**IT Technologies – Assignment 2**

**Machine Learning**

**What does it do?**

State of the art technology in Machine Learning can be broken down into different categories. Categories depend on what sort of tasks are expected to be completed by the algorithm being put into place. For example, AutoML (auto machine learning) aims to give an accessible solution to non-experts looking to work on machine learning projects. Azure Machine Learning studio**\*1** is an AutoML service developed by Microsoft, a software designed to speed up the process of train, deploy models, and manage MLOps (machine learning operations) for both individuals and teams. According to Enlyft**\*2**, Azure machine learning is adopted by companies with >10,000 employees and >1,000,000,000 US$ in revenue. Auto machine learning may be considered the future of machine learning as machine learning models have become a necessary part of activities concerning both organizations and consumers. Having an accessible solution would help meet the ever-growing demand of businesses to not only create new and efficient models, but also re-calibrate older problems to solve them in a new and more efficient way. MLOps is a procedure to develop reliable and efficient machine learning solutions so they can meet the needs of businesses that can achieve automation of data management on large scales easier and ensures minimal human error. MLOps may be seen incorporated in the near future a lot more when utilizing AutoML software as it would be more geared towards satisfying the needs of a business.

Machine learning in cybersecurity can have applications such as preventing a problem, mitigating damages done, and detecting compromised software. Software that specializes in detection of malware and viruses can use machine learning to perform their tasks more efficiently by detecting abnormal behaviour. Windows Defender ATP**\*3** specializes in detecting threats that are already prevalent within a system by using endpoint sensors that are built into Windows 10. Typically, according to the Microsoft Defender Security Research Team**\*3**, human analysts would create heuristics that alert on breach activities based on their expertise. However, an analyst can only consider a limited set of signals whilst machine learning algorithms would consider thousands of signals instead. Based on statistics provided by Microsoft, they found that the machine learning algorithms they incorporate were at least 20% more precise at alerting than their human’s manually crafted heuristics.

TinyML (tiny machine learning) solves the problem of not being able to make certain IoT (Internet-of-Things) devices embedded system smart where the embedded systems are too small and run-on battery. Machine learning models are not only unfit for placement at the embedded system level, but also require a lot of processing power. The idea is implementing a low energy system, such as sensors or microcontrollers, to perform automated tasks with decreased energy consumption and costs, and no internet connection requirement. Microcontrollers, one of TinyMLs solutions, can shrink deep learning networks to fit into any small hardware system and new machine learning frameworks allow for high-powered AI-IoT devices to perform tasks efficiently. With TinyML, we can expect to see voice interfaces on everything in the future. For example, a fridge letting you know that you need to purchase more groceries or an oven pinging your phone when a cake is done baking.

Finally, Quantum ML (quantum machine learning), which can be referred to as quantum-enhanced machine learning or quantum-assisted machine learning, is an area of research and development that aims to speed up the execution of classical machine learning algorithms by transitioning them into quantum circuits that use qubits instead of binary bits. These new quantum computing systems will utilize qubits rather than binary bits. The difference between the two is that a regular binary bit has two possible states, either a 1 or 0, whereas a qubit has three possible states, either a 1, 0, or a superposition of those two values – an unknown state considered to be both 1 and 0. The idea is that since qubits aren’t limited to two states, they can hold more information and theoretically give quantum computers the potential to be millions of times more powerful than today’s supercomputers.

Singh in ‘How machine learning is changing the world’**\*4** states, “Machine learning is the future of every business”. The broad implication for all kinds of data entry that previously necessitates human intervention can be completed by machines now, for example, ecological experts using machine learning and AI-enabled sensors to analyze data from thousands of sources to make accurate pollution and weather forecast.

**What is the likely impact?**

Machine learning has numerous applications in our lives and will impact every industry and most, if not all, people. Machine learning looks to improve all segments including healthcare, education, transportation, entertainment, and a lot more. IoT and cloud computing are implementations of machine learning to create smart objects. Businesses may find value in implementing machine learning as it can study patterns hidden in big data that can introduce businesses to methods which may increase customer satisfaction and revenue.

Machine learning in data mining, the process of analysing data from a database(s) to create findings, allows for the analysis of data to be automated on much larger quantities and provide actual assumptions that may support decisions. As we enter the digital information age, we can understand that manual analysis of data and interpretation by data analysts is impossible due to the volume of data being generated at a faster rate and thus automation can be considered a requirement if individuals or organizations are to benefit from data analysis. A potential application of this can be studying what marketing strategies might be most effective in different markets and which factors impact results, both positively and negatively, according to the business’ interests – for example, do users react positively when they see more familiar faces on personalized advertisements, like a friend of family member, for products or services. Furthermore, hospitals can use machine learning to predict illnesses based on age, socioeconomic status, and genetic history. According to Rajeckas**\*6**, pharmacists are at risk of losing their jobs in the coming decades. Pill-dispensing robots and prescription delivery services will be able to do much of the work that pharmacists currently do. However, the threat may not be imminent as Rajeckas**\*6** proceeds to explain that implementation of million-dollar pharmacist robots is simply costly and is unlikely that it will replace humans in the near future.

According to George-Parkin**\*7**, jobs requiring less than a bachelor’s degree have more than twice the risk of being automated than occupations that require a college degree. For example, non-degree jobs like packaging machine operator, delivery service driver, and retail salesperson have an average automation potential of 55%. In comparison, jobs that require a degree only have a 24% of being automated.

**How will this affect us?**

AI is being implemented behind the scenes on numerous things that make our everyday life more convenient. Spotify, for example, uses AI to provide users with recommendations based on their listening history through features like the “Discover Weekly Service” that recommends music every Monday.

We may begin to see our privacy being breached as individuals. Organizations have little incentive to build privacy protections into their system as data can be used to advance their strategic objectives. However, according to Pearce**\*8**, in recent years major privacy breached have made headlines but companies were never held accountable. This could be due to a lack of regulations being put in place to protect a user’s privacy and limit an organizations collection of data. We should hope that they can find a way to create suitable regulations that can both protect the privacy of users and not stifle the advancements of AI technologies.

Self-driving car have recently become a reality; however, we may begin to see that the implementation of self-driving cars in the near future becoming not only commonplace, but also a more moral task as machines can perform tasks more effectively than humans. According to Gibson**\*5**, self-driving cars will not only be safer drivers by 2025, but far safer, moreover, they identified that self-driving cars are rapidly improving whereas human drivers are not. According to Gibson in Self-driving, wave of future**\*5**, the idea was for humans to be behind the wheel ready to take control of the vehicle on short notice, however, studies show that it is difficult for people to remain alert and engaged while automated vehicles is driving, therefore it may not be wise to implement until we can fully rely on the self-driving vehicle to be fully automated under all circumstances.

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