**Machine Learning**

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Machine learning is a category of algorithm globally used in the technology industry that allows software to become more accurate in predicting outcomes without explicitly being programmed to do so. Machine learning today is used nearly everywhere; from social media and marketing to more complex areas like autonomous vehicles and quantum machine learning – an algorithm that analyses quantum states rather than classical data.

**What Does It Do?**

Machine learning is a form of data training in which software references existing data to produce the most successful results possible for the task assigned while simultaneously improving the model with new results for further accuracy. Machine learning is used in nearly all aspects of the modern world from data analysis for money saving measures and preventing fraud/identity theft to helping the health care industry monitor their patients and identify common trends to potentially improve future diagnoses and treatment.

For machine learning to be implemented a model must first be created using a collection of data which is fed into the relevant learning algorithm to be categorised. This process is called training and forms the foundation of the model. A model is a collection of categorised data that influences the predictions of a program, and as the program continues to make these predictions the model is updated to accommodate more accurate outputs.

It does this by comparing the output (i.e. result) with training data; if the output does not match the intended output, the algorithm is adjusted automatically in attempt to make a more accurate prediction next time. This process repeats as the accuracy increases.

Once training is complete, the model created is then tested against data it has not yet seen to evaluate its accuracy

An important part of the process is choosing the right algorithm to create your model as not all are equal; the data set and the intended use will heavily influence the decision.

There are four primary machine learning algorithms today, each with their own characteristics and use cases. These four algorithms are:

• **Supervised** – A model is trained using user input data with a desired outcome already defined. The algorithm must then process any further incoming data, comparing it to the desired outcome and modifying the model accordingly be there any errors or deviations from that outcome. This model can be used for analysing and filtering spam emails, scoring credit and speech recognition.

• **Semi-supervised** – An algorithm which shares a similar use case to its supervised counterpart. Where it varies is how much initial data the model is fed. A semi-supervised learning algorithm relies more on incoming data to make its predictions and is therefore cheaper to initialise as there is less effort required to produce an initial data set. However, this can result in inaccurate predictions and re-enforced mistakes if left to “self-train” without the necessary supervision.

• **Unsupervised** – As the name implies, an unsupervised learning algorithm is left to make predictions on its own without training (i.e. It is not given a defined outcome or any input data to work with). As this leaves the algorithm with only incoming data to process, it’s main use is to identify hidden patterns or intrinsic structures within that data. This is useful in applications such as neural networks.

• **Reinforced** – This type of algorithm interacts with its environment by producing actions and discovering either errors or rewards. The reward in this case would be a positive signal – or feedback – from the environment and the goal for a reinforced learning algorithm is to maximise the cumulative ‘reward’ while ideally minimising punishment. This model is commonly seen in the AI of video games; it helps train them to respond to stimuli and perform certain tasks in game.

As of today, it is commonly agreed among those in the industry that deep learning is state-of-the-art and will remain so until more advances are made. Deep learning is a subset of machine learning that focuses on using neural networks. These networks can take in data inputs, such as images and audio files, and learn from what is being labelled. It is considered state of the art as it is the closest machine learning process resembling how a human brain functions; as a result of significantly improved understanding of the brain and nervous system.

**What Is The Likely Impact?**

Machine learning and AI has brought many commodities to the public that many could not live without from self-parking cars and personal assistants to advanced photo editing and putting a dancing John Travolta in your living room in augmented reality (AR). But these are only small snippets of the current capabilities of machine learning, and to an extension, deep learning. There is much more to come.

Autonomous transportation is among the most reviewed aspects of advanced AI and machine learning. These vehicles, while not widely available to the average person right now, showcase both the capabilities of current software and its potential growth. The impact autonomous vehicles will have on society will be profound given that the novelty dwindles and prices settle into a reasonable bracket for the general public.

Another aspect that has a heavy impact is health care analysis software. In the past health professionals had to review data manually before making a diagnosis or treating a patient.

Now that we have high-performance computing GPUs, provided by companies such as Nvidia, operating as tools for deep learning, real-time insights can be produced which allows healthcare professionals to provide faster and more accurate diagnoses, reduce medical errors, predict adverse reactions, and generally lower the costs of healthcare for both providers and patients.

Lastly, advances in machine learning technologies can help prevent injury in extremely high-risk occupations such as bomb disposal and welding. While both are highly paid, they are both life threatening in their own way. Bomb disposal because of potentially volatile explosives and welding because of the intense heat, noise and toxic fumes emitted from any substances used during the process. Robots are already being implemented in both workplaces but with the progress of machine learning these robots can become much more intelligent and entirely remove the need to put oneself at risk.

These are only a few examples as to what AI and machine learning can do for us as a society.

**How Does This Affect You?**

As of right now, machine learning and the AI associated affects almost everyone with some form of modern device. However, some people rely on it more day to day. Some use semi-autonomous vehicles to park themselves when they lack time or patience, some use the personal assistant on their phone or tablet to take care of tasks when their hands are full and some just like the commodities machine learning can offer like smart home security.

Life with these novelties will become very simple. Transport will inevitably become so advanced that cars will be more like personal cabs; eradicating the need for public transport systems. Phones and handheld devices will become powerful enough to perform operations previously thought to be impossible without human supervision, like book keeping and automatic schedule updating based on constant audio input. In future the replication of emotions is not impossible, becoming companions with a device that exhibits very life like characteristics; a personality for instance, predetermined by the software or not.

However, these are but concepts. I believe that until it is required to use new technology day to day, it will not have any affects on the way that we live. The exception being the healthcare industry. I intentionally don’t make use of the features supported by machine learning outside of movie and TV show recommendations and spam filters so the affect that future applications will have on my life will most likely be insignificant until I see the need to adapt to new technologies because in the context that learning models are used, it affects businesses more than the individual.

**Conclusion**

Machine learning, deep learning, neural networks and other forms of artificial intelligence have already carved a hole in the industry that continues to grow and evolve as the industry forms a deeper understanding of the human nervous system and advanced algorithms. New milestones are continuously being reached and these achievements mark a new age of technology that will inevitably arrive in the hands of the general public.

With time this process of evolution can radically change the way we live and shape a new future many great minds in the past thought to be a dream.

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