AI for All

Mr. S. Arjun
2nd Year, B.Tech CSE (Hons.), Lovely Professional University, Punjab
arjun.santhoshkumar@gmail.com

What is AI

Many problems in the world that once seemed impossible for a computer to tackle without human intervention are solved today with Artificial Intelligence. We are witnessing the second major wave of AI, disrupting a plethora of unrelated fields such as health, ethics, politics, and economy. These intelligent systems prove that machines too can learn from experience, adapt, and make meaningful decisions. While the first wave was driven by rule-based systems where experts in performing a task handcrafted a set of rules for machines to follow, thus emulating intelligence, the second wave is driven by huge amounts of data, coupled with algorithms that enable machines to recognize patterns and learn from experience.

Impact

Though at a very early stage, AI has already made a profound impact on our lives. However, the nature of the impact it has made on different establishments is as unique as itself.

On Enterprises

Enterprises are seen to make the best out of the second wave of AI, primarily owing to the abundance of data they already collect every second. Deep Learning - a subset of Machine Learning, that allows recognizing and learning from complex patterns in data - feeds on huge magnitudes of data in the order of millions of samples. Large enterprises have the benefit of being capable of collecting such data in-house for their own systems, products, and services. Today, numerous such organizations that operate at scale are starting to use AI to automate workflows, streamline their operations, and optimize production.

On Startups

Realising AI's massive potential to solve problems, entrepreneurs have been quick to adopt new strategies and launch startups with AI at its core. Usually, startups are always at the risk of being copied, and hence are in need to continuously evolve and innovate. With AI, startups enter a new paradigm of competition. The ones with better methods to acquire quality datasets come up with better AI models, and hence better products and services. Today's AI startups are helping established companies easily adopt AI. By providing AI models that power chatbots, predict and optimize resource consumption, and much more, these startups have become exemplaries to make use of state of the art AI algorithms and methods like transfer-learning and federated-learning.

On Society

The inception of the Internet gave birth to a new community of problem-solvers, who utilized technology to address many pressing problems in society. With recent advancements in AI and availability of cheap computing resources, a whole new dimension of problems is being solved with AI. From providing better insights to farmers by processing aerial footage and satellite imagery of the field to counselling people under depression through a friendly conversation, AI is helping save lives, cut down cost, reduce waste and make a positive impact on billions of people. Of course, more than any technology adoption in the past, AI will demand an enormous cultural change. Humans have always been skeptical in depending on technology and let it control their lives. We are already witnessing such moments, an example being self-driving fleet that is a reality today. Questions of ethics and decision making in AI still remain unanswered. AI is as much a weapon as it is a tool, and a strong government regularisation and policy making is going to be essential.

Future of AI

All the recent buzz around Artificial Intelligence and its advancements fall into a specific class of AI called Artificial Narrow Intelligence (ANI) or Weak Artificial Intelligence. These are AI systems designed and trained for a dedicated task which it performs with incredible accuracy. We are seeing a record-making number of research publications and breakthroughs in this field, and technology companies are embracing its power to unlock new possibilities. Yet, they fail to sound like the AI we know from the movies. That's because those fall into a different class of AI called Artificial General Intelligence or Strong Artificial Intelligence. These are systems that can perform multi-domain tasks and generalize its learnings to perform new tasks just like humans. There has been very little progress in this field, and only a handful of organizations around the world are working to push its boundaries. The future of AI lies in the advancements in this field, and we won't be seeing AI surpassing human intelligence anytime soon.

Why Democratize AI

In an ideal world, elegant AI solutions should be equally accessible by people of all backgrounds. Bias is inevitable, but what's important is that these solutions should be equally biased by all. Additionally, any organisation of any size should be able to build their own AI based solutions. True democratization of AI happens in three layers - Data, AI Skill, and Infrastructure.

Data

AI models are trained on large datasets from which the model "learns". Hence for any organisation to build its own AI models, availability of quality open datasets for a variety of tasks is crucial. These datasets should consist of samples that apply to a generic audience, and should be reusable to build models for similar but different tasks. Recognizing the need, many tech giants, large firms and government organisation have started opening up their datasets. Transfer learning allows taking a pre-trained model and re-training it with application specific data, hence being able to build a model with a very small dataset.

AI Skill

Acquiring datasets, cleaning and pre processing them, feature engineering, building models incorporating different types of neural networks, deploying them and building a pipeline to continuously optimise and retrain the model - all these demand experts highly skilled in Machine Learning and AI. Democratising AI involves granting anyone access to resources for mastering these skills. The exploding demand for internal AI skilling has lead many universities and companies to provide both free and paid courses for AI. Many machine learning open-source frameworks are now bringing AutoML functionality to help automate the entire process of applying machine learning to perform a task. These methods, though more compute hungry, take a huge step forward in democratizing AI and making it possible for smaller organisations to build AI models. Many cloud based out-of-the-box ML solutions for specific tasks like natural language processing, object detection, etc are also made available, that enable integrate the power of AI into their products and services with minimal effort.

Infrastructure

Machine Learning, and more specifically Deep Learning, is extremely compute intensive. Training Neural Networks with datasets containing millions of examples takes days or sometimes weeks even with powerful computers. Rapidly trying out things and experimenting, which are critical for perfecting a model, is almost impossible without access to necessary computing power. Deploying a trained model for users to make real-time inference demands computation resources as well. Democratizing AI also means democratizing compute resources so that any organisation can use them on demand at a low cost. Cloud Computing is cheaper than ever today, and many Cloud Service Providers provide specialised solutions for training and inference on the cloud powered by hardware accelerators that are custom designed ASICs for neural networks. With these offerings, any small startup or organisation with zero infrastructure of their own can build and deploy state of the art ML models.

Inspiring Stories of Democratizing AI

These days, we come across numerous inspiring stories of people, companies and organisations involved in doing their bit to democratize AI. Below are a select few:

AI4ALL

AI4ALL is a US-based non-profit founded with the mission to make Artificial Intelligence more diverse and inclusive. The organization has its origin in SAILORS – a summer outreach program for high school girls to learn about human-centered AI – founded in 2015 by renowned AI researcher, Dr. Fei-Fei Li, along with Dr. Olga Russakovsky and Dr. Rick Sommer of Stanford University. Through its partnerships with Boston University, Carnegie Mellon University, Princeton University, and Simon Fraser University, AI4ALL conducts summer programs to help students underrepresented in technical careers to excel in the field of AI.

National Strategy for Artificial Intelligence #AIForAll

Recognizing the need to devise a common strategy that could help build a strong AI ecosystem in the country by collaborating with the various experts and stakeholders in the field, National Strategy for Artificial Intelligence is an initiative started by the Government of India through NITI Aayog. This strategy is expected to be premised on a framework that is aligned to the country's unique needs and aspirations. The identified focus areas for AI intervention in India include healthcare, agriculture, education, smart cities & infrastructure, and smart mobility and transportation.

DeepLearning.ai

Deeplearning.ai is an initiative focused in making a world-class AI education accessible to people around the world. It is a venture by Andrew Ng, an AI pioneer, co-founder of Coursera and Director of Stanford Artificial Intelligence Lab. Deeplearning.ai offers one of the best online specialization courses in deep learning. "AI for Everyone" is another course aimed at educating non-technical business professionals on how to adopt AI in their organization by building a sustainable AI strategy. Deeplearning.ai is also collaborating with Laurence Moroney, a developer advocate at Google, in launching its new Tensorflow specialization.

OpenAI

OpenAI is an AI research organisation aiming to advance in Artificial General Intelligence with emphasis on safety and control. It democratizes AI by open sourcing its efforts and making many amazing AI tools publically available to researchers around the world. It has published more than 76 research publications, each making considerable improvements and delivering innovations in Reinforcement Learning, Robotics, Natural Language Understanding, Generative AI, One-

shot Learning, Meta-learning and much more. OpenAI envisions bringing human-level intelligence to machines, which can benefit all of humanity.

H2o.ai

H2O.ai is an open source software company that aims to democratize AI at all levels. Its H2O machine learning platform makes state-of-the-art AI algorithms accessible to all. H2O also has its own AutoML platform called H2O Driverless AI that enables data scientists easily create AI models without putting effort on data pre-processing, visualization, feature-engineering, and many other tasks in building AI models that otherwise require considerable expertise.

Google

Google has one of the strongest AI research teams in the world. With most of its products running with AI at its core, Google has set an example of how something as compute intensive as AI can effectively scale to billions of people. Google has a range of software that helps democratize AI end-to-end. Its open-source platform, Tensorflow, is the most popular machine learning framework, and enables developers and data-scientists do everything from quickly prototyping ML models to deploying them to production, all without leaving the Tensorflow ecosystem. Google Cloud, their cloud service platform, offers PaaS and IaaS that are already optimised to work best with Tensorflow models. Google Cloud also offers a whole range of ML services. Its AutoML services allow companies to make use of their pre-trained models for image recognition, speech recognition, and other common tasks without writing a single line of code. The most recent service to join the AutoML family is AutoML Tables that lets companies and enterprises simply upload their datasets and start using an ML model that has been built specifically for them.

Facebook

Facebook uses AI throughout its platform, and has made it what it is today. Accurate search results, image captioning, face detection and friend suggestion - all these features are made possible by extensive research in AI that Facebook invested in. Joining the tech culture to help fellow companies and startups grow with them, Facebook publically shares some of the state-of-the-art research publications in machine learning. From efficient vector search algorithms that scale to billions of records to data visualisation libraries, their open libraries and tools have rendered to be of great value even to developers outside Facebook. Facebook's open source machine learning framework - PyTorch - is rapidly gaining traction among machine learning researchers, as it is easier to debug and experiment.

Microsoft

Microsoft's Azure Cloud Services has its own offerings for organisations looking to train and deploy their Machine Learning Models. With Azure Machine Learning Studio, Microsoft is making a massive move in democratising AI, letting users build ML models right from their browser with a friendly GUI interface. Azure's Cognitive Services consist of numerous pre-trained models working together to perform common AI tasks such as sentiment analysis, image and speech recognition, search, recommendation engines, etc. Microsoft also has its own open source deep learning framework called Microsoft Cognitive Toolkit previously known as CNTK. Through Microsoft Research, the tech giant has opened up a lot of its cutting edge AI research to the public. Being a cloud service that many enterprises already use, Azure makes AI adoption as easy as possible.

Amazon

Being a technology company with most products having AI and cloud at its core, and scaling its services to billions of people, Amazon has perfected its cloud service - AWS - over the years to become one of the most popular cloud service among enterprises. Like Google cloud and Azure, AWS provides a range of scalable and flexible services for AI and Machine learning. AWS's DeepRacer is an innovative product to help developers learn to apply reinforcement learning to train autonomous driving vehicles in simulated environment and then transfer that learning into real world. The market for autonomous vehicles is expected to see massive growth in the near future, and Amazon is pushing the world from its end to proactively make that skill set available.

About the author

S. Arjun is a young entrepreneur, Founder & President of LateraLogics Innovations LLP (www.lateralogics.com), a technology solutions company. He has several awards & recognitions to his credits that include the National Child Award for Exceptional Achievements 2014 for Computer Technology (Govt. of India), Young Innovators Award 2017 from Dr. V. A. Shiva Ayyadurai, the inventor of e-mail, Google Web Rangers Award 2018, Google Code to Learn Contest 2014, MIT App Inventor Bug Finding Contest 2014 (First Prize Winner), and MIT App Inventor App Contest 2013 (First Prize Winner). He was also felicitated jointly by CSI, IEEE CS & IEEE PCS in 2015. He has been featured in numerous regional, national and international magazines and TV programs (including National Geographic Society's Magazine). Arjun is presently pursuing 'B.Tech in CSE (Hons)' at Lovely Professional University. More at www.arjuninventor.com.