Machine Learning:

**What does it do? (600 words)**

Machine learning is a field of technology that uses self-improving algorithms to gain information and learn from a subject. Furthermore, machine learning algorithms are designed to self-improve as they gain more data and experience from the subject, therefore able to make better overall predictions (Mathworks n.d.).

Machine learning algorithms primarily use two main learning techniques: supervised learning and unsupervised learning (Mathworks n.d.). Supervised learning algorithms function by receiving knowledge from labeled data (known data) (Mathworks n.d.). This knowledge is then paired with a known set of responses in order to build a model to make predictions about any new unlabeled data being introduced (Mathworks n.d.). This process is done through the use of classification and regression techniques and can be used to predict things such as email spam, changes in temperature, speech and facial recognition. By contrast, unsupervised learning algorithms looks for patterns and information on unlabeled data (Mathworks n.d.). Through the use of clustering techniques, these algorithms are then able to predict things such as gene sequence analysis, areas in market research, and object recognition (Mathworks n.d.).

**What is the state of the art of this new technology? What can be done now?**

Although true artificial intelligence (interpreted as being comparable to the human mind) remains out of grasp for the moment, state of the art machine learning can be currently seen taking on various applications in a wide variety of industries and usages (Foote K 2021). Some examples of these new technological applications include, but are certainly not limited to:

**Virtual assistants:**

Machine based virtual assistants represent the epitome of state of the art, as they are one of the most innovative examples of artificial intelligence on the market to date (Foote K 2021). They currently have the capability of interpretating basic commands as well as storing and recollecting a large vocabulary (Foote K 2021). Virtual assistants are being used for aiding in daily tasks, such as setting reminders, making calls, notetaking and managing to do lists (Foote K 2021).

**Chatbots:**

Although Chatbots share similarities to virtual assistants in that they both share a high modality range and possess an ability to understand human language, their function is more rudimentary. Their purpose, simply speaking, is to act as an informational kiosk (Foote K 2021). As a result, chatbots responses are more limited in some ways but are most used for online customer support, providing directions, and answering phone calls with a basic selection of responses (Foote K 2021). These are usually organizations first encounters of machine-based learning as a result of being more user friendly. (Foote K 2021).

**Natural language processing:**

“Natural language processing (NLP) is concerned with programming computers to process and analyze data that has been presented in the form of human language.” (Foote K 2021, para. 9). This allows a computer to comprehend and receive verbal commands, therefore effectively allowing humans to communicate with machines (Foote K 2021).

**ML Algorithms for Writing ML Algorithms:**

Due to having a limited number of data scientist in fields, machine learning algorithms are being used to make better machine learning algorithms (Foote K 2021). The use of this technology is enabling businesses to solve complex problems more easily and the high level of automation, which helps to decrease human error, involved allows a more user-friendly approach and less technical machine learning applications (Foote K 2021).

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

Areas that will most likely see changes in the next few years as a result of improvements in ML include the transportation, manufacturing, healthcare, education, media and customer service industries (Thomas M 2021). In transportation, the use of autonomous vehicles will become more common and will be more widely available to consumers (Thomas M 2021). In the manufacturing industry, AI powered robots will have an increased role working alongside humans to assembly and stack products (Thomas M 2021). The healthcare industry will see various improvements such as a speedier rate of diagnoses with a higher level of accuracy, as well as the introduction of AI nurses which have the ability to monitor patients 24/7 (Thomas M 2021). In Education we will see early-stages of virtual tutors to assist human teachers as well as efforts to improve student experiences such as monitoring facial analysis (Thomas M 2021). The Media industry will likely see a steady increase of the use of ML data analysis systems, which in combination with continued improvements to these systems, will allow a greater amount of information to be consumed and produced (Thomas M 2021). In the customer service sector, AI assistants will play a larger role in the industry, completing tasks such as making phone calls and booking appointments for customers (Thomas M 2021).

**What technological or other developments make this possible?**

The development of these technologies that will be used to aid and replace humans in the workforce, requires a level of intelligence that is human like, if not better in some areas of thinking and processing information (Foote K 2021). This is where the goal for a true AI system (a computer or program that thinks and communicates like human beings) has come to exist in our society (Foote K 2021). The achievement of this level of intelligence requires a variety of ML programs, known as subprograms, that work together to support the goal of true AI (Foote K 2021).

In order to reach this goal, it is essential that further advancements in the field of ML take place and these programs are then integrated into our systems (Foote K 2021). As we continue to advance our civilization, through continual improvements in the field of technology, these ML program's abilities to self-improve and collect more data will soon achieve these developments in technology (Foote K 2021).

**What is the likely impact?**

The likely impact generated as a result of machine learning and artificial intelligence systems will be felt across almost every area of society. From a societal viewpoint, human behavior will, and has already begun to change (Marr B n.d). The need for face-to-face interaction has already begun to diminish as communication can be more easily achieved via technology. This has already begun to result in a higher prevalence of mental health issues as a result of alienation, which ignores the biological need for human closeness (Marr B n.d)

Economically, most of these impacts will affect larger scale businesses and industries as predictive maintenance algorithms allow for more efficient processes, the production of greater yields and the recognition of production faults (Clark, E 2020). Artificial intelligence can also dramatically influence workplace efficiency by increasing repetitive tasks as well as taking on the more dangerous tasks (Marr B n.d). As a result of this, some occupations have been greatly reduced if not made redundant altogether. These include roles such as accounting clerks, auditing clerks and book keepers (Australian Institiute of Machine Learning 2021). However, this transition allows humans to work primarily in the more creative fields, where AI does not have this capability (Marr B n.d). Because of this, many new occupations have been created, which are often higher paid (Australian Institiute of Machine Learning 2021).

In the healthcare system for example, AI can provide a more personalized treatment plan, while giving access to an informed information network through superior monitoring and diagnostics (Marr B n.d). Impacts on the marketing industry provide another example as artificial intelligence plays a role in the identification of a valuable customer source, improvement of sales results and personalizing the marketing experience (Clark E 2020).

“Those sectors of the economy that are dependent on people maintain a relatively high share of the economy as the price of more automated goods and services drop” (Australian Institiute of Machine Learning 2021, pg. 3, para. 2). An example of this occurrence, known as the Baumol effect, can be seen by looking at the relative cost of food, which has decreased dramatically because of greater efficiently in the sector through automation services (Australian Institiute of Machine Learning 2021). Other areas unable to be automated, such as plumbing or building, remain heavily reliant on human labour and their cost remains comparatively high (Australian Institiute of Machine Learning 2021). Despite automation, labour will continue to maintain its share in the economy, although many industries will take on a different ratio of automation and human labour going into the future (Australian Institiute of Machine Learning 2021).

**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?**

Machine learning is becoming present in almost every area of our lives. From a social and recreational perspective, machine learning aids in a more personalized digital media experience from social media platforms, internet browsing and movie and music apps such as Spotify and Netflix (Singh V 2020). Although this makes for an overall more enjoyable experience on these platforms, one of the potential downsides of this relate to data privacy issues of which true regulation is missing as many countries are still grappling to create a formal national strategy for Artificial intelligence (Australian Institiute of Machine Learning 2021).

From a domestic perspective, machine learning is becoming more widely present in the form of integrated alarm systems which are used to build a virtual catalogue of frequent visitors, call emergency services and provide digital assistance (Singh V 2020). I have contemplated the use of these technologies before and know of many people who do use these forms.

From an economic perspective, machine learning and automation has been on the rise, the origin of which can be traced all the way back to the industrial revolution (Australian Institiute of Machine Learning 2021). Although there is a common misconception that automation has taken away jobs, (Australian Institiute of Machine Learning 2021). While some occupations have admittedly been lost to automation, many have benefited. Furthermore, many new educational and career pathways have been created as a result (Australian Institiute of Machine Learning 2021). An example of this is within the food industry, which affects us all (Australian Institiute of Machine Learning 2021). As automation and ML has been more integrated, we are able to produce larger crops with a greater yield, thereby providing food sources that were previously scarce out of season, and lowering the overall cost of food (Australian Institiute of Machine Learning 2021).

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