IEEE Hong Kong Section

The Hong Kong Polytechnic University

明愛專上學院 Caritas Institute of Higher Education

IEEE HK Section Lecture Series on Continuing Education

4-Days IEEE joint Tutorial/Workshop on Deep Learning (Part 2):

2-Day IEEE Workshop on Deep Learning

Date: Friday-Saturday, 19-20 March 2021 (Virtual Workshop)

Program Schedule

Session 1: Friday, 19 March 2021, 9:00am-12:00nn

Session Chair: **Prof. Wan-Chi Siu**, *PhD, DIC, Life-FIEEE*

Opening Speech: **Dr. Paulina Y. Chan**, *PhD, DIC, MBA, SrMIEEE,* Chair of IEEE Hong Kong Section (3 minutes)

1. Deep Learning Baseline Model Design with sample application to Super-Resolution Imaging
Prof. Wan-Chi Siu, *PhD, DIC, Life-FIEEE, APSIPA Distinguished Lecturer*
Emeritus Professor, Hong Kong Polytechnic University & Research Professor CIHE

2 How to get Clear Vision in the Rain and Haze Environment using Deep Learning?
Dr. Lap-Pui Chau, *PhD, FIEEE*
Associate Professor, Nanyang Technological University, Singapore

Fee: Free Registration

For Limited Quota, Priority is given to members of sponsoring organizations. Hence ***make Early Registration.***

Click here to Register for Part 2,
IEEE Workshop on Deep Learning Web:
https://cis.cihe.edu.hk/workshop.html#02

Enquiry: Ms Daisy Kwok,
dkwok@cihe.edu.hk

Session 2: Friday, 19 March 2021, 1:30 -6:00pm

Session Chair: ***Dr. Paulina Chan***, *PhD, DIC, SrMEEE,* Chair IEEE HK Section

3. Few-Shot Learning: Three Examples
Prof. Changshui Zhang, *PhD, FIEEE, APSIPA Distinguished Lecturer*
Professor, Tsinghua University

4. "Edge Learning for Distributed Big Data Analytics: Theory, Algorithm and System Design"
Prof. Song Guo, *PhD, FIEEE,*
Professor, Computing, The Hong Kong Polytechnic University

5. Computational and Learning Aspects of DNA Sequences
Dr. Bonnie NF Law, *PhD, SrMIEEE*
Associate Professor, Hong Kong Polytechnic University

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Session 3: Saturday, 20 March 2021, 9:00am-12:00nn

Session Chair: ***Prof. H. Anthony Chan***, *PhD, FIEEE*

6. Deep Learning for Computational Manga
Prof. Wong, Tien-Tsin, *PhD, FHKIE, MIEEE*
Professor, CS & Eng, The Chinese University of Hong Kong

7. Deep Learning for Speaker Recognition
Prof. Man-Wai Mak, *PhD, SrMIEEE,*
Professor, EIE, Hong Kong Polytechnic University

APSIPA Distinguished Lecturer Program

IEEE Hong Kong Life Member Affinity Group

Organizers*:*
Prof. Wan-Chi Siu *(PhD, Life-FIEEE),*
Prof. H. Anthony Chan *(PhD, FIEEE),*
Dr. Paulina Chan *(PhD, Chair, IEEE HK Section)*

Sponsors: IEEE HK Section/HKS Life Member Affinity Group, APSIPA/APSIPA Distinguished Lecturer Program, Caritas Institute of Higher Education, TeleEye Founders' Charity Foundation, UGC/IDS(R)11/19

Click here to Register for Part 1:
https://cis.cihe.edu.hk/workshop.html#01
a 2-Day Tutorials on Deep Learning, which is a course for those who have very limited background on Deep Learning, 5-6 Feb. 2021.

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APSIPA Signal and Information Processing

IEEE HK Section Lecture Series on Continuing Education

2-Day IEEE Workshop on Deep Learning

Opening Speech

Friday, 19 March 2021, 9:00-9:03am

Dr. Paulina Yenbic Chan 陳彥碧博士, *PhD (Imperial), DIC, MBA (London U), SrMIEEE, CCMI, CMgr (CMI UK);* Chair, IEEE Hong Kong Section

Contact Number: +852 95271128 Email: paulinaue@aol.com

Continuing Education: Continuing Education is an indispensable part of the professional life of an engineer. We have to constantly learn and acquire new knowledge in order to carry out our duties. I am particularly glad to introduce this IEEE Hong Kong Section Lecture Series on Continuing Education, which not only fulfills the actual need for updating the knowledge and skills of engineers in this fast technology development era but also supports the Government's ambition to make Hong Kong one of the smart cities in the world. Particular thanks are given to Caritas Institute of Higher Education and TeleEye Founders' Charity Foundation for their generous financial sponsorship and the Caritas Institute of Higher Education for taking the lead in organizing this event. We also want to thank the technical co-sponsorship provided by APSIPA (Asia-Pacific Signal and Information Processing Association), APSIPA Distinguished Lecturer Program, IEEE Hong Kong Life-Member Affinity Group and The Hong Kong Polytechnic University. This is only the start of our Continuing Education Program. We hope in the near further we can mount more of these programs in Deep Learning and other emerging areas. We sincerely hope to have your support.

Speaker: Dr Paulina Chan is Chair of IEEE Hong Kong Section (2020 and 2021), General Chair of IEEE TENCON 2022, the Founding Chair of Imperial Women in World DSP and she was Chair of IEEE Hong Kong WIE (2019). Dr Chan is also a Chartered Manager (CMgr), CMI Companion (CCMI), Trustee on the Board of Governors of the Chartered Management Institute (UK) and Chair of the CMI Regional Board in Hong Kong.

Paulina is Principal and CEO of Global Mutual Innovation Consortium- a think-tank of multidisciplinary professionals and start-ups in multiple countries focusing on the translation and applications of novel technologies in STEM and Tech-Biz Intelligence into products and services, such as mobile communications network, Artificial Intelligence and Big Data, Smart Cities and Smart Buildings, green energies, and forward-looking health-tech and ed-tech. Over the years, more than ten angel network collaborations and cloud funding entrepreneur ventures have been set up in various EU member states, Hong Kong, and China.

Dr Chan was in senior management in AT&T/Lucent Technologies in the US, Exxon/Mobil Corporation in New York, ICO Global Communications London and Beijing, and EU for Hungary.

As the Founding Champion of Imperial College London Mentoring Programme (2013-present), Dr Chan has contributed a lot of her time and energy to guide young scientists, technologists, engineers and managers-in-training to develop career paths and personal growth.

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APSIPA Signal and Information Processing

2-Day IEEE Workshop on Deep Learning

Deep Learning Baseline Model Design with Sample Application to Super-Resolution

Friday, 19 March 2021, 9:03-10:30am

Prof. Wan-Chi Siu, *PhD, DIC, Life-FIEEE, APSIPA Distinguished Lecturer*

Abstract: There are always large demands for more suitable and efficient machine learning techniques for hi-tech applications. In this talk we will start with a brief review of the architecture of a standard deep learning network for classification, and image to image applications. Many possible approaches can possibly be used to achieve improvement of the architecture of the deep learning structure, which include making novel improvement on the design of the baseline model, information aggregation, resolving the conflict between optimization and generalization and normalization approach of deep learning algorithms, etc. For the present presentation, we will just concentrate on the study of baseline models for deep learning, and will give a brief discussion on the evolution of building blocks for deep learning architectures. We will then proceed with the discussion of some currently proposed baseline models. The techniques can be used as a reference for those who want to design their own deep learning networks for specific applications. At the end of the discussion we will briefly talk about our proposed baseline models making use of joint back projection and residual network for image super-resolution. Demonstrations and experimental results will be provided to show the effect of the new design, and research trend along this direction will also be discussed.

Speaker: Wan-Chi Siu received the MPhil and PhD degrees from The Chinese University of Hong Kong in 1977 and Imperial College London in 1984. He is Life-Fellow of IEEE and Fellow of IET, and was Past President (2017-2018) of APSIPA (Asia-Pacific Signal and Information Processing Association). Prof. Siu is now Emeritus Professor of the Hong Kong Polytechnic University, Research Professor of Caritas Institute of Higher Education, and Distinguished Lecturer of APSIPA. He was Chair Professor, Founding Director of Signal Processing Research Centre, Head of Electronic and Information Engineering Department and Dean of Engineering Faculty of The Hong Kong Polytechnic University. He is an expert in DSP, transforms, fast algorithms, machine learning, and conventional and deep learning approaches for super-resolution imaging, 2D and 3D video coding, object recognition and tracking. He has published 500 research papers (over 200 appeared in international journal papers), and edited three books. He has also 9 recent patents granted. Prof. Siu was an independent non-executive director (2000-2015) of a publicly-listed video surveillance company and convenor of the First Engineering/IT Panel of the RAE (1992/93) in Hong Kong. He is an outstanding scholar, with many awards, including the Best Teacher Award, the Best Faculty Researcher Award (twice) and IEEE Third Millennium Medal (2000). Prof. Siu has been Guest Editor/Subject Editor/AE for IEEE Transactions on Circuits and System II, Image Processing, Circuit & System for Video Technology, and Electronics Letters, and organized very successfully over 20 international conferences, including IEEE society-sponsored flagship conferences and as TPC Chair of ISCAS1997 and General Chair of ICASSP2003 and General Chair of ICIP2010. He was Vice-President, Chair of Conference Board and Core Member of Board of Governors (2012-2014) of the IEEE Signal Processing Society, and has been a member of the IEEE Educational Activities Board, IEEE Fourier Award for Signal Processing Committee (2017-2020) and some other IEEE Technical Committees

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IEEE HK Section Lecture Series on Continuing Education

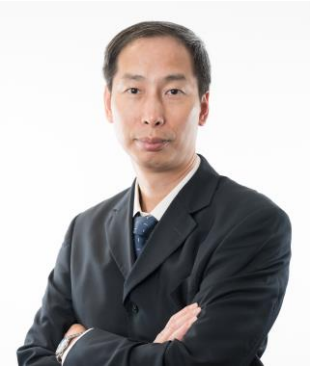
2-Day IEEE Workshop on Deep Learning

How to get Clear Vision in the Rain and Haze Environment using Deep Learning?

Friday, 19 March 2021, 10:30am- 12:00nn

Dr. Lap-Pui Chau, *PhD, FIEEE*

Abstract: Rain and Haze removal is important for improving the robustness of outdoor vision-based systems. Current rain removal methods show limitations either for complex dynamic scenes shot from moving camera. In this talk, we cover a de-rain algorithm which applies deep learning and super-pixel segmentation to decompose the scene into depth consistent units. Alignment of scene contents is done at the super-pixel level, which proves to be robust towards rain occlusion and camera motion. Besides, outdoor images suffer from contrast degradation caused by fog and haze. We will discuss how deep learning framework can be used to mi□gate the contrast degradation.



Speaker:

Dr. Lap-Pui Chau works in School of Electrical and Electronic Engineering, Nanyang Technological University. He was the Chair of Technical Committee on Circuits & Systems for Communications (TC-CASC) of IEEE Circuits and Systems Society from 2010 to 2012. He served as associate editors for five IEEE journals. Besides, he was an IEEE Distinguished Lecturer for 2009-2016

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2-Day IEEE Workshop on Deep Learning

Few-Shot Learning: Three Examples

Friday, 19 March 2021, 10:30am–12:00nn

Prof. Changshui Zhang, *PhD, FIEEE;* APSIPA Distinguished Lecturer

Abstract: Deep learning has achieved great progress in recent years. However, its huge demand for labelling information often overburdens engineers. In this talk few shot learning is focused. First, I will give a short tutorial on Few-Shot Learning. Then I will introduce our works on Few-Shot Learning. 1. We use the structure of dataset to implement a Self-reinforcing Unsupervised Matching algorithm. 2. We use the knowledge of the Chinese characters and encode a character to a vector, and learning the map from a character image to the vector. 3. We separated and build an illumination base, and augment the feature of an image with the base.

Speaker: Changshui Zhang (Fellow, IEEE) received the B.S. degree in mathematics from Peking University, Beijing, China, in 1986, and the M.S. and Ph.D. degrees in control science and engineering from Tsinghua University, Beijing, in 1989 and 1992, respectively. He joined the faculty of Department of Automation at Tsinghua University in 1992, where he is currently a Professor. His current research interests include pattern recognition, machine learning and computer vision. Prof. Zhang has authored more than 200 articles. He received Best Short Paper Award from the 2016 IEEE International Conference on Healthcare Informatics (ICHI), and the 2013 National Teaching Achievement Award, the highest national award for excellence in teaching in China. He served as a Standing Council member of the Chinese Association of Artificial Intelligence, General Co-Chair for 2017 IEEE Signal and Data Science Forum (SIDAS) that was technical co-sponsored by APSIPA, and a Member of the inaugural IEEE SigPort Board and Student Services Committee of IEEE Signal Processing Society. He has served on the Technical Program Committees of ICIP, NIPS, ICML, ACM SIGKDD, among others, and currently an Associate Editor of the IEEE Transactions on Pattern Analysis and Machine Intelligence. He was elected IEEE Fellow for his contributions to machine learning and signal processing.

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Edge Learning for Distributed Big Data Analytics: Theory, Algorithm and System Design

Friday, 19 March 2021, 3:00-4:30pm

Prof. Song Guo, *PhD, FIEEE*

Abstract: This talk will focus on the field of Edge Learning. Specifically, learning paradigms, fundamental theories, and enabling technologies for Edge Learning consist the main components of this tutorial. We will first explain the background and motivation for AI running at the network edge. Then, we will review the challenge issues existing in Edge Learning. Furthermore, we will provide an overview of the overarching architectures, frameworks, and emerging key technologies for learning performance, security, privacy, and incentive issues toward training/inference at the network edge. Finally, we will discuss future research opportunities on Edge Learning.

Speaker: Song Guo is a Full Professor in the Department of Computing at The Hong Kong Polytechnic University. He also holds a Changjiang Chair Professorship awarded by the Ministry of Education of China. His research interests are mainly in the areas of big data, edge AI, mobile computing, and distributed systems. He has published over 500 papers in major journals and conferences and been recognized as a Highly Cited Researcher (Web of Science). He is the recipient of over 12 Best Paper Awards from IEEE/ACM conferences, journals and technical committees. He is the Editor-in-Chief of IEEE Open Journal of the Computer Society and the Chair of IEEE Communications Society (ComSoc) Space and Satellite Communications Technical Committee. He has served on IEEE ComSoc Board of Governors, IEEE Computer Society on Fellow Evaluation Committee, and editorial board of a number of prestigious international journals like IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Cloud Computing, IEEE Internet of Things Journal, etc. He has also served as chair of organizing and technical committees of many international conferences. Prof. Guo is an IEEE Fellow and an ACM Distinguished Member.

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Computational and Learning Aspects of DNA Sequences

Friday, 19 March 2021, 1:30-3:00pm

Dr. Bonnie Law, *PhD, SrMIEEE*

Abstract: A DNA sequence is an extremely long sequence containing every living organism's genetic composition on this planet. DNAs have fast been accumulated and the sizes of databases storing them expanded significantly in recent years. From 1982 to now, the number of nucleotide bases in GenBank was doubled approximately every 1.5 years. It is thus essential to develop effective techniques to study DNA sequences.

The sequencing technologies allow DNA to be represented as a long chain composing of four nucleotide bases: Adenine, Cytosine, Guanine and Thym ine. Computational methods can be useful for extracting knowledge from this character sequence. For example, the gene region in a DNA sequence is often linked to our physical traits. Its length is not fixed and varies from species to species. It can also appear at different parts of a DNA sequence. A critical problem in DNA analysis is to identify their exact location. Various computational methods have been developed for gene location detection using features such as position asymmetry and three-periodicity property. To improve the detection accuracy, a learning approach has been developed. In particular, features from DNA sequences are extracted and fed into the learning algorithm so that the learned model can identify the gene location. Recently, deep models such as convolutional neural networks have been proposed for gene location detection.

In this talk, an up-to-date account of recent research done in DNA sequence analysis is given. We will highlight the principles and results of different learning-based methods, including traditional machine learning-based methods and the recent deep learning methods. The talk will be beneficial to individuals interested in DNA compression and general signal processing researchers who many want to know more about DNA compression methods.

Speaker: Bonnie N.F. Law received the BEng (Hons) degree with first-class honors from the University of Auckland, New Zealand in 1993 and the Ph.D. degree from the University of Tasmania, Australia in 1997. Her research interests include image forensics, machine learning, and image/signal processing. Dr. Law has published over 80 research papers, 40 of which appeared in international journals, such as IEEE Transactions on Image Processing and Pattern Recognition. She has also extended her study into various new applications, such as in information security and bioinformatics. The former includes source camera identification, network traffic anomaly detection, malware and phishing detection. The latter involves works on gene expression and DNA sequence analysis.

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Deep Learning for Computational Manga

Saturday, 20 March 2021, 9:00-10:30am

Dr. Prof. Tien-Tsin Wong, *PhD, FHKIE, MIEEE*

Abstract: With the wide popularity of portable devices, youngsters are moving away from reading paper-based manga to digital manga on tablet, from static manga to power point-style animated manga, and from traditional 2D anime to stereoscopic anime. All these changes raise a lot of technical problems on how to process legacy manga and anime, in order to be digitally presented in a modern form.

In this talk, I will present how deep learning can be applied to manga industry for higher productivity and efficiency. We start with early handcrafted methods for solving manga colorization and manga screening. But handcrafted methods usually suffer from instability due to the noisy and ambiguous input which is common in hand drawing. To raise the reliability of the method, we designed various deep learning models in solving multiple computational manga problems. In particular, I will discuss a case study on how deep learning can be applied for manga localization. While black-and-white manga is popular among Japan and Asian region, color manga is more common for western countries. However, the conversion between color and B/W manga/comic is never trivial, and hence such localization is done by hand currently in the industry. I will present multiple deep-learning methods to tackle this challenging goal.

As an example, the first step to convert B/W manga to color comic is to extract the structural lines from pattern-rich manga. Unfortunately, it is very challenging to distinguish structural lines from arbitrary, highly-structured, and black-and-white screen patterns. We developed a novel learning-based approach to identify structural lines out of pattern-rich manga, without any assumption on the patterns. A deep convolutional neural network model is designed to handle the large variety of screen patterns and raise the output accuracy. Instead of preparing training data by manual tracing, we synthesize a rich set of training data pairs. The system outputs clear and smooth structural lines even if these lines are contaminated by and immersed in complex patterns and substantially outperforms state-of-the-art methods in terms of visual quality. This research is an interesting demonstration on the effectiveness of learning-based method for solving hard problems in computational manga. More applications of deep learning will be presented in this talk. We believe that more long-time open problems in computational manga will be solved in a substantial degree in the coming years.

Speaker: Tien-Tsin Wong is known with his pioneer works in Computational Manga, Image-based Relighting, Ambient Occlusion (Dust Accumulation Simulation), Sphere Maps, and GPGPU for Evolutionary Computing. He graduated from the Chinese University of Hong Kong in 1992 with a B.Sc. degree in Computer Science. He obtained his M.Phil. and Ph.D. degrees in Computer Science from the same university in 1994 and 1998 respectively. He was with HKUST in 1998. In August 1999, he joined the Computer Science & Engineering Department of the Chinese University of Hong Kong. He is currently a Professor. He is also the director of Digital Visual Entertainment Laboratory at CUHK Shenzhen Research Institute (CUSZRI). He is an ACM Senior Member and a HKIE Fellow. He received the IEEE Transactions on Multimedia Prize Paper Award 2005 and the Young Researcher Award 2004. He was the Academic Committee of Microsoft Digital Cartoon and Animation Laboratory in Beijing Film Academy, visiting professor in both South China University of China and School of Computer Science and Technology at Tianjin University. He has actively involved (as Program Committee) in several international prestigious conferences, including SIGGRAPH Asia (2009, 2010, 2012, 2013, 2018, 2019) and SIGGRAPH (2019, 2020), Eurographics (2007-2009, 2011, 2019), Pacific Graphics (2000-2005, 2007-2020), ACM I3D (2010-2013), ICCV 2009, and IEEE Virtual Reality 2011. His main research interests include computer graphics, computer vision, computational manga, machine learning for graphics, computational perception, precomputed lighting, image-based rendering, GPU techniques, medical visualization, and multimedia compression. More information about him can be found at http://www.cse.cuhk.edu.hk/~ttwong/

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Deep Learning for Speaker Recognition

Saturday, 20 March 2021, 10:30am-12:00nn

Prof. Man-Wai Mak, *PhD, SrMIEEE*

Abstract: Deep learning has played a crucial role in biometric applications such as speaker recognition and face recognition, where model parameters are learned from data. In speaker recognition, researchers and engineers have been attempting to tackle the most difficult challenges: noise robustness and domain mismatch. These efforts have now been fruitful, leading to commercial products starting to emerge, e.g., voice authentication in e-banking and speaker diarization in smart speakers. This talk provides audiences with the fundamental knowledge in deep learning, how deep learning plays an important role in extracting speaker features, and how to make the features robust to channel mismatch and acoustic noise under real application scenarios. The talk will also cover some Python implementation and evaluation platforms for beginners to join this exciting field. Most of the materials are based on the speaker's recent work and his recent book "Machine Learning for Speaker Recognition," published by Cambridge University Press in 2020.

Speaker: Man-Wai MAK is currently a Professor in the Department of Electronic and Information Engineering, the Hong Kong Polytechnic University. He has authored more than 200 technical articles and three books in speaker recognition, machine learning, and bioinformatics. Dr. Mak coauthored postgraduate textbooks Biometric Authentication: A Machine Learning Approach, Prentice-Hall, 2005, and Machine Learning for Speaker Recognition, Cambridge University Press, 2020. He served as a member of the IEEE Machine Learning for Signal Processing Technical Committee in 2005--2007. He has served as an associate editor of IEEE/ACM Transactions on Audio, Speech and Language Processing. He is currently an associate editor of Journal of Signal Processing Systems and IEEE Biometrics Compendium. He also served as Technical Committee Members of ICASSP, Area Chair of Interspeech, and Technical Co-chair of ISCSLP'18 and ISCSLP'21. Dr. Mak's recent research interests include speaker recognition, speaker diarization, emotion recognition, and ECG classification.

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