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Artificial Intelligence: Demystifying Machine Learning

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Artificial Intelligence (AI) has been around for over 7 decades but there have been significant advances in the last 2 years. Machines now interpret dense data such as images and sound and process these inputs like old school computer code. What we are talking about is the ability for machines to interpret real-world signals. The breadth of prospective application for AI is wide and its impacts will be strongly felt in industry and everyday life. At Nanuk we are wholly focussed on investing on globally listed companies which benefit or contribute towards environmental sustainability and resource efficiency. Our investment interest in AI stems from the key role that we see it playing in the transition to a more sustainable and resource-efficient world that we see unfolding in the years to come.

What is AI? Simply the programming of computers to perform tasks that traditionally required human intelligence. AI researchers first started in the 1950s when Alan Turing proposed a test designed to determine a machine's ability to exhibit intelligent behaviour. At that time capabilities were limited and machines were only capable of playing simple games such as checkers. The next key growth phase was in the 1980's, when **Machine Learning**, an application of AI, began to flourish in line with advances in computer technology. Machine learning is about computational statistics, a statistical approach whereby computers use models from observed data, and has been applied for example in logistic regressions to create the early spam mail filters that most of us use in our email options.

Deep learning is the most recent iteration of AI and it took off around 2010. Deep learning is a type of machine learning which came about as the world started creating huge amounts of data, computational power increased and res earchers developed better algorithms. Presently deep learning is capable of human level accuracy in many areas and as such its application across a number of industries has exploded and will continue to grow.

The advantage of deep learning is that very little human-sponsored programming is required and the models can be quite sophisticated. However, the catch is that they require significant amounts of data to be effective. This works really well when using real world data where many features are not immediately obvious. It can also be easily extended to use new data. These features have allowed deep learning models to excel at image and pattern recognition as well as behaviour prediction.

Deep learning is based on a simplistic model of the human brai n, an artificial neural network composed of many hidden layers and connections. The number of nodes, layers, connections or algorithms can be changed: the more layers, the more data that is required.

Different designs make it suitable for a particular task. Machines are being programmed to read and comprehend natural language. Stanford University run a competition to build a deep learning model that can perform better than humans at reading comprehension. Machines are now able to compete with humans at this function, and similar results have been seen across other applications such as images, sound, natural language and forecasting analytics.

While technology has clearly evolved to enable AI to develop, another key input into recent advances is the need for large amounts of data. The world is undergoing an explosion of data, generating 16 zettabytes in 2016 and expected to be 163 zettabytes in 2025. For context, a zettabyte is a billion terabits or 250 billion DVDs.

We think of data and AI as part of a virtuous circle. As more data is generated, companies are better able to develop better AI which in turn allows them to develop products more closely aligned to the interests and needs of users, machine or human.

Why AI is important

AI has advanced to a point where it is driving commercial and practical solutions across many industries and driving fundamental change. For example, a successful application of machine learning, which you may not know about, is data centre power management. Data centres are being built around the world by private companies and governments. Look for example at a cooling system that's used to support data centre infrastructure. Google has shown that when they turn on machine learning they can drastically reduce the power usage effectiveness of data centres – ie a 40% reduction in cooling costs! This example also highlights the potential of AI to drive sustainable solutions, such as lower energy consumption, which is a core focus for us at Nanuk.

If this application could be replicated across multiple usages in the domain of power, the efficiency gains would generate massive positive impact across both cost and environmental metrics.

AI excels at interpreting signals and real-time analytics which give rise to a number of important developments, for example computer vision to allow cars and industrial robots to identify objects around them, and predictive analytics to allow whole fleets of vehicles or machines to be managed effectively.

AI also plays an important role in smart infrastructure. A good example here is smart cities. Security cameras with computer vision and predictive analytics can better monitor the flow of people and vehicles. Improving public transport utilisation and lowering congesting. Hexagon is one company leading in this space working with government agencies to make smarter decisions for urban planning.

Looking to renewable energy infrastructure sector, predictive analytics can be used to manage intermittent generation sources and optimize battery storage. Vestas recently spent $100 million purchasing a data analytics company to improve their wind product offering. In the water space, Xylem, a manufacturer of technologies for the water industry is now able to identify pipeline leaks 150 times faster using AI tools that interpret the sound of a pipeline leak.

Healthcare is also getting a lot of press as autonomous machines play an increasingly important role in surgery, improving patient outcomes. Computer vision and improved analytics are also being used to improve diagnostics and predictive algorithms are facilitating new drug discovery.

Deep learning is also changing the way internet services interact with customers. The improving interpretation of speech and natural language is changing the way we interact with computers. A prominent example is the new Amazon product, Alexa.

Investing in AI

Nanuk has developed deep expertise in the investment implications, opportunities and risks associated with AI. The Nanuk New World Fund is exposed to AI through companies which collect data (eg Continental and TE connectivity), supply semi-conductors (eg Lam research, Teradyne) and design chips capable of performing the many calculations needed for deep learning (Nvidia). The fund is also exposed to AI implementation via system software engineering companies (eg Hexagon, Ansys), AI consulting service providers (eg Accenture) and data management / cloud storage (eg Amazon) and data networking (eg Cisco).

All of these companies reflect some of the key characteristics Nanuk sees as typical of the sustainable-themed global companies held in its fund - strong, established and profitable companies under-priced by the financial market.

AI is a rapidly evolving field. The potential is enormous and significant advances have been made in the last few years. As a general-purpose technology it is comparable to development of the combustion engine. It is clear that AI will drive many of the major trends we see unfolding in the years and decades to come and indeed play its part in the "sustainability revolution" now underway.

Disclosure: The Nanuk New World Fund is invested in companies mentioned in this paper

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