**Machine Learning**

**What Does it Do?**

Machine learning can be described as a “branch of artificial intelligence and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy” (IBM Cloud Education 2020). More specifically, machine learning describes any technology that allows any computer system to ‘learn’ or improve the predictability of its algorithms without human intervention by exposing a computer system to large, ever-evolving data sets (Expert.ai Team 2020).

Machine learning appears to be playing an ever-increasing role across a surprisingly wide variety of sectors. For example, Marius (2020) points to a number of use-cases which rely on state-of-the-art machine learning models including ‘semantic segmentation’, ‘image classification’, and ‘object detection’, within images. These three technologies allow the sensors in modern self-driving vehicles to safely navigate complex road systems in high traffic. Marius also points to machine-learning as being the backbone behind recent technological advances in written-text analysis, allowing chatbots, spam filters, and automated social media moderation to perform with ever-increasing efficiency. Likewise, machine-learning continues to play an integral role in the growth of online content delivery and e-commerce. As an example, Spotify uses the listening data of its roughly two-hundred-and-forty-eight-million current subscribers to feed machine learning models that enable Spotify to provide better artist, playlist, and podcast recommendations to its users in an attempt to provide a more engaging user experience and drive consumer loyalty (Spotify Engineering 2020). Machine learning is also playing a major role in the security and intelligence sector and has coincided with a rise in what is known as ‘predictive policing’. In this scenario, machine learning uses historical datasets to provide predictive analysis around individuals or geospatial areas exhibiting an increased probability of criminal activity (Meijer & Wessels 2019, p. 1032).

According to experts, machine learning technology is evolving at an extremely rapid pace, making predicting its future extremely difficult. However, most machine learning practitioners point to the technology playing a pivotal role in the future of robotics, artificial intelligence, search-engine optimisation, increased consumer personalisation, and predictive analysis (Slupski & Kurasinska 2021). Isaksson (2020) expands on this line of thinking, explaining that machine learning will benefit from the global adoption of 5G technology and the ‘internet of things’ by allowing machine learning technology to play a greater role in the development of smaller consumer products.

At the other end of the spectrum, some experts point to advances in quantum computing as being necessary before machine learning models can truly evolve. Thiyagarjan (2021) supports this argument by stating that “the introduction of quantum computing into machine learning would metamorphose the domain completely. This implies that in a tiny split moment, complicated issues that we may not have the capacity to tackle with conventional methods, and existing technologies may well be done so”.

Finally, some machine learning practitioners believe that machine learning will likely become more automated in the coming years. As it stands, machine learning often requires significant human interaction when feeding data into a machine learning model, with critics arguing that machine learning models suffer from the fact that the product of a machine learning model will only ever be as good as the data it is based on (Scannell 2019, p. 107). With this in mind, Zhydik (2021) believes that the future of machine learning will rely heavily on the increased automation of data-cleaning and processing, which will allow machine learning algorithms to run more efficiently in the future.

**What is the Likely Impact?**

There is significant debate about whether or not the future of machine learning will result in a net positive or negative for society as a whole. Critics of machine learning point to its role in the development of more advanced forms of robotics and artificial intelligence, which some commentators believe could cost millions of jobs in advanced economies. This line of thinking is best encapsulated by Semuels (2020), who argues that advances in robotics and artificial intelligence supported by machine learning models could endanger millions of jobs in the United States as companies look to lower overheads as they recover from the economic fallout from the COVID-19 pandemic. Jain (2021) largely supports this notion as well, and highlights that a disproportionately high number of low-income workers will be impacted. More specifically, it is likely that individuals working in food service and office support roles are most at risk. Likewise, Jain’s analysis suggests that workers located outside of major cities will be placed at risk unless internet and data transfer infrastructure is provided to rural communities, allowing them to participate in an increasingly digital economy.

However, not all commentators share this negative outlook as many believe that increased adoption of machine learning technology will coincide with a rise in vacancies for jobs in Information Technology disciplines such as data science, software engineering, and robotics (Gupta 2021). Further, it can be argued that many sectors will benefit significantly through machine learning, allowing existing practitioners to work more efficiently and provide a much more personalised service to consumers. One such sector likely to be impacted in this way is healthcare, where machine learning can use patient data to play a pivotal role in patient treatment, predictive diagnosis, and epidemic control (SPD Group 2022).

**How Will This Affect You?**

Machine learning is somewhat of a paradox in that it is more than likely that it will continue to play an ever-increasing role in our lives, while staying almost invisible in nature. In more noticeable ways, machine learning algorithms used by online retailers such as eBay and Amazon, as well as content providers such as Netflix and Spotify will continue to improve. In turn, these retailers and service providers will be able to better predict our interests and can provide increasingly curated content. Likewise, as noted above, machine learning has a huge role to play in sectors as healthcare, where the benefits of accurate predictive analysis will undoubtedly result in a net positive for society.

While advances in content curation and healthcare technology are well-intentioned, there is the potential for an overreliance on machine learning to have significant, negative consequences. For example, in an analysis on machine learning’s potential impact on security and policing practices, Scannell (2019, pp. 107-117) argues that while anecdotal evidence may suggest that machine learning is capable of removing human bias, this is unlikely to be the case in practice. Machine learning databases rely on data provided by human beings, as a result the datasets used in machine learning models will likely contain the same problematic biases that infiltrate human cognitive behaviour. Obviously, this can have dire consequences when talking about machine learning’s potential in the security sector, where already marginalised communities may have legitimate causes for concern. However, similar issues may creep into other sectors as well. Machine learning algorithms have the potential to create feedback loops whereby individuals are only served content or products that have been carefully modelled and selected by a computer system. An individual then interacts with these products and further validates the machine learning model, which then serves more of the same again.

With this in mind, machine learning will undoubtedly play a major role in the near future within the Information Technology sector and has the enormous potential to provide a great deal of good to a great number of people. However, like all things, it must be used carefully and in moderation.

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