Intro to IT A2 - IT Technologies - Machine Learning

Machine Learning has shown itself to be one of the greatest technological advancements in the modern world. The basic goal of machine learning is to replicate how humans learn. To understand Machine Learning, we have to understand the basic concepts of Artificial Intelligence (AI). Artificial Intelligence is where computer systems replicate human behaviour to solve basic problems or tasks, such as image recognition and language processing. The best example of Artificial Intelligence are smart assistants like Siri or Alexa. They have been programmed to answer basic questions and complete tasks, examples being “What’s the weather tomorrow?” or “Play something from my Spotify playlist”.

Machine Learning is a type of artificial intelligence where computers use large amounts of data, statistics, algorithms, and patterns to learn how to complete different tasks without seeing them before, with increasing accuracy as it learns. What sets Machine Learning apart from Artificial Intelligence is the ability to evolve (or “learn”) as opposed to AI being restricted to what they were programmed to do. An example of machine learning in action would be detection of potentially fraudulent banking transactions on customer accounts. They do this by analysing the typical spending habits of the customers in addition to location of their spending (i.e country, suburbs, etc). If a transaction(s) deviates from the customer's usual spending habits to what the machine believes to be a significant degree, it will be flagged and the account will either be locked to prevent any further fraudulent transactions or it will be manually reviewed by a human.

There are three main types of machine learning algorithms: supervised learning, unsupervised learning, and reinforcement learning.

- Supervised learning is when a machine algorithm is trained using data that is labelled. For this kind of learning to be effective, the dataset is usually given in smaller parts and needs to be accurately labelled. The algorithm is then able to find the relationship between the given data and the outcome. An example of supervised learning is image recognition and classification software. These algorithms are trained using photos of various, carefully labelled, objects.

- Unsupervised learning is where a machine learning algorithm is trained using data that is not labelled. The algorithm analyses data for relationships and creates its own outputs. An example of unsupervised learning is analysing DNA patterns to analyze evolutionary biology.

- Reinforcement learning is a style of machine learning that is similar to how people learn in real life. The algorithm learns from trial and error. The algorithm will produce either favourable or unfavourable outputs, which are reinforced or punished respectively improving upon itself from past mistakes. It is essentially a reward and punishment system. Most self-driving cars use a reinforcement algorithm for road mapping and function.

One of the most impressive things I have seen done with Machine Learning is a project called OpenAI which is essentially a computer that has been taught how to play Dota 2, a multiplayer team-based strategy game. Essentially, they used a reinforcement learning algorithm and just let the bot play thousands of instances of the game for a long period of time. Within just 2 weeks, it was able to defeat over 98% of people it would come against, including professional level players / teams.

Machine learning is going to play a big role in the future of businesses and is going to become more occurring in our day-to-day lives. Machine learning algorithms will increase with even greater accuracy over the coming years, making them potentially able to make accurate predictions and business decisions. It is estimated that the machine learning market is going to grow to $117.19 billion by 2027.

Machine learning is making a massive impact on society. Some of the things that use machine learning in our daily lives include:

- Personalized Digital Media - Websites and other software applications offer users personalized results and advertisements based on our past history. Examples of this include Spotify's Daily Mixes, YouTube video recommendations, and custom advertising on Google.

- Education - Machine learning algorithms are used to analyse the data of student's results and create reports highlighting what students need to improve on. This helps take some stress off teachers as it can automate some of the tasks that teachers need to complete, freeing up extra time for them to work on other things.

- Home Security - Machine learning has revolutionized home security. An smart integrated alarm system will use facial recognition software to essentially create an index of people who frequently visit the premises.

- Healthcare - Machine learning is used to help make faster and more accurate patient diagnosis based on factors such as age, genetic predispositions, medical history, and socioeconomic status. It is also used in hospitals to detect tumors and cancer in radiology scans.

These innovations help bring society a step forward and could potentially save lives. However, the caveat to these innovative advancements is that it could automate most jobs, taking them away from people. In addition, there are also data privacy concerns as information can be hacked, obtained, and used for the wrong purposes or get leaked on the internet.

All and all, I believe that machine learning is currently or is going to make a positive impact on the lives of so many people. We live in an age of self-driving cars, smart assistants, image recognition, and so much more. This is all possible due to machine learning. I find that its use in the healthcare / medical field is extremely helpful in assisting doctors and nurses and could be used to save so many lives and prevent serious long term negative health effects. Although there is potential that jobs could be lost due to the automation capabilities of machine learning, I personally believe that the benefits outweigh the cons.

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