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Assignment 2

IT Technologies – Machine Learning

**What does it do?**

Machine learning is a component of the larger field of artificial intelligence pertaining to furthering our understanding of computation theories and the human learning process with the idea of imparting such abilities on a machine through programming (Mitchell & Jordan, 2015). Further, machine learning is a tool used in data analysis which automates analytical model building. The goals of machine learning models are to analyse data, identify patterns within the dataset and using this knowledge make predictions and inferences regarding future data. A machine learning algorithm can; correct its own errors, improve from past mistakes, and learn to perform new tasks based on old tasks (Chen, 2020). Machine learning provides humans with a tool to analyse datasets that are far beyond the scope of human capability and to come up with predictions and inferences that can be acted upon. The assistance of machine learning would be sought if; very high accuracy was not vital, the dataset is very large and unanalysed, the question being asked is novel with very little historical data, or the problem is dynamic and in a constant state of change (Awad & Khanna, 2015).

There are two common types of machine learning: supervised and unsupervised. Supervised machine learning systems use training data to generate predictions. Training data is a set of data with known relationships generally in the form of an input *x* and an output *y*, though the inputs and outputs can vary greatly in their nature, for example inputs can be entire documents, images, DNA sequences, or graphs (Mitchell & Jordan, 2015). Outputs may be binary or regressive in nature, for example, identifying spam emails(binary), or predicting house prices using a regressive model (regressive) (Imran, et al., 2021). Unsupervised learning does not require a training data set and instead looks at relationships between points of data within a set. Some areas that unsupervised machine learning is used are recommendation engines, anomaly detection within datasets, natural language processing, image processing and computer vision (IBM Cloud Education, 2020).

The forefront of machine learning applications are AI neural networks. An AI neural network is a series of interconnected artificial neurons and synapses that act together to process information in a method analogous to a human brain. AI neural networks are layered with the first layer being the input layer, a middle layer that contains most of the nodes and synapses which attenuate the data based on trained coefficients, and finally an output layer which distributes the information to a point outside the network (Mach, 2021). Ai neural networks are used in many disciplines for classification, clustering, pattern recognition and prediction (Abiodun, et al., 2018).

The ability of machine learning is directly tied to the computing strength of processing units. Quantum computing will greatly increase the ability of machine learning algorithms to process large amounts of data. An experiment conducted in 2019 pitted a state-of-the-art supercomputer against a quantum computer, the results showed that a task which would take a supercomputer 10,000 years to accomplish was achieved by a quantum computer in 200 seconds (Arute, et al., 2019). This is an obviously giant leap in computational power that is likely to become mainstream technology within a decade, and a very powerful combination when coupled with advanced machine learning algorithms.

**What is the likely impact?**

AI neural networks are currently commonly used in e-commerce for recommendation engines that are tailored to the user based on what the neural network has learned about their habits, and in search engines. More recently, AI neural networks are being used in the health care industry to assist in diagnostic imaging, clinical decision making, and many other areas clinical and enterprise related (IBM, 2021). In the specific case of IBM Watson, an AI neural network, it was trained for two years on millions of pages of medical data to the point where the network can now prompt diagnosis and propose treatments based on patient complaints and anamnesis (Mach, 2021). Other areas that AI neural networks are used include information security, big data, cloud computing, agriculture, science, medical science, education, finance, management, security, engineering, trading commodity, art, and forensic science (Abiodun, et al., 2018).

The process of developing machine learning algorithms that are tailored for specific purposes is being automated. This means that people or business who are not trained in coding or machine learning can benefit from what complex machine learning algorithms have to offer (AutoML.org, 2021). This process of automating machine learning has already begun with Keras offering a user-friendly python interface to the TensorFlow library. TensorFlow is a free and open-source software library for machine learning and artificial intelligence. Machine learning is predicted to have a specifically large impact on the healthcare and pharmaceutical industries by improving prediction and prevention of possible diseases, rather than focusing on treatments after diagnoses. Currently disease predictions are based on limited variables such as age, weight, gender, etc. With machine learning, however, the data set can be greatly widened to include things like, patient demographic and health records. By using machine learning techniques such as natural language processing and image processing, electronic health record data can be fed into a machine learning algorithm where patterns can be established which will lead to better prediction results (Jones, et al., 2018). Further, machine learning will assist in drug development by using datasets of drug compounds and chemical structures to predict the impact they may have on different biological functions causing side effects. Machine learning will result in shorter drug testing times (Zhydik, 2021).

As machine learning becomes more ubiquitous in society more and more jobs will not require a human presence. The benefit will be that productivity and effectiveness will increase to levels that humans can’t achieve. Some jobs that are likely to be replaced by machine learning are bookkeeping and data entry, receptionist, customer service, manufacturing and pharmaceutical work, doctors, market research analyst, and retail services. All members of society will benefit from a medical system augmented by machine learning, as diagnosis will be quicker, preventative measures will be stronger and faster, and care will be more tailored to specific needs.

**How will this affect me?**

Machine learning will greatly affect me personally in the years to come. From my google searches being more efficient, to my overall online experience being more personalised, my car being automated, my medical services being more effective, machine learning will affect almost every aspect of my life. Previously my doctor would have to sift through towers of medical data to make a diagnosis, but with the aid of machine learning that can be done accurately and swiftly by an algorithm in a matter of minutes or seconds. Machine learning will ensure that members of my family are adequately cared for medically all the way through to their old age.

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