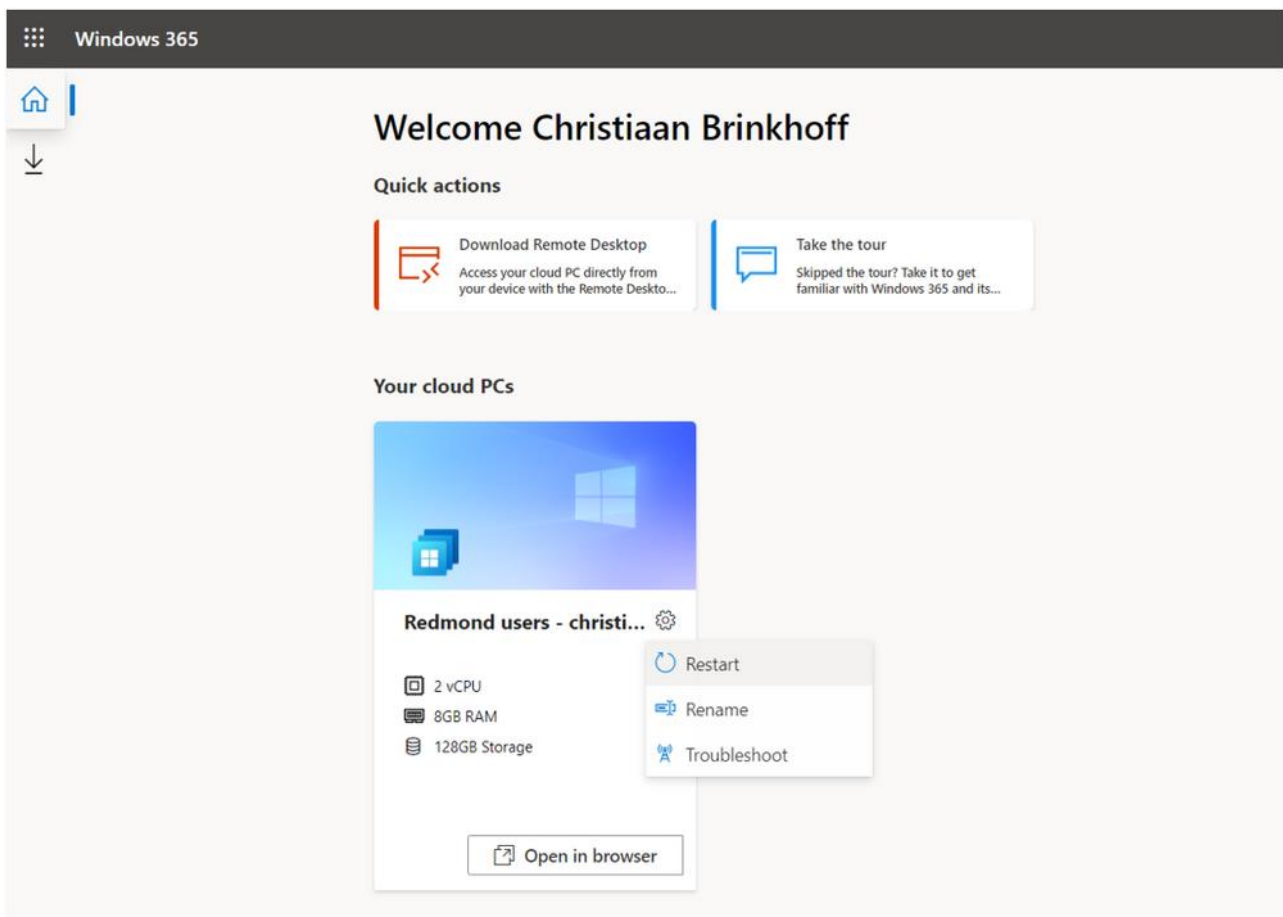


*Figure 5: Windows365.com dashboard for self-service*

Small businesses can benefit from the self-service features offered by Windows 365.

The three main benefits of Windows 365 over on-premises Windows are:

- **Powerful**: With instant-on boot to their personal Cloud PC, users can stream all their applications, tools, data and settings from the cloud across any device. Windows 365 provides the full PC experience in the cloud.
- **Simple**: With a Cloud PC, users can log in and pick back up where they left off across devices, providing a simple and familiar Windows experience delivered by the cloud.
- **Secure**: Windows 365 is secure by design, leveraging the power of the cloud and the principles of Zero Trust. Always up to date. Information is secured and stored in the cloud, not on the device.

The below table provides the differences between the Windows 365 editions and with Azure Virtual Desktop (which has been available for the last few years):

| | Windows 365 | | Azure Virtual Desktop | |
| --- | --- | --- | --- | --- |
| | Enterprise | Business | Personal | Pooled |
| Management portal | Microsoft Endpoint Manager | No admin portal | Azure Portal | |
| Operating system | Windows 10/11 Enterprise (single session) | | Windows 10/11 Enterprise (Single session, multi-session), Windows Server | |
| Desktop images management | Custom and Microsoft-provided. No image based management due to persistent VMs. | Microsoft-provided only | Custom and Microsoft-provided. Image-based management possible with FSLogix. | Custom and Microsoft-provided. Image-based management. |
| Applications and updates | Delivered via MEM or manually installed | Manually installed only | Delivered via MEM, image updates or MSIX app attach | |
| Backup and DR | No hypervisor-level backups at this time | | Full backup and DR flexibility of Azure | |
| Monitoring | Endpoint Analytics | Not available | Azure Monitor | |
| User profiles | Local profiles stored on C: drive | | Native stored on C: drive or FSLogix stored on SMB file share | FSLogix stored on Azure Files, Azure NetApp Files or file server VM |
| Networking | Flexible, customer-managed | Not configurable, Microsoft-managed | Flexible, customer-managed | |
| Auto-scaling | Not applicable due to fixed monthly cost | | Flexible and can save up to 75% of peak Azure costs | |

*Figure 6: Windows 365 Business & Enterprise compared with Azure Virtual Desktop*

Future updates to Windows 365 will bring Windows 11 as a Cloud PC operating system and virtual graphics processing unit options that support advanced graphic workloads on Cloud PCs.

**References**

1. How to check for TPM 2.0 in your PC and enable it? https://venkatarangan.com/blog/w11preview
2. Introducing Windows 11: https://blogs.windows.com/windowsexperience/2021/06/24/introducing-windows-11/
3. Getting started with Windows 365 Enterprise: https://techcommunity.microsoft.com/t5/windows-it-pro-blog/get-started-with-windows-365-enterprise/ba-p/2530504
4. Windows 365 architecture: https://docs.microsoft.com/en-us/windows-365/architecture
5. Windows 365 plans and pricing: https://www.microsoft.com/en-us/windows-365/all-pricing

**About the author**

Mr. T. N. C. Venkatarangan is a Geek, book worm, coach, professional speaker and a blogger. He is a software entrepreneur with 25 years' experience of starting, growing and selling a company that operated in India, USA and UK. He holds the title of a Microsoft Regional Director (Honorary) from 1999 and is an IEEE Senior Member. Currently he is an advisor to the APJ Abdul Kalam International Foundation - House of Kalam in Rameswaram (India). He had predicted in 2003, that Mobile Phones will be the first and only computer for the developing world. By 2030, he foresees smartphones will cease to exist in the form we will identify, and he had created Simpligic – a U.S. patent pending (62/343,406) news app.

# Revisiting Immersive Technologies

**Mr. Pradeep Khanna**
pradeepk@globalmindset.com.au

Yet again in 2021, there is lots of noise around immersive technologies. It makes one wonder what the current state of play is in 2021 – lets revisit and demystify this.

In emerging technologies, it becomes important is to get the timing of the "Tipping Point" right. If one is too early, one runs out of resources, if too late, opportunity is gone. One can refer to various models on emerging technologies hype cycle for more information- a popular one being Gartner's hype cycle for emerging technologies.

What do we mean by "Tipping Point"? - it is when widespread adoption starts to happen

So, what's the current state of play of Immersive Technologies? And what do we mean by Immersive Technologies – is it Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), Extended Reality (XR)…...? or all of above.

XR is now generally accepted term for all types of realities including VR AR, MR.

MR was the common term representing all realities earlier - it included different points along a spectrum as we go from real world to a virtual world and keep adding digital content. Starting from the real world, the first milestone along this spectrum is Augmented Reality (AR), the next Augmented Virtuality (AV) and finally Virtual Reality (VR) where we are totally in a virtual /digital environment.

XR now includes MR and anything else related to a much used/ misused term "Metaverse"!!! now, what is "Metaverse"?

Metaverse is fusion of real world and all types of realities – AR, AV, VR, MR, XR, Internet ++. In this "Metaverse', we oscillate from the real world to a virtual world for experiences as well as get these experiences to the real world. In 2018 Steven Spielberg showcased "OASIS" in his movie "Ready Player one". "OASIS" was a symbolic version of a metaverse.

There are billions of dollars being spent on "Mini- Metaverses" – e.g., Facebook's "HORIZON", Epic Games "FORTNITE", Microsoft "MESH" and many more. Of course, one does wonder whether these mini metaverses will ever talk to each other? how many mini metaverses would one like to be a part of?

Anyway, back to the real world of Immersive Technologies. Despite being around for 25+ years, the taxonomy of immersive technologies is still emerging, standards are still emerging – so what has changed in the last couple of years.

Well, 5G is the game changer for XR. What is 5G? – it is the fifth generation of mobile network technology. 5G address the latency aspect in XR, enables some of head mounted device functionality to go to the cloud etc.

5G is different stages of implementation all over the world. It will take ~ 7-8 years to come to full functionality as it requires a whole new ecosystem to be built around it. So, we see ~ 7–8-year roadmap for XR with the tipping point happening in ~ 2-3 years. There are equally strong projections for XR for B2B and B2C in the 5G world. At a lower level, there are equally good projections for VR and AR, though AR comes up quite strong. Of course, being a futurist is a mugs game.

We also see Telecom companies being important players in the XR ecosystem – building 5G at infrastructure level and offer XR to the last mile at content level.

So, we are now in the sweet spot where an emerging technology like XR, which has been around for last 25 years is now heading for a tipping point in ~ 2-3 years. There is so much happening under the radar which will start becoming apparent in ~ 2-3 years.

However, even for the next 2-3 years XR related revenue will still be difficult to come by as the demand side is still struggling to understand the business and/or consumer value of XR and supply side is full of start-ups who no one knows outside the niche they operate in. In fact, very few really know what is happening in the XR ecosystem.

There are large number of XR entities ~ 1500 in Australia, ~2500 in India, ~3500 in China alone. 80% of these tend to be start-ups with headcounts of anywhere between 1 – 25 people. And 75% of these 80% tend to be bootstrapped.

There is currently an imperfect market with information asymmetry between demand and supply. Revenue will still be difficult to come by in the next 2-3 years as XR heads for the tipping point. On the delivery side, there are niche skills required like 3D modelling, UX/UI, Unity, Unreal etc and finding the right skill at the right time at the right place and at the right cost

can be challenging. The focus for XR entities in the next 2-3 years has to be on brand building. The challenge though is who pays the bills while following your passion.

There are two types of XR solution providers. Some are only XR focused, whereas others have another line of business generating revenue with investment in XR as a way of protecting their future.

On the enterprise demand side, ~ 10% are doing interesting work in XR, ~ 20% are dipping their toes and the remaining 70% are trying to understand the business value.

For XR, we are seeing at one end, a futuristic trend towards metaverse deploying deep tech. At the other end we have simple low-cost AR apps which are helping large number of people – some examples being AR heat maps for high criminal activity in specific parts of a city, AR app for installing Oxygen cylinder at home in times of severe delta covid outbreaks ++

Digital twins are another emerging trend. At B2C level this takes the shape of avatars and holograms. At enterprise level, Digital Twins are an exact digital replica of a physical product/system. Here XR blends with IoT (Internet of Things) and AI/ML (Artificial Intelligence/ Machine Learning) by leveraging sensors attached to the real product/system to send data points to the digital twin helps in tracking current and predicting future performance.

Economic activity in the virtual world is also seeing high growth though from a low base. Leveraging NFT (Non-Fungible Tokens) and Block Chain technology enables validating authenticity and ownership in the virtual world. Artworks have been leading in this with real estate /other asset categories following through.

One of the key challenges is Cybersecurity. There are many players involved in the XR ecosystem – hardware, software, rendering engines, content, apps, platforms ++ - who is looking at cybersecurity from an end-to-end perspective can often slip through the cracks.

Stay tuned for more updates in the next issue.

**About the author**

Mr. Pradeep Khanna is Executive Director Asia Pacific, Sydney Chapter President & Global Co- Chair Education for the global Virtual Reality Augmented Reality Association (https://www.thevrara.com/) & CEO of Global Mindset (http://www.globalmindset.com.au/)

He has MBA from AGSM (UNSW), MSc (Computer Science) from UTS & B Tech from IIT Delhi. He has 30+ years of executive experience and has been a leader for IBM Australia/NZ leveraging India, China, Philippines, Vietnam, Egypt, Romania, Brazil & Argentina.

Mr. Pradeep is an Adjunct Professor in Australia, Singapore & India. Pradeep is a regular speaker at international conferences and in the calendar year 2019 has presented in 27 international conferences all over the world. He is an acknowledged leader in Emerging Technologies especially Virtual. Augmented and Mixed Reality and Education/EdTech. He is also convenor for Global Chapters & Emerging Technologies (including Immersive Technologies) for IIT Delhi Alumni Association (IITDAA), a worldwide community of more than 50,000 professionals. Pradeep is on the Advisory Boards of a number of companies.



*Source & Courtesy: https://www.accenture.com/us-en/insights/technology/responsible-immersive-technologies*
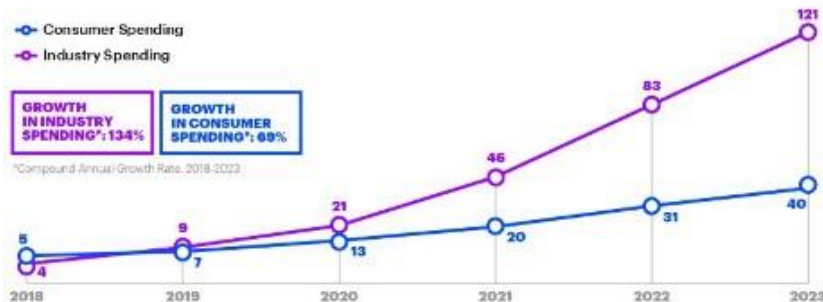
# Building a Promising Tech Product: The CredPad Experience

**Mr. Pradeep Henry**
PHenry08@gsb.Columbia.edu

It's quite shocking. With an abundance of coding skills has come an abundance of copycat apps. Building a tech product for the international market requires much more than coding skills. It requires three areas of expertise or steps:

- Step 1: Innovate a solution to a problem
- Step 2: Design business and product integrally
- Step 3: Develop software

The first two are creation steps that must precede development. The copycat apps missed the creation steps and instead started with development. How did I get all three steps done?

## Step 1: Innovate a solution to a problem

The product must solve an existing serious problem that individuals or organizations are struggling with – and do it in a unique way. Also, the problem should be something that a large number of customers care about.

Let's look at a problem. Take the achievers of the world – the top talent, the contributors, or whatever you call them. Those among the achievers who rely on a resume to promote themselves are probably stuck in the crowd – with jobs and paychecks that aren't consistent with the relatively bigger value that they contribute. The resume can't differentiate them. Competing resumes have similar content. Worse, the resume isn't even trusted. Even the best-written and best-looking resume is still only a list of alleged achievements.

Here's how CredPad – a personal digital showcase – solves the problem for achievers. Let's look at CredPad's primary output called "Contribution Chart." CredPad generates this chart based on your responses to a questionnaire. CredPad gets you to demonstrate your contribution in a business-savvy way. You present your contribution in the context of what matters to the recipient of your contribution (say, your employer). You structure it in a business format and write it using business language. Employers can instantly relate to it. Besides providing information, you also add evidences such as customer emails and awards that support your claims, which ensure the chart's credibility. In summary, the chart gives employers the most accurate sense possible of your true value, thus differentiating you.

The chart is based on a strategic alignment framework called AlignWay$^{TM}$ that I created by drawing from my works on strategy and transformation. Besides the contribution chart, CredPad has other features that make it a complete platform for achievers. CredPad differentiates achievers and sets them up to win bigger jobs and paychecks that are consistent with their bigger value.

By design, CredPad brings benefits to employers as well. Organizations can now complete their hire/retain processes significantly faster. Instead of conducting multiple pre-hire checks or a complicated annual assessment, they can take a look at an individual's 1-page contribution chart, view evidences, and instantly know the individual's value and proven capability.

Whether or not your product solves an important problem is important not only for your customers, but is also at the top of the list for investors and acquirers.

## Step 2: Design business and product integrally

You have seen multiple specialist groups working in a project. Each one is great individually, but the overall value is often diminished or worse – there's conflict and chaos. That's the opposite of what you want if your goal is to build a great tech product. Business model, marketing, sales, customer experience, process design, technology, onboarding, user experience, content, and visual design must all come together to produce blended or integrated architectures and designs.

The CredPad business succeeds when customers get jobs and paychecks consistent with their value. This principle helps me to keep focus on the design of the customer success journey. In reality, a product typically can only take customers so far – not all the way to success. For example, your email software helps deliver your message, but it can't ensure that your recipients read it. The CredPad journey too is only a subset of the customer success journey. There are gaps between the two. Holistic or integral design helped me to identify product features and services that can close those gaps.

While designing the CredPad journey, I used what's now called a product-led approach, where we integrated onboarding and some sales into the product. I was able to do such integration because I have created and used integrated methods in hundreds of projects executed for global organizations.

As for the user interface, I got the architecture right, but the visual design wasn't good. In fact, some reviewers who saw the Sign-In page didn't go further thinking that the product wasn't ready for review. I hired a professional visual designer to improve the look of the UI.

Now you see why and how several disciplines and factors must come together.

**Step 3: Develop software**

Most founders of today's software startups seem to be coders. I'm not. So, I hired a small app development firm. The firm helped choose the latest technologies and used some really efficient coding techniques. They had one strong fullstack expert who had a few folks working for him and he could also easily do the integrations with the cloud service provider, the payment gateway, etc. Apart from these advantages, there was one problem: there were big delays at every milestone. You should make sure that your vendor team has reasonable project management and process capabilities to deliver on time. Better yet, non-tech founders should get a tech cofounder and also hire their own team as soon as it becomes feasible.

We're now planning for tech support and for upgrading with features. Any further software changes will be done only based on error reports and customer suggestions. It's important to seek and use customer feedback rather than keep improving the product in an isolated way.

**Marketing and sales matter for eventual success**

We have innovated, designed, and developed a tech product – not perfect, but promising. It is promising because we first got steps 1 and 2 done right and then we made sure that the app has no known bugs.

Yet, an app is not a company. Our marketing and sales must now reach the right audience, win them over, and help bring them success. An important and early marketing task is positioning. For decades I've been a fan of the book "Positioning" by Ries & Trout, but I also learned from April Dunford's recent positioning book "Obviously Awesome." Positioning influences your business model, messaging, and pretty much everything. It's crucial to get this right. As for CredPad, I earlier talked a bit about positioning elements such as current alternative, customers, and value. Another essential marketing task is a content campaign. I created over 100 social posts before we launched the campaign. Here's one of our posts.



**Proof**

Does Elon Musk drive a Tesla? Does a creator use his or her own product? For two decades, I maintained a website to show all the content I had about my career achievements. I have now moved my profile to CredPad. My four contributions, the supporting evidences, and an upgraded resume all look concise and compelling in CredPad. I'm super excited and I look forward to making a lot of customers happy.

**References**

1. CredPad digital showcase, https://credpad.com/
2. Product-Led Growth: How to Build a Product That Sells Itself, Wes Bush, 2019
3. Positioning: The Battle for Your Mind, 20th Anniversary Edition, McGraw-Hill Education, 2001
4. Obviously Awesome: How to Nail Product Positioning so Customers Get It, Buy It, Love It, April Dunford, Ambient Press, 2019

**About the author**

Mr. Pradeep Henry is globally recognized for bringing business and human perspectives to technology-intensive initiatives. Since the mid-80s, Pradeep has contributed to the success of Cognizant, TCS, the Indian tech industry, and the technical writing profession. He is the Founder of, CredPad. His contributions are showcased in CredPad.

# What Should be the Future of Virtual Work?
## Evolving a Post Pandemic Optimum

**Dr. Sandhya Shekhar**
sandhya.shekhar@gmail.com

## Introduction

The crests and troughs of the Covid-19 pandemic have seen the ebb and flow of virtual work. At the peak of the pandemic, virtual work appeared to be the only way to lend a reasonable level of business continuity. With the world attempting to limp back to some level of normalcy, the industry is likely to be pushed to a new normal to future-proof itself by figuring out what should be the way forward. Questions abound on whether the future of work should be just the way it used to be earlier, or entirely virtual, or a hybrid. Should everyone be returning back to the offices? Should some or all of them continue to work from home on some or all days? Who is to decide and how? The time has come for us to look at work arrangements, not merely from the limited perspective of potential risk mitigation strategies for organisations during such crises, but as an opportunity to rethink the fundamental blue-print of our cities and towns to build a more environmentally sustainable post pandemic world. This article suggests a paradigm shift. It advocates 'Work Near Home' as a more sustainable and viable alternative to 'Work From Home' as a post-pandemic new normal. This article outlines the contours of this new model.

## Background

A Gartner CFO survey reveals that 74% intend to shift some employees to remote work permanently [1]. A frequently voiced opinion is that it is going to be a hybrid work-format post the pandemic. However, this seems to be driven more by intuition and intelligent guesses rather than an informed decision based on clear organisational conviction. This is borne out by the fact that different industry leaders have been coming out with vastly different percentages of potential virtual work going forward [2]. Scratch a little deeper and it becomes abundantly clear that nobody really appears to have all the answers. For some "hybrid" connotes each individual working from home on some days and from the office on others. For yet others it means a certain percentage of the staff working predominantly from home and the rest coming in to work, based on the nature of the jobs, availability of infrastructure and so on. But as Monika Fike, Editor LinkedIn News points out, such arrangements could be rampant with inequality.

## The Challenges of Working From Home

During the pandemic, working from home (wfh) has been virtually the only option (pun unintended!). However, it has not been easy. While it has definitely helped sustain institutions and organisations to some extent, there have been numerous problems. The extent of the problem has varied from being relatively low and manageable in IT and allied sectors (where remote working has been institutionalized for several years), to being quite significant in other sectors. Some of the key problem areas have been as under:

1. Inadequate working infrastructure at home including a noise free work-space, office equipment and robust connectivity
2. Major psychological issues of working in isolation with no social contact
3. Activities thriving on group work, especially those that are innovation centric as well as manufacturing and equipment-based work as in research labs, taking a significant beating

Hybrid work formats have several problems for employers as well [3]. Many traditional organisations simply can't wait to get back to the good old ways of working in comfortable office spaces.

So which way should one go? Will all the remote work that people have been forced into adopting get jettisoned out as a bad dream once the pandemic is (hopefully) behind us? Clearly the Universe has been urging us to introspect about creating a healthier and more sustainable world. After going through all those trials and tribulations, would we have learnt any lessons at all? If yes, what should we do about it? Specifically, what should be the way forward as far as work-formats are concerned? This might perhaps be the best time to step back and take a more holistic view of this issue, rather than from a limited organisation-centric perspective. Now is the time to start re-imagining our cities and towns by bringing in multiple stakeholders to evolve a comprehensive solution that addresses all the above issues related to virtual work, whilst creating a cleaner environment and a vastly improved quality of life for everyone.

## The Proposed Model – Work Near Home

The model proposed here can be called the Work Near Home model. The blueprint in a nutshell is creating a well-planned distribution of Work Hubs and Super Hubs across each city or town. The distribution of Work Hubs (WH) will need to be done in a manner that it caters to residents living within a radius of about 2km (this could vary based on the population density

and area of each city). Each WH will comprise of good quality office-space that is modular and is equipped with all the essentials of a good office including security, essential office equipment, robust connectivity, critical support services and parking space. They will need to be equipped with air filters, air-curtains and sanitisation tunnels at entry points, which can get activated especially during times when there is a prevalence of any infectious / contagious contaminants. WHs will also need to become the nodal points for solar powered charging stations for electrical vehicles. Over time the immediate vicinity of WHs can get allocated for essential commercial outlets like pharmacies, emergency services and household consumables. Organisations can rent spaces from multiple WHs with the flexibility to cater to dynamic requirements based on the number of employees residing in a particular area at any point in time.

A Super Hub (SH) would be a much larger work space catering to higher quantum and quality of infrastructure requirements and the need to temporarily or permanently accommodate larger congregations from a single organisation for specific events / time periods. In addition to the infrastructure in the WHs, the SHs would be equipped with high-speed connectivity for activities that could be heavy band-width guzzlers like tele-presence or transmission of highly media-rich content, meeting rooms and auditoriums, food courts and hyper-charging facilities for electric vehicles. SHs can be created within a 2km vicinity of a key public transport system like a metro with the numbers and distribution based on the total working population in any city. SHs can accommodate core teams and facilities that necessarily need to be co-located. An SH could also serve as a WH for residents living close by. Some corporate offices could be re-designated as SHs. The difference would be that it might now house a much smaller number of employees based on a careful identification of the teams that necessarily have to be accommodated there. The rest of the space can be made available to other organisations. These organisations can pre-book space and facilities in the SH based on requirements of larger groups of employees to come together without having to necessarily invest in their own infrastructure.

### Integrating the Electric Vehicle Dimension

What would this mean for office-goers? Any employee can specify any WH as his preferred workplace. With the maximum distance to commute for work being about 2 km, rapid adoption of electric vehicles (EVs) can be facilitated. Charging slots for EVs can be pre-booked at the WHs. If the employee is part of a core collocated team or has to commute for a larger group meeting within his organisation, the use of a good quality public transport can be encouraged and over a period of time, gently mandated. The adoption of public transport by mid-level / senior employees has been constrained by issues of last mile commute. A well-planned system of EVs for hire from every station / stop of the public transport system to nearby SHs ensuring seamless connectivity without wait time can increase adoption manifold. Transport aggregators have already started introducing options for hiring EVs [4].

### Benefits of the New Model

What could be the potential benefits of implementing such a blueprint? The benefits are numerous. Just a few are enumerated below:

*At the macro level:*

1. An order of magnitude reduction in emission levels on account of drastically reduced commutes for most office-goers.
2. A pull-based adoption of EVs in a phased manner and corresponding reduction in pollution levels.
3. Gradually over a period of time, a more scientific delineation of commercial clusters in the vicinity of WHs, releasing up pavements and green spaces in other areas.
4. Expansion of cities will be based on replicable well-planned and largely self-sufficient hub-based clusters rather than a skewed mushrooming of infrastructure.

*For organisations:*

1. Systems Thinking tells us that 'structure is the most important determinant of behaviour'. A congenial work environment with the right mix of social interactions and individual privacy is known to produce significant improvements in outcomes. Our experience in creating innovation ecosystems like research parks has also shown that heterogeneous constituents in work groups often lead to innovative ideas. A WH comprising people from multiple organisations and diverse domains could encourage positive outcomes compared to homogeneous groups often working in a 'compete' mode.
2. Organisations will be able to leverage the advantages of virtual work, without having to face any of the problems mentioned earlier, a few being:

    a. They will not have to provide for work infrastructure for every employee at home.
    b. They will not be forced into making difficult and often "unequal" choices across employees.

3. Organisations will no longer have to make huge investments in large facilities in anticipation of growth. A WH-SH model of expansion will provide enormous flexibility and agility to expand / cut-back at will, with few overheads. It will also provide a great opportunity for organisations to critically review current arrangements of collocated teams,

given the fact that with the current levels of work-pressure in the industry employees barely have time for face-to-face conversations, with most interactions being virtual even while operating out of the same facility. Technology currently facilitates seamless inter-connections across dispersed locations, vastly bringing down the need for colocation. There is a plethora of innovative apps that can pinpoint the precise geographic location of any employee at any time (What3Words is an amazing recent addition). Such a model will also give organisations the flexibility to dynamically change and rotate members of core collocated teams, bringing in fresh ideas and greater agility.

4. Organisation risks on account of potential future pandemic like situations can be minimised compared to mass infections and multiple hot zones reported in many IT companies in recent months. Smaller well-planned WHs with sanitation tunnels, air filters and air-curtains will be easier to monitor and manage.
5. Geographically dispersed work arrangements such as these cannot happen without a high level of process maturity and discipline. This will automatically push work discipline and process standardization improving operational efficiency even within smaller organisations.

*For individuals:*

1. An average commute of around 2 km for a majority of the workforce in any town or city sounds like utopia. But it is most certainly within the realms of feasibility with the systematic adoption of the proposed blueprint. This will have a transformational impact on the quality of life. Currently most families with young children have to make a choice between living near the educational institution that the children go to, and living near the workplace. The decision tends to favour the children and gets more complicated if there are multiple office-goers involved. The adults often have to put up with long commutes, work hours, fatigue and a less than satisfactory quality of time spent with family. The proposed model would liberate families from this tedium, give them complete flexibility to pick a home in whichever area works best for them, with the comforting knowledge that their commute time for work will be minimal in any case.
2. The rampant psychological problems of working in isolation without any social contact, as in the case of working from home will no longer be there. The emotional and psychological impact of wfh during the current pandemic is there for all to see. Clearly, this is not a sustainable proposition.
3. All infrastructure problems associated with wfh like sound-proof work areas, work-stations, connectivity, power back-ups etc., will no longer be an issue once there is a **shift from the work-from-home to the work-near-home paradigm**.

*For infrastructure providers:*

Once city-planners (based on aggregated inputs from employers) share the work-hub map with infrastructure providers like telecom, real estate, security, transport providers and essential services, these industries will have a clearer roadmap for their own organisational plans. Specifically,

1. Telecom providers can align their networks better for peak requirements and backup plans for uninterrupted connectivity to work areas based on a better understanding of actual requirements.
2. The WH-SH grid map can drive the business models of EV providers and aggregators. It can also be the basis for a more systematic distribution of charging stations and allied services
3. Real-estate providers who are currently grappling with low occupancy rates for most of the buildings can re-structure their offerings to capitalise on the new opportunity that this model provides. Large multi-storeyed apartments can delineate spaces for creating WHs with all the required amenities. This could well spawn a new breed of aggregators providing end-to-end services for WHs.

A lot of thought and work is currently going into the building of Smart Cities that are already incorporating a number of innovative ideas. If those can be retrofitted into an overall WH-SH blueprint for every city or town it could have a transformational impact on our journey towards making this a more sustainable world.

**Implementing the Model**

It might be best to implement this model first in a new township or a satellite town and then diffuse it into other areas. The advantages listed here are but a few. A closer look would reveal a number of additional benefits that a careful implementation of this model can bring about. The incremental costs of a restructuring such as this may not be significant. However, it requires multiple stakeholders to come together to make this happen. This includes policy makers, city planners, industry, real-estate providers, telecom providers, public transport providers and key opinion leaders from the EV segment. Needless to say, it requires visionary leadership and the conviction to stay the course on implementation. It is a mammoth task. But one that has the potential to make India a role model for creating a happier world, where economic growth is not at the cost of sustainability.

# References

[1] https://www.gartner.com/en/newsroom/press-releases/2020-04-03-gartner-cfo-surey-reveals-74-percent-of-organizations-to-shift-some-employees-to-remote-work-permanently2

[2] https://www.computerweekly.com/news/252482444/No-going-back-to-packed-workplaces-after-Covid-19

[3] https://www.lexology.com/library/detail.aspx?g=94546ef4-f782-4809-b1f9-d3732d0b8fbf

[4] https://yourstory.com/2021/05/ola-launches-electric-ride-hailing-category-london/amp

(An abridged version of this article was published in Hindu Business Line. Refer: https://www.thehindubusinessline.com/opinion/re-imagining-cities-and-the-workplace/article34823503.ece)

## About the author

Sandhya Shekhar works as an Advisor and Strategy Consultant. She serves as an independent director on the boards of Simpson & Co. Ltd., Bimetal Bearings Ltd., IP Rings Ltd., and Amco Batteries. She also works with educational institutions both in an advisory capacity as well as a visiting faculty. She serves on several advisory boards and on policy committees including India's Science, Technology & Innovation Policy – STIP 2020, and an expert committee constituted by BIRAC (a GoI enterprise) to scale the Biotech innovation ecosystem nationally.

Earlier she has served as the founding CEO of IIT Madras Research Park, the first university research park in the country; Director, Asia Pacific Consulting – Gartner Inc., CTO, BConnectB.com; Head, Knowledge Management Research – Aptech; and Group Consultant – NIIT.

She has a management degree from the Indian Institute of Management, Bangalore and is a University Rank holder in her under-graduation. She earned her PhD from IIT Madras, with her dissertation winning the award for outstanding doctoral research from the European Foundation for Management Development and Emerald. She was felicitated as an Outstanding Woman Achiever during the 100th International Women's Day. She is an author of several books, papers and articles. Her latest book titled 'Managing the reality of virtual organizations' published by Springer has received worldwide acclaim.

---

## Work From Home Productivity
### 10 Tips, Methods and Apps to Improve your Remote Productivity

- Invest in a Noise and Distraction Free, Comfortable Home Workspace

- Create and Stick to a Routine Taking your Energy Levels into Consideration

- Plan your work ahead list your to-do's establishing Tasks Priorities

- Block "Focus Work" Time in Your Calendar and set a maximum Number of meetings per Day

- Run Meetings Efficiently and when there's a real need

- Mute Alerts and Block Non-Work Apps During intensive Work time

- Take Breaks during your workday

- Practice Self-Care

- Track your time with Tools

- Do Cross-Accountability Checks with Colleagues

- Bonus: Work on something you love, somewhere you love too

*Source & Courtesy: https://remoters.net/tips-methods-apps-work-from-home-remote-productivity/*

# Alignment for Business Transformation

**Mrs. Poonam GK**
poonam@iyka.com

## Introduction

In most medium to large organizations, the emphasis is on serving the customers with seamless services. It is referred to as Digital Transformation. Digital Transformation has two portions- "digital" and "transformation". But over 80% of companies agreed that they see it as their IT department's job to make the digital transformation work. [11] Technology is only a tool to enable transformation. It can be termed as "Digitally supported efficiency, not the transformation." We are going to look at the "Transformation" part of the business. It focuses on how we can transform an organization where most people are 100% engaged instead of 20%[11].

Rediscovering the success model of the highest civilized society of Bharat that was referred to as "Golden Bird", they had 16 Ancient Universities in India over 3,600 years Ago[12]. The happiness index and overall prosperity index were the highest that could never be achieved in any country in modern times. The factors that made this bright and successful society had many aspects but at the base of everything was that each individual lived in an ecosystem that supported every aspect of its growth.

This article brings highly innovative and well-proven concepts of Bharat's Vedic systems back to life that can be implemented to achieve near 100% employee's engagement.

The Vedic civilization paid great attention to a person's soul makeup and what are his/her needs to be in flow and progress based on innate qualities, tendencies, and the ultimate goal of the person. This balanced inner science and outer organization helped the whole society be in flow and harmony during the most glorious ages in the history of humanity.

We will discuss the qualities and tendencies of a person based on innate qualities (gunas) and their expressions in four classes or hues (*Chaturverna*). Clarity of understanding based on these concepts will help us understand where we stand, where we want to head, and what we need to do to sail an organization in the right direction.

## Business Paradigm shift – People at the center

Starting from the 18th-century industrialization to current commercialization, mass production, an organization's efficiencies have focused on the output. So, most efforts are put towards streamlining and automating processes. That has paid off well to the most extent. But as societies mature, an individual must be given the utmost attention as a building block of society or organization.

Whether a manufacturing facility or a service business with the latest and the best breed of technology, it is run by the people (employees), sold to the people (customers), and is used by people (end-user or consumer). When a whole person is well aligned with his or her tendencies, upbringing, training, and opportunities, we have a lot better chances of happy and engaged employees, organization, and society. So, we will look at the human capital aspect of the equation in an organization.

*Sri Aurobindo said, "The cause of India's decline was the practical disappearance of the Kshatriya and the dwindling of the Vaishya. The whole political history of India since the tyranny of the Nandas has been an attempt to replace the Kshatriya. The Vaishya held his own for a long time, indeed, until the British advent by which he has almost been extinguished." -- Sri Aurobindo, "Karmyogin." Volume 8. p. 19-20*

Each person has in him something of his own, some characteristic principles and inborn power of his nature. So, for a person, all actions must be determined from within because for each man, there is the efficient power of his spirit that creates the dynamic form of his soul in nature to express and perfect it by action. This inner power makes it effective in capacity and conducts his work which defines his true and soul-aligned calling (Karma). This Karma points him to the right way of his inner and outer living and is the right starting point for his further development. Whatever work a man does, if done according to the law of his being, the truth of his nature can be a very effective means of his personal growth and the growth of the organization.

The inner force is much stronger and is constantly shaping the outer reality unceasingly. It is like the river within knows the direction and extent of the flow. Work that is not in alignment only creates friction, delay, frustrations, disease, and of course, serves neither the person nor the community. This aligned action contains in itself the principle of its own success, the principle of ones' nature, the Swabhava, and right action according to innate tendencies, Swadharma.

It provides solutions to organizations that are conducive to individuals, organizations, societies, and nations.

**Redefining Success**: In today's economic society, the definition of success is primarily focused on fulfilling the objective of the institution or projects that are tied up to economic growth. For a person, the definition of success is mainly economic well-being. The focus is to get a good education, a good job, take care of lifestyle needs, family needs, and save for old age. Personal well-being is limited to taking vacations or social gatherings. In this process, the individuality of a person has hardly any place to be nurtured.

Bhartiya Seers described that everyone has a right to attain four ultimate objectives of life and be eternally happy. These objectives are- Dharma, Artha, Kama, and Moksha.

These four ultimate objectives can be defined as:
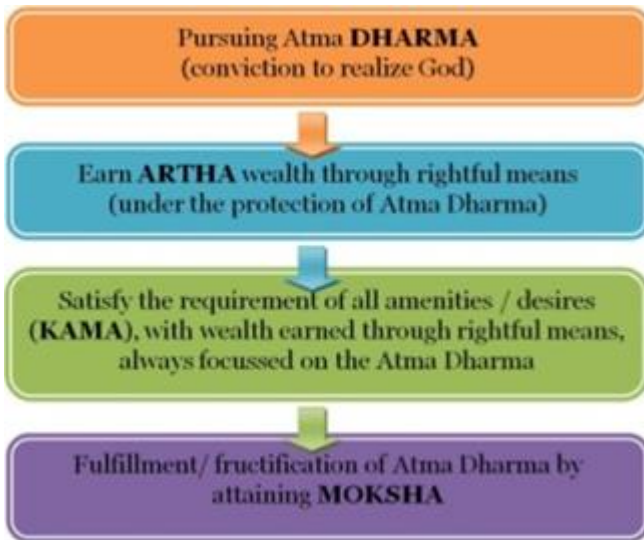


In the contemporary world, the challenge is that people are taken as a commodity with very little in place to identify the individual soul makeup or understanding of the right type of nurturing. It seems an impossible task to provide an individualized ecosystem of upbringing, training, and opportunity to each individual.

Bharat's glorious seers have organized and defined natural human tendencies (or *Swabhava*) and, based on the natural tendencies of a human, defined the right duties (*Swadharma*) for the person. Aligning, upbringing, training, and opportunities to someone's natural human tendencies (or *Swabhava*) brings out the best in the person and also helps grow the person. It provides solutions to organizations that are conducive to individuals, organizations, societies, and nations over a period of time.

**Human Traits or Gunas: Combinations of Guna make all different types of people**
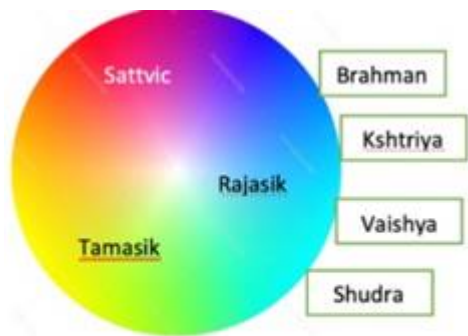


Fig: Combinations of these Guna make all different tendencies of people

The unmanifest potential, *Prakriti*, inherently has three qualities. These qualities manifest in various ways, causing a wide range of differences. Everyone and everything in the creation is made up of three qualities (guṇas). sattva, rajas and tamas. The permutations and combinations of these three create a wide variety in the world.[5] These are the main characteristics of these three gunas.

**Satvick (Knowledge)**: Faith, love, brilliance, understanding, remembrance, alertness, peace, compassion, sensitivity, selflessness, and the like.

**Rajasic (Activity)**: Dynamism, ambitions, restlessness, impatience, arrogance, doubt, anger, passion, confusion, greed, and the like.

**Tamasic (Inertia)**: Laziness, Inertia, satisfied with repeat work, carelessness, short & instant gratification, short term vision, taking care of physical needs, and the like.

These three qualities of Prakriti pervade everything in the creation. However, when one quality is predominant, the other two lie dormant. Different qualities gain dominance at different times, but one of them generally dominates each personality.

Hence, we may categorize people as sāttvika (sattva-dominant), rājasika (rajas-dominant), and tāmasika (tamas-dominant). Everything we do – the way we sit, eat, walk, talk, work, or behave – reflects the quality or mood of the mind. For example, in a sāttvika mood, we eat unhurriedly and neatly; in a rājasika mood hurriedly and barely chewing; while in a tāmasika mood in a sloppy and lethargic manner with more emphasis on satisfying the senses. Do we have a roadmap to know where we are, what do we want to be, and what is the ideal combination of the guṇas we should strive to have?

This spiritually aligned work is referred to as Swadharma or right work for a person. But in recent times, too much emphasis has been given to the outer social order that broke natures' law.

Fig: Chaturveran- Development of Tendencies



Sri Aurobindo, who was the highest scholar of spirituality, politics, and education of modern times, discusses in much detail in his work, Incarnate Word[9], that the ultimate salvation or Ananda cannot enter into the cosmic dynamism unless the fourfold soul-force, *Chaturverna*, has established itself here in its perfection. That is the long preparation to be affected by the practice of *Chaturvarna* before this transformative change can take place. It is the human obligation that must be fulfilled. There is no national life that can be perfect or sound without the *Chaturvarna*.

Awareness of gunas and their combinations would allow organizations to enhance total work culture and human capital development by highlighting and promoting desired traits (*guṇa ādhāna*) and reducing or managing its undesirable traits (*doṣa apanayana*). Swamini Vimalananda describes 23 aspects of gunas in her book, "Not Too Loose, Not Too Tight, just right."



Tendecies 2 of 23        Verna with detailed map
Tools designed by the Author, Poonam GK
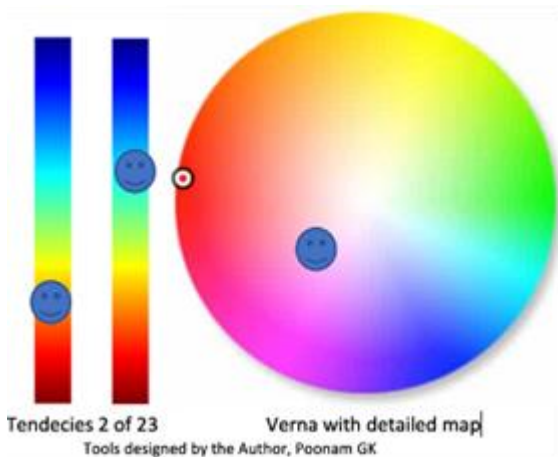
For example, based on the assessments, identified areas of strength and weaknesses can be identified for an individual or a group of individuals in any department of an organization. This not only helps facilitate change management plan much more efficiently but also aligns the right training that aligns with the organization's vision. This alignment of work with individuals' innate tendencies provides a person a much better growth plan and motivation for an individual.

When people take to professions (karmas) according to their qualities (gunas), it is like fish taken to the water. They have a natural inclination towards their jobs and so love what they do. The exact opposite is also possible and every shade in between. Understanding Verna also helps a person or a company recognize the areas that need to be worked at.

**Combinations of tendencies in people: The Verna System**

Structure and functional understanding of tendencies is explained in the *Chaturverna*. We are talking about the "Verna," which literally means "hues."

There are four Verna systems that define a person's natural tendencies. They are called *Chaturverna* (Chatur means four, and Verna is hue). Most people have some level of all four tendencies, but mostly one set is dominant.

This fourfold categorization of human beings on the basis of qualities (gunas) are[4]:



Fig: Different combinations of gunas create many hues of humans divided in four major categories

**Brahmin**: Approximately 70% Sattva + 20% Rajas + 10% Tamas

**Ksatriya**: Approximately 70% Rajas + 20% Satva + 10% Tamas

**Vaisya**: Approximately 70% Rajas + 20% Tamas + 10% Sattva

**Sudra**: Approximately 70% Tamas + 20% Rajas + 10 Sattva

It should, of course, be understood that the proportions are approximate and not to be taken literally. They vary in different people but what is noteworthy is that all of us have each of the three qualities. No human being, however good or bad, can claim to have only one or two of the three. Also, the proportions of these *gunas* may vary in us at different times and stages in life. It is possible that a lethargic and laid-back person may, at a time in his life, becomes dynamic and a go-getter.

Sri Aurobindo wrote*: "The life of the nation must contain within itself the life of the Brahmin,— spirituality, knowledge, learning, high and pure ethical aspiration, and endeavor; the life of the Kshatriya,—manhood and strength moral and physical, the love of battle, the*

*thirst for glory, the sense of honor, chivalry, self-devotion, generosity, the grandeur of soul; the life of the Vaishya,—trade, industry, thrift, prosperity, benevolence, philanthropy; the life of the Shudra,—honesty, simplicity, labor, religious and quiet service to the nation even in the humblest position and the most insignificant kind of work.*

## Shudra dominance

*Chaturverna* is not a fundamental division but stages of self-development in our growth. Verna is shaped by birth, upbringing, training, traditions, and opportunities. Sanatan Dharma accepts continuity of life through different births and understands that a soul takes birth in its chosen family. The topic of birth is beyond the scope of this paper's discussion. But it is worth mentioning that when outer attacks on the rich civilization happened, the Kshatriya, the power of passion and dynamism, dwindled, the Vaishya, the power of material prosperity and donation, dwindled, the Brahmin and Shudra were left. The inevitable tendency was for the Brahmin type to disappear and the first sign of his disappearance was utter degeneracy, the tendency to lose himself and while keeping some outward signs of the Brahmin to gravitate towards *Shudrahood*. At this stage to hang on to the traditional pride. The families hung on the Verna of parents, and a confused version of Verna came into existence that was based on birth (jati). Britishers started calling them "Caste." There was no concept of caste in the Sanatan Dharma. Along with this, another distortion was forced by Britishers on India that was unheard of. It was that only male children could be the heir of the power position. This pushed women out of the Verna system leading to caste, dowry, and second class place of women in the social issues that were introduced in the society.

Along with the economic division, there existed the association of a cultural idea that gave each class its religious customs, its law of honor, ethical rule, suitable education and training, type of character, family ideals, and discipline. Based on a thorough understanding of Verna, an organization can develop its' culture and more for sustainable organization and individual.

Chaturverna provides an understanding and solutions for balanced growth, balanced individual, balanced organization, and balanced societies.

"*When the tendency based Chaturvarna disappeared, that led to an utter and resulting chaos. In the Kaliyuga, the Shudra is powerful and attracts into himself the less vigorous Brahmin, as the earth attracts purer but smaller bodies, and the brahmatéja, the spiritual force of the latter, already diminished, dwindles to nothingness. For the Satya-yuga to return, we must get back the brahmatéja and make it general.*" [3] Sri Aurobindo.

The four functions are still inherent in the life of all normal communities, but the clear divisions no longer exist anywhere. Like in India into more fluid order that is a confused and complex social rigidity and economic immobility degenerating towards the chaos of castes.

## Contemporary *Chaturverna*

A person's inner makeup has included intellectual, ethical, and spiritual growth as the central need of the person and the societies; it is a system of relations that provides it with its needed medium, field, and conditions and with a nexus of helpful influences. [8]

The fourfold function of social man was considered as normally inherent in the psychological and economic needs of every community and therefore a dispensation of the Spirit that expresses itself in the corporate and individual existence. [8]

*Chaturverna* provides a structure to create an orderly yet flexible system to help the individual gain the appropriate educational, ethical, and moral training suitable to his or her inner temperament, aptitude, and nature. In the context of today's corporation, functional *Chaturverna* can be defined as:

**Brahmin** - Inventor (of product, services, process).

**Kshatriya** - "C" level executives- CMO, CIO, CTO, CDO, CBD.. etc.

**Vaishya** - Sales Staff, Accounting, HR, Marketing,

**Shudra** – Repetitive skilled workers that are not inventors, worriers, traders, or chief executives. This is the largest group in a corporation that makes up employees in factory or farm workers, data-entry, clerks, and bookkeepers. They get training to do their work efficiently.

It is clear that the ultimate goal of an individual is to achieve, Brahm-tej in every aspect of a person's life. Hence defining where one stands and taking steps at the individual level, organization level, and government level can ensure happy, prosperous, and progressing societies.
It can be identified as where one stands in different aspects of gunas and can work on planning his/her future self. [10]

As discussed earlier that Gunas drive tendencies in a person. Tendencies aligned with work create the best possible trajectory of growth for a person, organization, and society.

**Redefining success for an individual and organization.**

In recent times we have had the definition of success for an individual that includes successful career, economically upscale living with house, cars, travel, and kids' education etc. There is nothing wrong with it; these are the basic needs that must be taken care of. But while taking care of responsibilities is required to be a part of a society, internal spiritual growth of soul-self cannot be ignored. The inner and outer growth of a person defines the peace and harmony in a person internally and in society at large.

Thinking at the level of upgrading our skills to perform our job well, get a promotion, and earn more money, recognition, and respect are the basic needs. But climbing the corporate ladder, ignoring our internal needs, circumstances, or challenges do little to support a person's overall satisfaction and growth, and it reflects in the performance of the organization.

This climbing of the corporate ladder race has forced most to be Shudras. Shudra's are defined as skilled workers that are not inventors, worriers, traders, chief executives in other words elevated to be thought leaders and trend setters. This is the largest group in a corporation. They get training to do their work efficiently—nothing wrong in being Shudra; that is where most of us start. Irrespective of the job function that one performs, there is an inherent challenge in satisfaction and internal growth for the person that also hurts the organization. Shudra has the dominance of tamasic Guna (Inertia-Carelessness, forgetfulness, sloppiness, sleepiness, dullness, wickedness, laziness, and so on). This aspect of gunas does not allow Shudra to genuinely rise up in their own life or contribute much to the organization's growth. Once we understood the concept of Guna and Verna, things can be improved with the right training, expectations, and opportunities.

The developmental phases go from Shudra's tendencies of taking care of the basic needs to Vaishya, the active man, more dominant will with more sattvic mind predominates. Vaishya progresses into Kshatriya that brings useful creation. Kshatriya progresses into Brahmana that brings innovation, thought leadership, and steers the society into a more prosperous, harmonious society for all.

In human nature, some of all these four personalities developed or undeveloped, wide or narrow, suppressed or rising to the surface. But in most men, one or the other tends to predominate and seems to take up sometimes the whole space of action in nature. And in any society, we should have all four types. Even, for example, if we create a purely productive and commercial society such as modern times have attempted, or for that matter, a Shudra society of labor. It attracts the most modern minds and is now being attempted in one part of Europe and advocated in others.[3]

These are quite outward things, and if that were all, this economy of the human type would have no spiritual significance. Or it would mean at most, as has been sometimes held in India, that we have to go through these stages of development in our births; for we must perforce proceed progressively through the tamasic, the rajaso-tamasic, the rajasic or rajaso-sattvic to the sattvic nature, ascend and fix ourselves in an inner Brahmanhood, Brahman and then seek moksha from that basis.

In other words, success needs to be redefined that is inclusive of a person's needs and their social implications.

**Conclusion**

Social classes are not a part of an economic ladder that is built over our crushing and crashing individuality. It is more like a tree. Each part is important for the full functioning of society. Each part needs appropriate nurturing in its place.

Economic classes forced Kshatriya and Vaishya to disappear, and Shurda subdued Brahmana - leaving disbalance in person, family, society, corporations, and countries. All actions must be determined from within because each man has in him something of his own, some characteristic principles and inborn power of his nature. That is the efficient power of his spirit that creates the dynamic form of his soul in nature, and to express and perfect it by action, to make it effective in capacity and conduct his work is his true Karma. This Karma points him to the right way of his inner and outer living and is the right starting point for further development. Whatever work a man does, If done according to the law of his being, the truth of his nature can be a very effective means of his personal growth and organization's growth. Once we understand the Guna-based tendencies, we are in a better position to build a satisfied people and healthier society.

Work alignment is needed with the swabhava- perfection, spiritual growth, satisfaction. But work not naturally one's own, even though it may be well performed, even though it may look better from the outside when judged by an external and mechanical standard or may lead to more success in life, is still inferior as a means of subjective growth precisely because it has an external motive and a mechanical impulsion.

Indian seers have defined three categories of gunas in a continuum. We all fall some combination of these gunas. Understanding these gunas will help us navigate our own personal growth.

Four Verna are defined in swabhava. Swabhava determines swadharma and not the otherwise. Swabhava comes from birth/genetics, upbringing, and opportunities. Knowing individual swabhava helps define the right education, training, and atmosphere. This leads to personal growth and satisfaction of an individual as well as the organization.

These tendencies can be cultivated to the four proper aims of human life (*Dharma, Artha, Kama,* and *Moksha).* The four *puruṣārtha* are the need of every human that yearns to achieve equanimity of Chitta. Understanding these timeless scientific principles is sure to expedite the vision of Dharma in the corporate world. Discussions on these four aims of human life (*puruṣārth)* are out of scope for this paper but an important topic to learn as well.

## References

1.  Valorie Kndos, at Ted Talk "win at all costs." Former UCLA Women's Gymnastics Coach. http://t.ted.com/wdvoBIS
2.  RY Deshpande**.** "Four Powers in the Cosmic Dynamics." **The lights of Supreme journal,** *by Alagesan, May 16 2015.* https://savitri.in/blogs/light-of-supreme/four-powers-in-the-cosmic-dynamics-by-ry-deshpande-11
3.  Sri Aurobindo, "Karmyogin." Volume 8. p. 19-20. The Complete Works of Sri Aurobindo. Sri Aurobindo Ashram Publications Department.
4.  Swamini Vimlananda, Conflicts and Confusions. (2018). (n.p.): Central Chinmaya Mission Trust. P. 2-4.
5.  Vimalananda, Swamini. Not Too Loose, Not Too Tight... (p. 11). Central Chinmaya Mission Trust.
6.  Sri Aurobindo, "Essays of Gita." p.507-p.525. Swabhava & Swadharma,
7.  Shremad Bhagwad Gita, Chapter 18, Verse 46
8.  G H Visweswara, "Chaturverna" p.9. Gita on Chaturverna.
9.  Sri Aurobindo, "The Incarnate word." Soul-Fource and the Four Fold Personality
10. Rajesh Kamath, talks at "Chanakya Consulting Insight.
11. eBook, "Digital Transformation Strategy." 7 Emerging Trends that will define 2021.Creatio. https://www.creatio.com/page/ebook/digital-transformation-strategy-7-emerging-trends-that-will-define-2021
12. 16 Ancient Universities of India: 3,600 years Ago. https://www.myindiamyglory.com/2019/02/14/15-ancient-universities-of-india-from-3600-plus-years-ago/

## About the author

Mrs. Poonam is the founder and CEO of Data Management Company, Iyka Enterprises Inc. Chicago, IL, USA, which has been serving the US government and global corporations since 2000. She has won many national and international awards for innovation, best practices, and business leadership. She has a passion for building business and technology communities. She established a foundation, Government Technology Foundation (GTF), which collaborates with the public sector, private sector, academia, and special interest groups to get more technology innovation in the government sector. GTF provides technology trends, best practices, and consulting to CIOs, CPOs, operations, and policymakers. She also founded "Indian American Business Council (IABC)," a not-for-profit focused on providing collaboration platforms to global businesses.

Mrs. Poonam is combining her entrepreneurship, international business experience of over two decades with her deep research interest of Vedic Sciences of social order that lead the most prosperous and harmonious society. The resilience of the social order stood the test of times against extreme odds for over 20,000 years. These timeless deep scientific principles are very much in demand of time in today's world. Mrs. Poonam, a visionary leader brings her experience into her first book, "Transformation before Digital: Bringing the missing pieces from overall sustainable corporate value creation"

## eBook: Digital transformation, the open-source way

Digital transformation creates new possibilities for your organization with innovative products and services, better ways of working, and nimble organizational models. Often, digital transformation fails because organizations focus solely on technology—and do not pay as much attention to people and processes.

This e-book details how to approach digital transformation by uniting people, processes, and architecture using open source principles.

- Understand the 5 elements of digital transformation.
- Learn how to adopt an open approach.
- Find out how to practice open transformation.
- Uncover resources to help you on your digital transformation journey.

Download the e-book and learn key strategies to successfully transform your organization while avoiding common mistakes. https://www.redhat.com/en/engage/digital-transformation-ebook-20181026

# STEM Careers and Role of Women Coding Communities in Enabling Diversity and Inclusion

**Dr. Renu Rajani**
renu@womenwhocode.com

## STEM Education: Evolution and Importance

Science, Technology, Engineering and Mathematics (STEM) as an abbreviation was announced by the scientific administrators of the National Science Foundation (NSF), in 2001. STEM refers to study of theoretical and practical aspects of these disciplines, relate them and develop higher level of thinking. STEM education involves hands-on learning, real-world application in teaching of science and maths to develop variety of skillsets and creativity in the student.

Regardless of the career path the students choose, the experiences are valuable to prepare the students to be innovative and adaptive. Innovation is a critical element of economic growth with about 75% of the jobs requiring STEM graduates with an ongoing growth in this demand.

## STEM Education, Progress Worldwide and in India

While India produces large number of Science and Engineering graduates, STEM is a relatively new concept. The success of STEM education in India would depend on ability to make a shift from being the user of the technology to being an innovator. Also, it involves use of learning assets and infrastructure including redesign of classrooms to provide engaging experience to the students. Such tools include but are not limited to use of Augmented/Virtual Reality, Do-it-yourself tools, Learning management and assessment systems, labs and gamification.

Many countries around the world are making efforts to implement STEM; the efforts include use of coding devices (e.g. micro: bit by UK in 2016), and Singapore, Ireland, India are rising to the challenge.

While there is progress, there are role-based stereotypes in societies around the world; in the computing profession, mode developers are men, usability designers and testers are women. While the computing profession is seeing increased diversity in India in terms of female to male ratio, there are dropouts due to family reasons, resulting in fewer women in Middle/Senior Management in the computing careers, despite a larger pool at entry level.

Let's trace the evolution of computing, role women have played and where it stands as of date.

## Trace the Women in Computing

### Computing started out first in field of Astronomy

The history of women in computing dates back to 18th century, Nicole-Reine Lapaute carried out scientific computation and predicted Halley's Comet in 1757. Maria Mtchell is credited with computing motion of Venus in 1847. Ada Lovelace designed the first computer algorithm in 1840s to generate Bernauli's numbers in a language that later came to be known as ADA.



Nicole-Reine Lapaute    Maria Mitchell    Ada Lovelace    Grace Hopper

### Women worked as human computers to catalogue stars and during WW-1 for US Government

After American civil war women worked in Harvard observatory as 'human computers' to catalogue the stars, created 'Horsehead Nebula" a system to describe stars. Some of the prominent women at this time were Anna Winlock and Annie Jump Cannon. Florence Tedd Weldon, Alice Lee and sisters – Beatrice and Frances-Cave-Brown-Cave were the first few to work as human computers in biological calculations. Elizabeth Webb Wilson, Barbara Paulson were the first two women computers to do ballistic calculations for the US government during the world-war-1.

Mary Clem invented punch card in 1920s and is credited with use of "zero check". Clara Froehlich at AT&T was human computer to boost electric signals with amplifiers. Edith Clarke, the first woman to earn electrical engineering degree, also was granted a patent for graphical calculator solve problems related to power lines. The first woman PhD in Computing was Sister Mary Kenneth Keller at Dartmouth University in 1965, who developed BASIC language.

### Use of Computing in Aeronautics and Navy (1930s to 1950s)
Annie Easley, Katherine Johnson, Kathryn Peddrew, Christine Darden at NASA were among women to prototype air defence system that used radar inputs to track planes and direct aircraft courses. Joyce Aylard, Joan Clarke, Margaret Rock, Mavis Lever, Ruth Briggs, Kerry Howard, and Louise Pearsall have been pioneering women in cryptography, an area heavily male dominated in 1930s.

Hedy Lamarr in 1942 used frequency hopping methods for navy control and was granted patent for the same. The frequency hopping is a method used in Bluetooth and Wi-Fi today. Grace Hopper designed the first compiler in 1943 and is also credited for the first use of terms "bug" and "debug"

Margaret Hamilton worked on reliability of defence systems and Apollo mission. In those years code was hard-wired by threading copper wires to magnetic rings. 1200 words could be stored on a copper wire. Margaret Fox in 1950s was human computer and her work led to development of Geostationary Position System (GPS).

### Computing for Meteorology, Weather Predictions, Atomic Energy
Computing machines ENIAC was invented by Marlyn Meltzer, Betty Holberton, Kathleen Antonelli, Ruth Teitelbaum, Jean Bartik, Frances Spence, led by Adele Goldstein; and MANIAC by Klara Dan Von Neumann. Beatrice Worsley, in Canada (1949) worked on differential analyser calculator (EDSAC) for atomic energy.

### Invent of Programming languages.
Grace Hopper along with Adele Mildred Koss, Frances Holberton, Jean Bartik, Frances Morello, and Lillian Jay programmed UNIVAC compiler; these became base for Smalltalk, Windows 1.0. Grace Hopper and Mary Hawed created COBOL language and compiler in 1959. Jean E Sammet ay IBM developed FORMAC programming language in 1961.

### Evolution of Computer Networks, Multi-Media, Gaming Fields
Elizabeth Jake Fienler created ARPANET in 1969, and Stacy Horn introduced the world to the Bulletin Board System (BBS). Joan Margaret Winters considered human factors in software design and which led to multi-media and usability aspects in computing. Computer gaming field once male dominated, as it was considered boys' game, had contributions from several women during 1980s to 2000. Brenda Laurel founded purple moon, a gaming company that was later acquired by Mattel.

### Gender-Gap Situation in various parts of the world
All through the American history of women in computing until mid-20th century, there were stereotypes about women doing soft roles "coordinate, test" whereas men did coding, design, hardware and networking.

The cultural stigma decreased attractiveness of computers among women. There are often perceptions that men take errors in program compilation as learning whereas women look for perfection; also prevailing biases that women like people-facing jobs and men like coding and hardware. Gender Disparity in computer industry became visible in 1980s;

These prevailing biases led to Misha Mahowald researching on Neuromorphic Engineering in mid-90s, and an award was instituted to recognize excellence in this field.

It is perceived that while male and female equally used computers, women are less likely to choose computing career as it is considered an introvert profession and faced self-selection bias in interviews.

Women in male dominated fields did not receive adequate acknowledgement or recognition for the path breaking work. 1960s onward, the computing revolution spread across the globe. Women from around the global played role in key inventions in the areas of programming languages, internet infrastructure, country-specific domains creation, Quantum Computing, and AI.

The gender gap in technology continues, but more prevalent now in western countries. Bulgaria and Romania have the highest rate of women entering in computer programming. Women constitute 59% of students in computer science in Saudi Arabian universities.

## Rise of Women Networks to Address the Disparity

Various institutions have come forward to address gender disparity by encouraging women in computing careers, offer training, skill development and job opportunities for women.

Association for Women in Computing (ACM) was the first in dedicating itself to the advancement of women in computing profession. The *Committee on Status of Women in Computing Research (CRA-W),* 1991, focuses on increasing the representation of women in computer science and engineering, research and education. ACM-W has 36000+ members. ACM also hosts Turing awards since 1966 dedicated to Alan Turing, the inventor of Turing Machine.

*AnitaBoorg Institute* (anitab.org) runs the *Grace Hopper Celebration of Women in Computing* annually in various parts of the world including India. Anitaboorg Institute also runs Systers, an email support/listserv group to promote use of computing among women/households.

*National Centre for Women in Information Technology (NCWIT),* set up by Lucy Sanders aims to address gender gap and increase women in technology and computing.

*Women in Tech International (WITI)* is dedicated to advancement of women in business & tech.

*Women in Technology & Science (WITS) Ireland* advocates inclusion and promotion of women in STEM industries.

*Women in Engineering (WIE)* by Institution of Electrical and Electronics Engineers (IEEE).

*Women Who Code* is an international non-profit dedicated to inspiring women to excel in tech careers.

*Girls Develop It*, provides affordable programs for women interested to learn web and software development.

*Girl Geek Dinners*, is an international group of women of all ages

*Girls Who Code,* works on closing gender gap in technology

*Arab Women in Computing* encourages women to work with technology and provides opportunities to network with industry experts and academicians for the students.

*BCSWomen* by British Computer Society

*Teen Turn*, Ireland is a charity that runs school training and work placement for girls.

*Women's Technology Empowerment Centre (W.TEC)* in Nigeria provides education and mentoring.

*Black-Girls Code* focuses on providing technology education to African-American women.

*Code First Girls, UK* is dedicated to transforming tech by providing the skills, space and inspiration for women to become developers.

### Computing Awards Won by Women

*ACMs Turing awards* are amongst the highest honours in computing and to date won by the three women - Frances Elizabeth Allen (2006), Barbara Liskov (2008), Shafi Goldwasser (2012).



Turing Award Winners: Frances E Allen, Barbara Liskov, Shafi Goldwasser. KSJ Award Winners: Mirella Lapata, Diane Kelly, Emine Yilmaz, Jaime Teevan

*British Computer Society (BCS)* in 2008 instituted *Karen Sparck Jones (KSJ) award* to commemorate her achievements. The award to date has been won by Mirella Lapata (2009), Diane Kelly (2012), Emine Yilmaz (2015), and Jaime Teevan (2016).

There are fewer organizations where one would find awards in computing/ information technology of global stature won by women from India. This is not due to capability; it is more a matter of awareness. One such platform is womentech.net (women in tech global awards). The 2021 awards nomination are open and number of women from India are featured in for 2020 nominations, including – Parneet Pal (Chief Science Officer, Wisdom Labs), Tonima Khan (Sr Account Exec – Slack), Vijaya Kaza (Chief Security Officer, AirBnB), Sunita Shenoy (Director, Industrial IOT – Intel), Dilruba Malik (SQA Manager – Palo Alto Networks), Rachana Kumar (VP Engineering – Etsy), Arti Venkatesh (Director Delivery- Avanade), Sailaja Vadlamudi (Director Security & Data Privacy – SAP).

## Women Who Code (WWCODE)

WWCODE founded by Alaina Percival in 2016, launched its first cohort with presence in 20 cities worldwide. WWCODE aims to inspire women to inspire excel in technology careers. WWCODE envisions a world where women are proportionally represented as technical leaders, executives, founders, VCs, board members, and software engineers. WWCODE today is a world-wide community of 290,000+ members. The WWCODE community is committed to (i) empowering the members with skills needed for professional achievement, (ii) Educate companies to better promote, retain and hire talented women (iii) build a global community where networking and mentorship is valued (iv) Develop role models. WWCODE holds an annual global conference event "Connect Reimagine".

In India WWCODE started its presence with VMWare starting the chapter in 2016 in Bangalore, India. Many corporates currently support the WWCODE chapters across India in Mumbai, Pune, Chennai, Hyderabad, and Delhi. Each chapter conducts entry, Mid/Senior leadership talks, tech mentoring, and return to career programs, networking, job fairs, codefests, hackathons and other events to promote women in computing. VMware runs "VMInclusion Taara" a mentoring program to bring women back to work, the program is also offered on WWCODE platform in partnership with WWCODE.

Membership can be obtained by anyone signing up on womenwhocode.com and choosing a location network and be active as volunteer or member. WWCODE chapters have directors for respective chapters who announce the programs on the chapter meetup page. Most programs are free for members, some conferences are priced at subsidized rate for members. As per a recent global survey of WWCODE members, 97% of members recommend WWCODE and 80% members have experienced a positive career impact after joining.

The WWCODE Bangalore chapter is holding a world-wide virtual event "Connect India 2021" during August 27-Sept 3, 2021. While many associations reduced the activities during pandemic, with its state-of-the-art platform, WWCODE has carried on with activities virtually for the benefit of the community. So, what are you waiting for? Get active and make a difference - by technically contributing the community and involving in ongoing learning.

## References

www.acm.org Association for Computing Machinery
www.anitab.org Anita Boorg Institute, Global Organization for Women Technologists
https://arabwic.org/ Arab Women in Computing
https://bcswomen.bcs.org/ British Computer Society (BCS) Women
https://www.blackgirlscode.com/ Black Girls Code: Women of Color in Technology
www.britannica.com   What is STEM Education
https://codefirstgirls.org.uk/ Helping Women Learn How to Code - Giving women the fair advantage
https://girldevelopit.com/ Girls Develop IT
https://girlgeekdinners.com/ Girls Geek Dinners
https://girlswhocode.com/ GirlsWhoCode
https://www.mahowaldprize.org/ Misha Mahobald Prize for Women in Neuromorphology
https://ncwit.org/ National Center for Women in IT
https://teen-turn.com/ Turning Teens towards Tech
https://wie.ieee.org/ Women in Engineering, IEEE
https://www.witi.com/ Women in Technology International
https://www.witsireland.com/ Women in Technology and Science, Ireland
https://wtec.org.ng/ Women in Technology Empowerment Center, Nigeria
https://en.wikipedia.org/wiki/Women_in_computing
www.womentech.net   Women in Technology Awards in IT
www.womenwhocode,com Women Who Code

## About the author

Dr. Renu Rajani (PhD) is an IT leader and is passionate about evolution of IT industry, and role women have played in technology. She is Director at Women Who Code, Hyderabad chapter and can be reached at renu@womenwhocode.com

"To me programming is more than an important practical art. It is also a gigantic undertaking in the foundations of knowledge." -- Grace *Hopper, U.S. Navy Admiral and Developer of the First Compiler*

# Information Resources

Compiled by
**Mr. H.R. Mohan**
Editor, IEEE CS R10 Newsletter
ICT Consultant & Former AVP (Systems), The Hindu, Chennai
hrmohan.ieee@gmail.com

The developments in the field of Information and Communications Technology, has been mind boggling during the last few decades. It is rather quite difficult to keep abreast with all the developments. This column, Information Resources tries to provide some pointers to the developments in various technologies & strategies along with tips for self-development and general interest info. Please note only few areas of covered and the information is not complete since many areas of ICT are left out. You can find the updates on the resources under the posting "Interesting Reads And Information" in the blog Information Resources at   https://infoforuse.blogspot.com/

Top 30 DevOps interview questions and answers for 2021: The need for qualified DevOps job candidates continues to grow as more companies adopt the methodology. Review these DevOps questions and answers to prepare for an interview.
https://whatis.techtarget.com/feature/Top-30-DevOps-interview-questions-and-answers

Is Google getting worse? Increased advertising and algorithm changes may make it harder to find what you're looking for: Over the past 25 years, the name "Google" has become synonymous with the idea of searching for anything online. In much the same way "to Hoover" means to use a vacuum cleaner, dictionaries have recognised "to Google" as meaning to undertake an online search using any available service. Former competitors such as AltaVista and AskJeeves are long dead, and existing alternatives such as Bing and DuckDuckGo currently pose little threat to Google's dominance. But shifting our web searching habits to a single supplier has significant risks.
https://theconversation.com/is-google-getting-worse-increased-advertising-and-algorithm-changes-may-make-it-harder-to-find-what-youre-looking-for-166966

Wearable tech for your ears: 'Hearables' can teach you a language or music with the help of AI: Hearables are wireless smart micro-computers with artificial intelligence that incorporate both speakers and microphones. They fit in the ears and can connect to the internet and to other devices, and are designed to be worn daily. Some technology companies are now marketing these as "the future of hearing enhancement," and focusing on their capacities to disrupt existing hearing aid markets. But hearables aren't hearing aids, ear plugs, headphones or headsets, although they could acquire the benefits of these devices. This means that one could rely on hearables as a kind of always-worn personal assistant nested in the ear, whether used for whispering scheduling reminders, playing music, amplifying sound or talking with friends.
https://theconversation.com/wearable-tech-for-your-ears-hearables-can-teach-you-a-language-or-music-with-the-help-of-ai-161571

IPv6 Adoption in 2021: As part of our ongoing efforts to chart the rise and rise of IPv6, we've been looking into the difference between average IPv6 capability per country over a few days in June 2020 versus the most recent similar averages for 2021.
https://labs.ripe.net/author/stephen_strowes/ipv6-adoption-in-2021/

Quantum computing's next big challenge: A quantum skills shortage: Increasing qubit counts and improving error correction is hard enough. But quantum computing companies are finding one of the biggest challenges might be to find the right people to do that. Building, programming and maintaining a quantum computer, therefore, is a radically different paradigm. It requires an understanding of quantum physics and how to map problems to the quantum space -- think programming languages, architectures, workflows and software, all of which are specific to quantum computing. And it turns out that finding workers who have that breadth of knowledge is becoming more and more difficult.
https://www.zdnet.com/article/quantum-computings-next-challenge-finding-quantum-developers-and-fast/

When you buy an NFT, you don't completely own it – here's why: Whether it is a remarkable piece of digital artwork or a cute digital penguin, NFTs are essentially tradeable jpegs or gifs. Unlike physical collectables, an NFT owner will not be able to display the asset in their home – except on a screen. They might think they could display it on a website, but this isn't

necessarily the case. So, what is someone actually getting when they buy an NFT, and what do they truly own from a legal perspective? https://theconversation.com/when-you-buy-an-nft-you-dont-completely-own-it-heres-why-166445

Linux turns 30: Linus Torvalds on his "just a hobby" operating system: It's been 30 years since Finnish graduate student Linus Torvalds drafted a brief note saying he was starting a hobby operating system. The world would never be the same. https://www.zdnet.com/article/linus-torvalds-on-linuxs-30th-birthday/

Your Guide to Autonomous Vehicles: Everything you need to know about self-driving cars, robotaxis, and more. This guide will start with the terms you need to know about autonomous vehicles (AVs). We'll look at where AVs have been, how the tech stack works, and where they're going. You may have come in asking, "Are we there yet?," and with any luck, you'll leave with a clearer sense of the ETA. https://www.morningbrew.com/emerging-tech/s/your-guide-to-autonomous-vehicles

There's no such thing as 'alternative facts'. 5 ways to spot misinformation and stop sharing it online: We are living in a dangerous age where the internet makes it possible to spread misinformation far and wide and most people lack the basic fact-checking abilities to discern fact from fiction — or, worse, the desire to develop a healthy skepticism at all. Journalists are trained in this sort of thing — that is, the responsible ones who are trying to counter misinformation with truth. Here are five fundamental lessons from Journalism 101 that all citizens can learn to improve their media literacy and fact-checking skills: https://theconversation.com/theres-no-such-thing-as-alternative-facts-5-ways-to-spot-misinformation-and-stop-sharing-it-online-152894

From AT&T To Xerox: 90+ Corporate Innovation Labs: Innovation is critical for established companies to stay relevant in the face of disruption. Here's our list of corporate innovation labs. This post broken up into sections as below features the innovation labs in companies under that category. Technology, Telecommunications, Finance, Food/Beverage, Retail/Consumer Goods, Auto/Aerospace, Health/Pharma, Media, Consulting/Advisory, Insurance, Energy/Industrial, Travel/Hospitality. https://www.cbinsights.com/research/corporate-innovation-labs/

What is Open Innovation: It's possible to find different answers to this question of 'What is open innovation?' Though the majority agree it is a process that goes beyond an organization's own R&D resources and enlists the support of outside help for innovation ideas to resolve challenging issues, develop new products, or innovate on a wider scale that could ultimately disrupt entire business sectors. Some people also say open innovation has existed for less than 20 years since Henry Chesbrough coined the phrase in 2003. However, let's not overlook that even a simple Suggestion Box in a staff canteen allows any employee to suggest ideas or offer observations related to other departments and functions beyond their own. What we address here is open innovation in the age of digital mass communication. We each have opportunities to instantly communicate with people all around the world, and access more information than we would have ever imagined just a few years ago. https://crowdsourcingweek.com/blog/what-is-open-innovation/

Crowdsourcing in the Circular Economy: Much of the work and focus in the circular economy is based around disrupting standard linear economy business models of "take-make-waste" to ones where higher proportions of resources can be recycled with minimal disposal. Through using waste as a resource to be recycled rather than disposed of, and by prioritising regenerative resources, we can stretch the lifetime of our planet's finite resources. Otherwise, in a world where success is largely measured by profits, most company directors are tied to legal requirements to maximise shareholder value. Stock markets reward relentless growth, and everyone chasing growth in a race that will exhaust those finite resources is not sustainable. How hard will it be to make the switch? https://crowdsourcingweek.com/blog/crowdsourcing-in-the-circular-economy/

Compare design thinking vs. Agile for QA: Design thinking helps a team figure out what problems to solve, while Agile is a framework that helps a dev team build better software faster. Let's compare the two approaches. https://searchsoftwarequality.techtarget.com/tip/Compare-design-thinking-vs-Agile-for-QA

Coding: How to make a change to a shared codebase: When multiple developers are working on the same codebase, it's important that everyone follow the same procedure for making changes. This is software engineering 101, but the details matter and new engineers don't always come out of school knowing how to do this. Here's how I have done it with my teams in the past. https://thezbook.com/coding/

The Long-Term Impacts of Ongoing Technical Debt: Technical debt not only increases total cost of ownership (TCO), it also holds organizations back from leveraging new digital technologies and creating new experiences for their customers, stakeholders and partners. In this article we delve into the details of what makes up technical debt and its impact on the IT and the business as a whole. https://www.reworked.co/information-management/the-long-term-impacts-of-ongoing-technical-debt/

Data science vs. machine learning vs. AI: How they work together: Data science, machine learning and AI are central to analytics and other enterprise uses. Here's what each involves and how combining them benefits organizations.

https://searchbusinessanalytics.techtarget.com/feature/Data-science-vs-machine-learning-vs-AI-How-they-work-together

15 common data science techniques to know and use: Data scientists use a variety of statistical and analytical techniques to analyze data sets. Here are 15 popular classification, regression and clustering methods.
https://searchbusinessanalytics.techtarget.com/feature/15-common-data-science-techniques-to-know-and-use

What is Data Visualisation and why is it important: Data visualization is the practice of translating information into a visual context, such as a map or graph, to make data easier for the human brain to understand and pull insights from. The main goal of data visualization is to make it easier to identify patterns, trends and outliers in large data sets. The term is often used interchangeably with others, including information graphics, information visualization and statistical graphics.
https://searchbusinessanalytics.techtarget.com/definition/data-visualization

Top data visualization techniques and how to best use them: BI and analytics teams and self-service BI users can choose from various types of data visualizations. Here are examples of 12, with advice on when to use them. A wide variety of data visualization techniques can be used to help business users find the meaning in BI and analytics data. Visualization is a core component of the business intelligence process, and many enterprises are seeing an explosion in the need for it, driven by improvements in data infrastructure, wider use of BI tools and a corresponding rise in data literacy.
https://searchbusinessanalytics.techtarget.com/tip/12-data-visualization-techniques-for-effective-BI-applications

## SECURITY

Evaluation of Comprehensive Taxonomies for Information Technology Threats: Categorization of all information technology threats can improve communication of risk for an organization's decision-makers who must determine the investment strategy of security controls. While there are several comprehensive taxonomies for grouping threats, there is an opportunity to establish the foundational terminology and perspective for communicating threats across the organization. This is important because confusion about information technology threats pose a direct risk to an organization's operational longevity. In order for leadership to allocate security resources to counteract prevalent threats in a timely manner, they must understand those threats quickly. A study that investigates categorization techniques of information technology threats to non-technical decision-makers through a qualitative review of grouping methods for published threat taxonomies could remedy the situation.
https://csiac.org/articles/evaluation-of-comprehensive-taxonomies-for-information-technology-threats/

Security in WFH: A balanced perspective:  With the hybrid work model gaining momentum every day, the HR and cybersecurity teams need to work closely to enable a safe and secure WFH environment for the employees. Here's everything they need to offer a comfortable, conducive, productive, and secure working environment.
https://cio.economictimes.indiatimes.com/news/digital-security/security-in-wfh-a-balanced-perspective/85169056

12 Quick Cyber Tips: This post provides  12 quick tips on how you can stay more safe online and protect your personal data. And if you're not sure where you stand, it has 5 questions you can ask yourself as a quick security risk assessment.
https://insandouts.org/12-quick-cyber-tips/

Spies for Hire: China's new breed of hackers blends espionage and entrepreneurship: Sponsored but not necessarily micromanaged by Beijing, this new breed of hacker attacks government targets and private companies alike, mixing traditional espionage with outright fraud and other crimes for profit.
https://ciso.economictimes.indiatimes.com/news/spies-for-hire-chinas-new-breed-of-hackers-blends-espionage-and-entrepreneurship/85680968

Expanded Protections for Children -- Initiatives of Apple: At Apple, our goal is to create technology that empowers people and enriches their lives — while helping them stay safe. We want to help protect children from predators who use communication tools to recruit and exploit them, and limit the spread of Child Sexual Abuse Material (CSAM). Apple is introducing new child safety features in three areas, developed in collaboration with child safety experts. First, new communication tools will enable parents to play a more informed role in helping their children navigate communication online. The Messages app will use on-device machine learning to warn about sensitive content, while keeping private communications unreadable by Apple. https://www.apple.com/child-safety/

What is a Next-Generation Firewall (NGFW): A next-generation firewall (NGFW) is a type of third-generation firewall with advanced security features that enable it to detect and block malicious traffic previous generations could not?
https://www.sdxcentral.com/security/definitions/what-is-next-generation-firewall-ngfw/

Minimizing the Impacts of Shadow IT: Shadow IT refers to employee use of applications not approved by an IT team. It may also refer to the improper use of applications.
https://www.sdxcentral.com/security/definitions/minimizing-the-impacts-of-shadow-it/

**IT Security Risk Management Best Practices:** IT security risk management is the practice of identifying what security risks exist for an organization and taking steps to mitigate those risks. Those steps can include using software, hardware, and personnel training to keep an environment secure from multiple threat vectors
https://www.sdxcentral.com/security/definitions/it-security-risk-management-best-practices/

## UI / UX DESIGN

**10 Great Sites for UI Design Patterns:** You don't want to spend your whole life redesigning the wheel do you? No, neither do we. If you are looking for a design that solves a problem that has been solved inside a different application before; then the template for your wheel is probably already out there. That's a design pattern to you and me. We've put together a list of some of the best places to find design patterns on the web. Now, whilst all of these resources are free some may ask you to pay for premium resources and the like; we just want you to know we are NOT affiliates of any other site and have no financial interest in you purchasing anything from anywhere else online.
https://www.interaction-design.org/literature/article/10-great-sites-for-ui-design-patterns

**10 Free-to-Use Wireframing Tools:** Wireframes help you quickly ideate and test your ideas. While paper wireframes are the quickest to create, digital wireframes look more polished and presentable. If you are after a pocket-friendly wireframing tool, then look no further! Depending on whether you prefer browser-based apps or offline desktop apps, how big a project you have on hand and how many people you need to collaborate and share your work with, here are a variety of free wireframing tools for you to choose from. Each has its own advantages and use cases. For the most part, you'll be able to work with the free apps; however, as your project expands, you may need to upgrade to access additional features or create more documents. If you find it hard to choose between the tools, go ahead and play around with them to get a feel for what works best for you, your team and your UX project.
https://www.interaction-design.org/literature/article/10-free-to-use-wireframing-tools

**Usability Testing: 7 Metrics to Assess Ease of Use:** An essential part of a user-centered design process is assessing a product or service's ease of use. It helps an organization understand how well a solution fits user needs and highlights areas for improvement. Empirical studies like usability testing yield insights directly derived from user behavior and feedback. During a usability test, users engage with a solution and solve test tasks while a facilitator observes them and gathers their feedback. While oftentimes considered a purely qualitative exercise, it is possible to record, analyze and synthesize quantitative measures as well. Here are some of the most widely used usability metrics such as: Task Success, No of Errors, Number of Help Requests , Number of User Actions, Time on Task, Learnability, and Satisfaction.
https://www.cmswire.com/digital-experience/usability-testing-7-metrics-to-assess-ease-of-use

**User Interface Design Guidelines: 10 Rules of Thumb:** Learn to design with your user's needs and expectations in mind by applying Jakob Nielsen and Rolf Molich's Ten User Interface Guidelines. These heuristics have been reflected in many of the products designed by some of the most successful companies in the world such as Apple, Google, and Adobe. Further evidence of how their design teams incorporate these rules into their design process is reflected in the user interface guidelines published and shared by these companies. This article will teach you how to follow the ten rules of thumb in your design work so you can further improve the usability, utility, and desirability of your designs.
https://www.interaction-design.org/literature/article/user-interface-design-guidelines-10-rules-of-thumb

**The 7 Factors that Influence User Experience:** User Experience (UX) is critical to the success or failure of a product in the market but what do we mean by UX? All too often UX is confused with usability which describes to some extent how easy a product is to use and it is true that UX as a discipline began with usability – however, UX has grown to accommodate rather more than usability and it is important to pay attention to all facets of the user experience in order to deliver successful products to market. There are 7 factors that describe user experience, according to Peter Morville a pioneer in the UX field who was written several best-selling books and advises many Fortune 500 companies on UX: Useful, Usable, Findable, Credible, Desirable, Accessible, Valuable. Let's take a look at each factor in turn and what it means for the overall user experience: https://www.interaction-design.org/literature/article/the-7-factors-that-influence-user-experience

**How to Change Your Career from Graphic Design to UX Design:** If there's an occupation that is 100% linked with the public's idea of what design is all about, it's graphic design. From the familiar golden arches of the McDonald's brand to the typography and colors of movie posters, graphic designers create some of the most iconic and ubiquitous designs around us. So why would a graphic designer like you want to change your career to UX design? Well, for one, much can be said about the sense of satisfaction and fulfillment derived from getting "under the hood" of the products you work on rather than working on the exterior. Furthermore, according to PayScale, the average salary for a graphic designer in the United States is $41,000, but the same for a UX designer is a whopping $74,000. Whatever the reason for the move, it's clear that it can be a very rewarding one. But how do you go about switching from graphic design to UX design? Let's find out.
https://www.interaction-design.org/literature/article/how-to-change-your-career-from-graphic-design-to-ux-design

## DIGITL TRANSFORMATION

**What is digital transformation:** Digital transformation is the incorporation of computer-based technologies into an organization's products, processes and strategies. Organizations undertake digital transformation to better engage and serve their workforce and customers and thus improve their ability to compete. Often large in scope, a digital transformation initiative can require an examination and reinvention of all facets of an organization, from supply chains and workflows, to employee skill sets and org charts, to customer interactions and value proposition to stakeholders. Successful digital transformations yield ongoing business benefits: Digital technologies and processes enable organizations to adeptly respond to customer demands in the present and as demands evolve. Digital transformation also builds the infrastructure and skills required for taking advantage of fast-evolving technologies that could confer a competitive advantage. A digital transformation strategy positions organizations to survive and thrive in a future where technology is the key economic driver. https://searchcio.techtarget.com/definition/digital-transformation

**Digitalization strategy for Business Transformation:** Accelerate your digital transformation journey. IT Roadmap for Digital Business Transformation. Most CIOs have a common question - What is the best way to scope, scale, and lead the digital transformation that can deliver financial results? Take your digital transformation initiative one notch up with this best practice insight. https://www.gartner.com/en/information-technology/insights/digitalization

**Ultimate guide to digital transformation for enterprise leaders:** Digital transformation is a global business phenomenon, capturing the attention of enterprises in every industry and spurring major investment. In survey after survey, heads of companies cite digital transformation as their No. 1 concern. By 2023, the digital transformation market is expected to reach $6.8 trillion, according to research firm IDC, and 75% of organizations will have a comprehensive digital transformation roadmap in place -- up from 27% of companies today. This in-depth guide explains what digital transformation is, why it is important and how enterprises can successfully transition to this new business paradigm. https://searchcio.techtarget.com/feature/Ultimate-guide-to-digital-transformation-for-enterprise-leaders

**10 must-read digital transformation books in 2021:** The books on our list will help you navigate the challenging path to digital transformation. Written by an array of digital experts from consultants and professors to business executives and IT professionals, the books cover a wide range of topics, including how to develop a strategy, how to increase the role of IT, how to avoid digital transformation failures and how to become a "vigilant leader." In no particular order, here's our list of 10 useful digital transformation books to consult in 2021. https://searchcio.techtarget.com/tip/10-must-read-digital-transformation-books

**10 ways the pandemic changed digital transformation:** The pandemic has brought lasting changes to how companies do business. Here are 10 important ways in which COVID-19 affected digital transformation initiatives. https://searchcio.techtarget.com/tip/10-ways-the-pandemic-changed-digital-transformation

**10 digital transformation benefits for business:** Businesses cite efficiency, resiliency, productivity, ROI and competitive advantage as critical reasons to digitally transform their operations in the wake of COVID-19 disruptions. https://searchcio.techtarget.com/tip/Top-10-digital-transformation-benefits-for-business

**Build a digital transformation roadmap in 6 steps:** Digital transformation, done right, is the key to business survival. Build a roadmap to digital business model success by following this in-depth, six-step template. https://searchcio.techtarget.com/tip/How-to-build-a-digital-transformation-roadmap-in-6-steps

**Building a digital transformation team: 8 essential roles:** Who needs to be on your digital transformation team? Metrigy's Robin Gareiss lists the key positions of an effective digital transformation team and explains why they're important. https://searchcio.techtarget.com/tip/Building-a-digital-transformation-team-8-essential-roles

**14 need-to-know tips for digital transformation success:** What separates a successful digital transformation implementation from a recipe for disaster? These 14 tips will help ensure your DX efforts result in business improvement. https://searchcio.techtarget.com/tip/14-need-to-know-tips-for-digital-transformation-success

**7 online digital transformation courses and certifications:** We've compiled a list of the best paid online digital transformation courses and certification programs for business leaders seeking to gain a competitive edge in the digital age. https://searchcio.techtarget.com/feature/7-online-digital-transformation-courses-and-certifications

**How to measure and improve digital transformation ROI:** Demonstrating a compelling ROI on digital transformation initiatives is vital to securing business support and ongoing funding for additional projects. These 9 tips will help. https://searchcio.techtarget.com/tip/How-to-measure-and-improve-digital-transformation-ROI

**6 tips for digital transformation budget planning:** Digital transformation budgets require different processes than traditional business or IT budgets. Here's what to bear in mind when budgeting for DX. Digital transformation projects require (sometimes significant) investment in time and money before cost savings, revenue growth or productivity improvements are

realized. Securing the necessary funding requires careful planning and convincing data. However, it's important to recognize that digital transformation budget planning requires different processes than traditional IT or business budget planning. Here's why. https://searchcio.techtarget.com/tip/6-tips-for-digital-transformation-budget-planning

Risk and reward: How to succeed in digital transformation: Most organisations are seeking to step up their digital transformation efforts, but history has shown that such efforts can be doomed to failure if they take the wrong approach https://www.computerweekly.com/opinion/Risk-and-reward-How-to-succeed-in-digital-transformation

What Serverless Computing Is and Should Become: The Next Phase of Cloud Computing: We are revisiting cloud computing a decade later to explain its emerging second phase, which we believe will further accelerate the shift to the cloud. The first phase mainly simplified system administration by making it easier to configure and manage computing infrastructure, primarily through the use of virtual servers and networks carved out from massive multi-tenant data centers. This second phase hides the servers by providing programming abstractions for application builders that simplify cloud development, making cloud software easier to write. Stated briefly, the target of the first phase was system administrators and the second is programmers. This change requires cloud providers to take over many of the operational responsibilities needed to run applications well. To emphasize the change of focus from servers to applications, this new phase has become known as serverless computing, although remote servers are still the invisible bedrock that powers it. https://m-cacm.acm.org/magazines/2021/5/252179-what-serverless-computing-is-and-should-become/fulltext

## GENERAL

13 Essential Apps Every College Student Needs: Whether you're a brand-new college student just entering your first year or a jaded senior, college is tough. But if you're equipped with the right apps, you won't have a hard time keeping things organized or understanding what your professor was talking about. You'll survive college in one piece and graduate in no time. It can be tough to find an app when you need it most, and having to spend an hour in the app store digging through irrelevant apps is just a frustrating waste of time. Lucky for you, we found some free apps that'll make studying easier, help you take notes, type up papers, stay in shape, balance your budget, and stay relaxed while focusing on your classes. https://www.reviewgeek.com/53488/13-essential-apps-every-college-student-needs/

eBook: The Datacenter as a Computer: Designing Warehouse-Scale Machines, Third Edition. Synthesis Lectures on Computer Architecture. Authors: Luiz André Barroso, Urs Hölzle & Parthasarathy Ranganathan. This book describes warehouse-scale computers (WSCs), the computing platforms that power cloud computing and all the great web services we use every day. It discusses how these new systems treat the datacenter itself as one massive computer designed at warehouse scale, with hardware and software working in concert to deliver good levels of internet service performance. The book details the architecture of WSCs and covers the main factors influencing their design, operation, and cost structure, and the characteristics of their software base. Each chapter contains multiple real-world examples, including detailed case studies and previously unpublished details of the infrastructure used to power Google's online services. Targeted at the architects and programmers of today's WSCs, this book provides a great foundation for those looking to innovate in this fascinating and important area, but the material will also be broadly interesting to those who just want to understand the infrastructure powering the internet. Download link at the bottom of the post. https://www.morganclaypool.com/doi/10.2200/S00874ED3V01Y201809CAC046

Online Book: Zach's Engineering Handbook: This "handbook" is my attempt to document my way of doing things as an engineer, manager, and CTO. It's not necessarily The Right Way, but it's what I've found to be most effective so far in my career. It's divided into four sections currently. Opinion == my opinions on eng and product; Coding == best practices on how to code, especially as part of a team; Planning == how to product manage and plan a project; Hiring == how to hire at startups. I'm documenting this mostly for myself. But maybe you'll find it useful too. You might also think my points are wrong, misguided, etc. That's great – I love feedback and very much consider this a work in progress. https://thezbook.com/about-this-handbook/

Videos: The 12th Annual ASU+GSV Summit sessions: The summit held during 9-12 Aug 2021 featured critical conversations and speakers, with a shared focus on scaling innovation in "Pre-K to Gray" learning so that ALL people have equal access to the future!. Whether you attended in San Diego, joined us online, or could not make this year's event, you can now find all of the videos on our YouTube channel. https://youtube.com/c/GlobalSiliconValley

Mindfulness meditation in brief daily doses can reduce negative mental health impact of COVID-19: As a team of cognitive neuroscientists and a clinical health psychologist studying mind wandering and ways to improve well-being in vulnerable populations, we responded to the call for action for mental health interventions. Specifically, we studied mindfulness meditation as a potential coping strategy for these mental health adversities. https://theconversation.com/mindfulness-meditation-in-brief-daily-doses-can-reduce-negative-mental-health-impact-of-covid-19-165163

Inputs for this column may please be sent to the compiler Mr. H.R. Mohan, editor of the newsletter by email at hrmohan.ieeecs@gmail.com

# Books
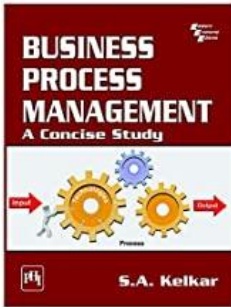
### Business Process Management: A Concise Study
Author: S. A Kelkar, Paperback. 416 Pages, Price: INR 650/- Publisher: PHI Learning

Business Process Management (BPM) is about managing all the work that is necessary for delivering an end product or service. This book is well-suited for teaching an academic course as a part of a final year Bachelor and Master Degree programs in Information Technology and Communications, Management, and also, other related disciplines. It can also be used for conducting an equivalent training programme for in-house professionals. Although no book can be a substitute for the wide and varied experience of an instructor, this book will help the instructor to concentrate on teaching rather than worrying about creating the teaching material and assembling the student material. In view of the likely differences in background of the readers, some material has been placed into appendices to enable them to read on a need-to-know basis. Besides, this book, in its present form, is equally useful for the professionals, who wish to grasp the essentials of BPM without attending a formal instructional course. Some of the key features include: Chapters are appropriately organized as per the process life cycle; Written in bullet format for easy grasping; Comprises theory and its applications systematically; Emphasizes relevant deployment issues; Separate chapter on Performance Monitoring; Highly illustrative with diagrams and sketches; Separate appendix on BPMS.

### Grandma in the Board Room
Authors: Jaganathan T and Sampath Kumar, Paperback, 316 Pages, Price: INR 349/- Publisher: Notion Press

Grandma in the Board Room (GIBR) is a gripping corporate saga of a current-day IT company, EmergePro, in the crucial years between the Chennai floods to the COVID19 lockdown. Emerge Pro is about to make a pathbreaking announcement. The protagonist of the story Krishna Prasad (KP), after a successful stint as its CEO, steering EmergePro from decline to unimaginable growth within a span of five years, is the architect of this surprise move. The story begins with an employee get-together, where the suspense is to be broken with an announcement by the founder. It weaves through the memory shares of the past five years of the stakeholders in this growth story. KP, an outsider CEO recruited before Chennai floods, has to find his way through the maze of corporate relationships and win the support of a diverse and disinclined leadership team. The journey winds through diverse ethnicity and leadership styles – weak leader Ananth Ram, indifferent Subendu Das, intimidatingly aggressive Suhas Ratnam, caring MD Rengarajan, faithful Neha Khosla, naïve and enthusiastic Krithika, talented but not-so-confident Ashok Kumar, ever-grateful Swetha Prakash, etc. – a complex intertwined spaghetti of minds. KP has to carefully use his fork without breaking the links. How the wisdom of the stories KP had learned in his childhood from his grandma which have roots from ageless epics Ramayan, Mahabharat, and Panchatantra & Folk stories, helps him overcome the challenges faced by him is a great learning and a great read as well. The book, presented as a story, deals with a lot of management issues such as persistence in marketing efforts, managing unreasonable clients, dealing with unfounded allegations, teamwork, price paid for nepotism, resistance you face when you want to give an out-of-turn promotion even though it is well deserved.  It is a good read for all professionals – younger ones will to learn about the complexity of the workplace related to the software and IT services industry and the older ones will find the book triggering reflection on their own experience.

### The Bird Farm: The Story of the AI and Internet World We Live In
Author: Varun Aggarwal, Paperback, 136 Pages, Price: INR 190/-  Publisher: Independently Published

This book is a story of three birds living a quiet life in their tree facing the impact of technological revolution, in particular mobile, internet & AI related technologies, happening around. The book highlights on how the tech entrepreneurs innovate, the politicians re-align ad the young rebound? What happens to the truth, the jobs, privacy and moral code?  The author, in this book, in an excellent way presents the complex interactions between technological developments, societal structures, inequalities and power equations. This book, refreshing to read highlights how technology, touted as a solution for many problems, in turn creates a new set of issues.  The author, Varun Aggarwal, an MIT alumnus, a successful entrepreneur, the founder of India Science Festival, one of the largest science festivals in the world and teaches AI to kids, tries to find the answers to the questions -- have the promises of the technology world delivered? Which have, which haven't and makes a prediction on what the future holds, through his writing of this book.

# Announcements

**Note from the Computer Society Vice President for MGA**

Dear Computer Society Region 10 leaders,

As you are aware your Region 10 Committee is currently requesting proposals for grants from their committee to support the work of local chapters. These grants are new in 2021 and are a result of our MGA Board making a significant allocation of funds to support our chapters around the world. I am pleased to now share the news that following significant efforts undertaken on your behalf, the Computer Society Board of Governors has agreed to a significant increase in funding for MGA Board in the 2022 budget, subject as always to IEEE approval. Assuming there are no changes, the regional grants program will continue in 2022 at the current level. The funding increase will also support a new pilot program to provide some funding, much like the rebate from IEEE MGA, to every active and engaged local chapter. Details of the new program will be released either at the end of this year or the start of next year, with the funding itself being transferred to chapters around the middle of 2022.

At this stage I want to highlight two things: (1) the importance of chapters (both Section Chapters and Student Chapters) updating their officer reporting so every member of the chapter committee is listed and everyone has both a start and end date for their position, and (2) the importance of chapters positively engaging with the volunteers within our Geographic Activities Committee (i.e. your Area Coordinators, SAC Coordinators (for student chapters), Regional Coordinator and other SAC / Area / Region / GAC committee members who reach out to you. I also highlight the opportunities our Students and Young Professionals (SYP) Committee are offering to chapters, along with the opportunities from our DVP committee. Other groups like Technical Committees (TCs) and Special Technical Communities (STCs) that focus on specific technologies have also expressed interest in opportunities to present online to our chapters. You can speak to your Area Coordinator to learn more about these opportunities.

Thank you for your leadership and your efforts to keep activities running and members connected through these challenging times.

Dr Andre Oboler
Vice President for Members and Geographic Activities
IEEE Computer Society

---

**Note from Chair, Geographic Activities Committee on 2021 Chapter Grants Program**

I am pleased to inform you of a new IEEE Computer Society chapter grant program being introduced to support your local activities. These funds are available for immediate access to support initiatives you would like to conduct for your members in 2021. Funds are available on a first-come, first-served basis and reviewed on a rolling basis. Applications that propose meaningful chapter activities and document a path to chapter growth will be favored.

Student Branch Chapters can submit for up to $200 for a single technical meeting.

Funds are limited so chapters are encouraged to apply early. Chapters may apply for more than one grant.

To apply for a chapter grant, a chapter officer must fill out the Chapter Grant Request Form available at https://ieee.secure-platform.com/a/solicitations/529/home

A final report will be required within 30 days of completing your activity. Information, regarding how to submit the final report, will be provided to those who receive the grant.

Request a Chapter Grant here. https://ieee.secure-platform.com/a/solicitations/529/home

$8400 has been allocated for professional chapters in region 10 and $7800 for student chapters ($5600 for student chapters in India and $1200 for student chapters in the rest of region 10).

Best regards.
Peter Mager
Chair, Geographic Activities Committee

# Guidelines for submitting matter & reports to get published in the IEEECS R10NL (Newsletter)

- Please submit the event reports within two months of it happening. Please avoid reporting very old events.
- The matter may be submitted in doc / rtf / txt format. Please avoid other formats such as pdf, jpg as they will not be considered.
- Please use SINGLE column format (while the report is prepared).
- To the extent possible, please avoid embedding the photos in the document relating to event reports. However, images referred in articles alone may be embedded at appropriate places in the article document in addition to sending them separately.
- Please send the event photos (typically one/two best) separately (even if they are included in the report).
- Preferred format for photos is "jpg". Please avoid sending the photos in "bmp", "png" formats.
- Photographs in digital form should not to exceed 1024 pixels in width. You may use any photo editing software (MS Office Picture Manager is quite useful) to re-size the image. This will reduce the file size of the images considerably. Please avoid sending large size photos (Sometimes we get image files of size close to 6MB). We generally recommend images of file sizes less than 500K.
- Provide your name, full affiliation, and email id at the end of the document.
- Send the matter by email with the subject: From <Chapter / Institution Name in short form> -- Report on <Event Name in short & Date> eg: "From Madras Chapter / SSNCE -- Report on Conf. on Wireless Networking dated 10th Dec 2020"
- Please send the matter by email to ieeecs-r10nl@gmail.com
- Please note, the matter sent to other email ids may get ignored and may not be considered.
- Please submit the matter for publication latest by 8th of the publication month (currently Mar, Jun, Sep, Dec as IEEECS R10NL is a quarterly) to facilitate inclusion in that quarter's issue of the newsletter.
- Please note that while all efforts will be made for publishing, due to certain constraints, the actual publishing may be delayed.
- We will be constrained to ignore the submitted materials, if they do not follow the above guidelines.
- Please co-operate with us by adhering to the guidelines specified in sending the matter for publishing.

## IEEE Computer Society Website

Home: https://www.computer.org/
Discover Membership: https://www.computer.org/membership
Join the Computer Society: https://www.computer.org/membership/join
Discover Publications: https://www.computer.org/publications
Author Resources: https://www.computer.org/publications/author-resources
Digital Library: https://www.computer.org/csdl/home
Discover Communities: https://www.computer.org/communities
Discover Professional Chapters: https://www.computer.org/communities/professional-chapters
Student Activities: https://www.computer.org/communities/student-activities
Society Leadership: https://www.computer.org/volunteering/society-leadership
Discover Volunteering: https://www.computer.org/volunteering
Awards and Fellows: https://www.computer.org/volunteering/awards
Discover Education: https://www.computer.org/education
Bodies of Knowledge: https://www.computer.org/education/bodies-of-knowledge
Additional Resources: https://www.computer.org/resources
Contact IEEE CS: https://www.computer.org/about/contact