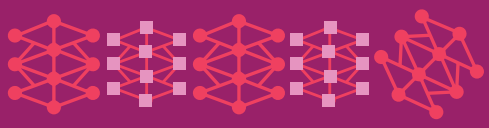
Capgemini

TECHNO VISION Change Making 2021
BE LIKE WATER

How Deep is **Your Math**



Challenge everything you've tried so far with analytics and algorithms, AI brings alternative, awesome ways to solve problems

Much of the current love for AI arguably comes from deep learning on neural networks. These are essentially brute force, pattern recognition machines that – if provided with enough training data – can go where more traditional data science (often based on statistics and mathematics) stops. Deep learning can be combined with other technology-enabled approaches, such as reinforcement learning, in order to provide even more raw, unmatched problem-solving power. Its simplicity is appealing, as it functions as a black box that simply needs lots of training data to become accurate. But as we are living in a world of tools, more than ever it is also a matter of finding the right balance between human and machine powers.

Padmashree Shagrithaya
Expert in Residence

WHAT

- Many current advances in AI are due to machine learning models on neural networks, detecting and classifying features through multiple layers in raw input.
- With abundant training data as an input, deep learning neural networks can recognize patterns much more effectively than traditional data science approaches
- Advances in the ability to collect, store and access training data, plus the emergence of powerful graphical processing units (GPUs) have been instrumental to success.
- Reinforcement learning uses an action/reward approach to learn from interactions. Combined with deep learning, it creates even more powerful AI applications in areas such as robotics, scheduling and gaming.

USE

- Using AWS Recognition, an AI system was built for retailers to analyse real-time footage for 'foot fall monitoring' – the movement of individuals in a store – to improve customer engagement and increase sales. The technology can be used in many situations such as security, social distance monitoring, facial analysis, field game tracking, emotion detection, inventory management and even customer onboarding on a cruise ship.
- Google's 'precipitation nowcasting' research project uses standard deep leaning image recognition models, making highly localized 'physics-free' precipitation predictions that apply to the immediate future. The machine learning approach is cheap, allowing almost instantaneous forecasts and in the native high resolution of the input data.
- Visa developed an advanced AI system to help manage transactions when service disruptions occur. Using deep learning to analyze past transactions, it enables approving or declining transactions if systems go offline, helping to prevent fraud.

IMPACT

- Solving problems that were deemed impossible to solve – or insufficiently successful – with more classic data science approaches.
- Creating powerful, complex autonomous systems, occasionally even with a lack of sufficient volumes of training data.
- Building next generation predictive and prescriptive analytics that go beyond human (or statistics-based) approaches in their capability to detect patterns in seemingly unmanageable volumes of unrelated data.

TECH

- Deep learning / neural networks: TensorFlow, Microsoft Cognitive Toolkit, Theano, MXNet, Keras, Chainer, PyTorch, Gluon, Horovod, AWS Deep Learning, Caffe, Deeplearning4j, PlaidML, OpenAI GPT-3
- Reinforcement learning: AWS DeepRacer, Facebook Horizon, Gym on OpenAI, Microsoft Project Malmo, Google Dopamine, RLLib via Ray Project, Tensorforce, Reinforcement Learning Coach by Intel, MAgent, Tensorflow Agents, SLM Lab, DeeR
- AI infrastructure accelerators: NVIDIA deep learning, AWS Deep Learning AMIs, Google Cloud TPU, Intel AI and Neural Compute Stick, Apple Neural Engine, Qualcomm Cloud AI100, IBM Watson Machine Learning Accelerator, Inference Engine by FWDNXT, ALVEO

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