**Machine** **learning**

# What is machine learning?

Machine learning in general is a concept that we train computers to make predictions or decisions based on the computational processing of an arrays of historic information fed in. Hence, the quantity and quality of the collected data determine the accuracy of predictions, which also heavily rely on the data analysis and modelling algorithms. It applies the principle of statistics, probability, and optimisation. (Mohri, M., 2018) ML also refers as generalisation or abstraction of myriads of real-world complex numeric scores. Data is scattered through the dimensions of time and space and it’s often random and isolated. Generalisation is a plausible way to analyse the data and unveil the underlying correlation among it to deliver a more meaningful implication for us to use as a tool to solve problems. Google machine learning crash course (2020) illustrated this concept concisely in its video clip.

<https://developers.google.com/machine-learning/crash-course/generalization/video-lecture>

# How it works

Diagram

Description automatically generated

Chart sourced from Diez-Olivan et al. (2018, p94)

The above flow chart shows the basic working mechanism about ML. First a hypothesis is stated, and related data are gathered. Then a machine learning algorithm is developed to correlate each type of data. The training data and test data should be homogeneous with same characteristics. The training data is then fed to computer to study patterns or the closeness to the trajectory of prediction. There’s possible a linear or non-linear regression relationship between the outcome and data. Finally, the performance results are evaluated to help to adjust the code towards better accuracy. The adjustment process could repeat several times in perfecting the modelling therefore improving the overall credibility of the outcome.

# Current applications

There are increasing popularity of ML embraced by all aspects of industries process. This niche market segment is projected a tenfold growth to $117.19 billion by 2027 (Zhydik 2021). ML has a broad range of usage including text classifications, natural language processing (NLP), images identification etc. A great example of text classification is to use ML to detect spam emails. The computer collects an array of email features as raw data including length of the email, subject, name of sender, key words presence and occurrence etc. Through training the computer would be able to cluster emails into two categories – spam or non-spam. Considering NLP, ML behind the scenes does various jobs such as part of speech tagging, words parsing, predictions of words according to syntactic order. Google machine learning crash course (2020) pointed out ML can also help quickly replicate the success of transcribing one audible language to be on another language.

in this paper, we will adopt health care scope to explore in dept how we harness this advanced technology.

**Health care sector.** In this field, there are already extensive applications in aid of medical diagnosis and interventions. Here are some great paradigms.

Hypertension is one of the major health issues worldwide, which usually leads to premature mortality or serious complications such as cardiovascular diseases, stroke, kidney failure. Ye et al. (2018, p2) developed a ML model to cluster and identify high risk people prone to acquire hypertension according to their past clinical records, followed by lifestyle shift and medication control. This had then prevented or delayed this cohort’s progression to serious conditions. It has generated relatively positive socioeconomic outcomes.

The demand for remote access to Home-Based Rehabilitation (HBR) has increased dramatically due to the Covid travel restrictions. Chea et al (2020) developed a system using ML to help stroke survivors evaluate the effectiveness of the remedial exercise done at home. A patient can wear a smart watch with built in accelerometer and gyroscope to enhance the accurate reference to the designated movement modules. It is proved that this system could reduce the patients’ drop out rate and increase the participation in rehabilitating practice. As a result of that, HBR paired with this system significantly reduces the medical expense compared with the cost of rehab centre visiting.

In coping with Covid-19 related mortality, Kang (2021, p2) introduced a neural network predictive algorithm that can identify who would likely develop severe symptoms among people infected. It provided a great benefit to a better care plan and early interventions to save lives. Notably, their algorithm achieved a high accuracy with area under curve score of 0.953.

# Future perspective

This technology is constantly evolving, and it’ll be continuously proliferating in the future. There are some rising stars in the fields.

**Computer vision**

We strive to develop clearer computer visual peripherals that could match or exceed human-level vision. One hypothetical application from it is to restore the blinds’ vision with artificial eyes. Another one is to make robots visual function more like human. Hong Kong University of Science and Technology (HKUST) (2020) announced its development of world first 3D retina biomimetic eyes which have ability to see better than human eyes.

**Quantum computer**

Zhydik (2021) reported a quantum computer made by Google only took merely a few minutes to complete a task that would require world fastest supercomputer 10,000 years to finish. Working in such super powerful quantum computational capacity can make instances of ML application multiply exponentially.

**AutoML**

So far, we must manually review the algorithm design for ML in order to improve accuracy of the prediction from time to time. In the future, computer with high AI may automatically correct and improve the code, which would make ML simpler to make and therefore more accessible by general population.

# Employment Impacts

It has huge impacts on the workforce structure. The shift in the workforce will bring massive improvement on productivity. In this inevitable rolling process that we can’t reverse, a great number of jobs may lose due to the replacement by AI or permanent redundancies. The demand for drivers could be decreasing as AI advances. Sydney now has its first automated driverless metro train in operation since 2019. Self-driving vehicle is the new trend that is on almost every car maker’s development agenda. World Economic Forum (WEF) reported that about one third of jobs are done by machines at the moment while by 2025 half of our jobs will be taken over by machines (Kelly 2020)

On the other hand, this shift may enable people to step down from elementary, repetitive, less skill required tasks and switch to managerial or supervising roles. Therefore, it also creates new jobs. The transition would require people to further their education to gain the new curriculum skills to fit in the emerging occupations. This wave of ML disturbance in labour market could also create concerns on job security and income inequality because of a decline in blue collar jobs and shrinkage of middle-class job opportunity (Yarmuth, 2020, p3).

# Personal reflections

ML offers another scope to exploit the potentials of computational capacity. It could greatly liberate me from doing routine tasks such as driving, cooking, cleaning, shopping. and let me focus on something more constructive and profound. If all the individuals from all over the world could enjoy this entitlement, how much surplus productivity would be generated. I would be very keen to try on wearable smart device embedded with AI that allows me to constantly monitor my health metrics i.e., blood pressure, heart rhythms, breathing rate, body temperature, red blood cell counts. Then, I could get instant clinical diagnosis without having to visit my GP periodically. On the other hand, one thing I do believe will happen at one point in the future is that computers would surpass human beings’ intelligence through countless deep learning cycle, which would raise again a heated debate: Is computer our great helper or ultimate enemy? Another problem we could foresee is that extensive AI aids we employed could make us lazier and incapable in doing basic tasks as we formed an inseparable dependency on machines. Just like our body muscles, if we don’t use them over a long period of time, they will shrink and become weakened.

To wrap it up, I second the idea of machine learning advancement as its benefits outweigh its cons.

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