**MACHINE LEARNING**

**What does it do? (600 words) What is the state of the art of this new technology? What can be done now? What is likely to be able to be done soon (say in the next 3 years)? What technological or other developments make this possible?**

*What does it do?*

Firstmost, it is important to differentiate machine learning and artificial intelligence (AI), as the two terms are commonly used interchangeably.

* **Artificial Intelligence** is the study of developing computer systems’ ability to perform functions with human properties, such as: visual perception, speech recognition, decision-making, and language translation.
* **Machine Learning** applies the concept from AI in facilitating the systems’ ability to independently learn and improve from experience.

Machine learning enables machines to create outputs based on data it was given or has gathered, requiring little to no human input. The machine’s “brain”, or algorithm, can be seen as a cycle of data collection, analysis, and feedback, with the latter being used to gather more quality data and then repeating the cycle. This effectively allows machines to improve themselves continuously: without explicit programming from humans.

Moreover, there are 3 distinct types of machine learning:

1. **Supervised Learning**: a set of inputs are given to the algorithm alongside correct outputs. It will proceed to identify errors by comparing its own output with the given correct outputs, and then modify the model accordingly.
2. **Unsupervised Learning**: no given set of inputs, so the algorithm draws inferences independently.
3. **Reinforced Learning**: an algorithm that finds correct outputs through a continuous cycle of trial and error. It will learn by either being rewarded for correct behaviour or punished for incorrect behaviour.

*What is the state of the art of this new technology?*

Despite some concerns from some experts that the technology’s development has plateaued, its application to the real world is increasingly prevalent and normalised. Kai-Fu Lee, a venture capitalist and expert on AI research, stated we are at an “age of implementation”. This means the research and testing done in the labs are gradually having more applicability to the wider society.

“Eventually, pretty much everything will have [machine learning] somewhere inside and no-one will care” said Benedict Evans, a VC strategist.

Machine learning can be strongly linked to robotics and autonomous vehicles, as it’s a vital component that empowers them. Therefore, the developments made in machine learning can be reflected in the advancement of robotics/autonomous vehicles. Currently, self-driving cars are expected to be used widely in the near future, with some already being tested on US roads. For example, Tesla released footage of a fully self-driven car in April this year, and it can be seen that the vehicle steers on its own and slows down in areas of risk.

*What can be done now?*

Machine learning is surprisingly pervasive in our society and people may not realise to what extent exactly. This technology can be found in personal virtual assistants, like Siri, that help us find and process information via voice commands. These virtual assistants will sift through data, refine its findings, and provide us personally tailored requests. For example, you can ask Siri what the weather forecast will be in the next few days. There are many more applications, such as: financial predictions, online fraud detection, social media, email spam/malware filtering, online customer support, product recommendations, etc.

*What is likely to be able to be done soon? (say in the next 3 years)*

Main areas of development lies in its processing speed and power. For instance, Quantum Computing will greatly increase the speed of executing algorithms and Tuned Recommendation Engines will improve the accuracy of data collection and interpretation. As these technologies become more effective, they will be increasingly sought and hence become more integral to our day-to-day lives. In simple terms, what machine learning does today will be done more quickly, accurately, and effectively.

*What technological or other developments make this possible?*

The development of computers coupled with the concepts of neural network and statistical philosophies have facilitated the rise of machine learning. Computer programming have enabled us to carry out complex sequences of arithmetic and logistic functions. The study of neural networks have moulded the structures of how machine learning developed, modeling after the behaviour of neurons in the human brain. Statistical philosophies have influenced the design and functionality of machine learning models. For example, the Bayesian statistics theory centers around the probability of an event based on previous results or prior knowledge.

**What is the likely impact? (300 words) What is the potential impact of this development? What is likely to change? Which people will be most affected and how? Will this create, replace or make redundant any current jobs or technologies?**

*What is the likely impact?*

Machine learning will continue to have a positive impact on the world as it performs human tasks more effectively than humans. Recent developments in machine learning indicate an upward trend with algorithms progressively improving: faster and more efficient processing times.

*What is the potential impact of this development?*

As the technology becomes increasingly reliable and adept, it will gradually become more integral to society and our day-to-day lives. People may not realise this, but machine learning is already influencing major aspects of society, such as: retail, economics, and social networking. Popularly used, ride sharing app Uber, uses machine learning to determine ETAs and optimal locations for pick-up. This has allowed users to enjoy a cheaper and more convenient commuting experience; the average wait time for uberX is 4.28 minutes while taxis are 7.47 minutes (Deloitte, 2017).

*What is likely to change?*

Many industries will experience changes because this technology provides many benefits to those companies that use them. Businesses will be pressured to adopt those tools or risk lagging behind competition. We can see this with the introduction of uberX and other related apps to the taxi industry, where it has led to some companies using innovative technology to adapt to the highly dynamic environment. For instance, some taxis companies are now using apps like goCatch and Ingogo for its pre-booking function. Additionally, over 1000 drivers affiliated with goCatch were banned for violating its code of conduct. Therefore, the continuing development of machine learning has influenced industries to embrace these innovations, and has consequently given rise to improved goods and services offered to customers.

*Which people will be most affected and how?*

Machine learning carries the potential to greatly affect any industry and its stakeholders it’s introduced to. As ridesharing apps entered the world of taxis, some taxi drivers have developed animosity for and experienced competition from apps like Uber and Lyft. In May 2019, a class action lawsuit was filed against Uber by thousands of Australian taxi drivers. This was made on the basis of illegal operation and deliberate financial harm. Despite whatever outcome comes to fruition, the effects of machine learning, in the form of ridesharing apps, have made a big impact in the industry.

*Will this create, replace or make redundant any current jobs or technologies?*

Machine learning has the ability to both create and replace current jobs or technologies, and it has arguably done so. The development of the technology will encourage further studies and spur innovations, and will consequently create technical positions, such as: engineers and research scientists. However, machine learning is also potentially threatening some low-skilled labour jobs because it enables the automation of some goods and services. For example, businesses traditionally had cashiers to operate the transaction for shopping goods, but businesses are now increasingly implementing self check-out machines which rules cashiers out of the equation.

**How will this affect you? (300 words) In your daily life, how will this affect you? What will be different for you? How might this affect members of your family or your friends?**

*In your daily life how will this affect you?*

Ultimately, I believe machine learning will make our lives easier. Its application enables certain tasks to be done faster and more efficiently. For instance, if our emails did not automatically filter out junk, spam, or malware, we would have to manually remove ourselves. Additionally, like many others, I personally like to shop online, and it’s a common feature for websites to have product recommendations based on previous purchases. This is all thanks to a machine learning algorithm.

*What will be different for you?*

There are numerous accounts of how machine learning is beneficial is to society, and this positive assessment fuels its development. As an individual who is interested in having a career around machine learning/AI, it is both reassuring and exciting for such a field gain traction in recent years and have a bright future. The advancement of this technology will certainly offer countless opportunities in research and development positions, and even open up new and unexplored areas of study.

*How might this affect members of your family or your friends?*

The older members of my family are not so tech-savvy and do not understand the nuances of technology, but their lives are greatly affected by it. It is becoming increasingly difficult to be devoid of technology and its influences, so they will need to learn about it to some extent. For example, the technology driving autonomous vehicles is machine learning and if they become the most common form of transportation, like some have predicted, people will need to be educated about it.

Also, I have some friends working in the finance industry and deals with risk analysis. This would involve some degree of prediction and probability work, and it isn’t uncommon for there to be the use of algorithms (machine learning) in the process. They may need to learn some programming skills to exploit these tools.

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