Machines are omnipresent and continue to have an increasing role in our decision making processes mainly because they can analyse a lot of data better and more effectively than we can. Everything that we will be doing in the future, will depend on machines. Self-driving cars which utilise the concepts of machine learning with artificial intelligence (AI) are already on the market now. In the future, everything around us will be automated and hence we will come to a point where we will have to rely on machines for basic tasks (Haven't we already!). The main questions that machine learning deals with are these: Given a set of input points and their corresponding output points, can the machine correctly guess the output for an input point not specified in the initial set of input points? Also, if only a set of data points are given, will the machine be able to correctly guess the pattern governing these data points?

What we are learning right now in this course is the mathematical foundations required for machine learning. Machine learning algorithms help the machine learn the input data in an effective way to make decisions. These type of algorithms usually use the probabilistic modelling and the geometric modelling. Both models provide a concise way of representing data points. We need to cover basic mathematical concepts centred on probability, statistics and linear algebra to work with these models. In the first week, we have begun to address the main questions by analysing how a function can be fit to a set of data points. Many problems can then be replaced by this function for further calculations and data modelling. Polynomial curve fitting comes in handy here and we can use the Lagrange interpolation (although limited to lower orders) and Spline polynomial basis functions for this. Using Taylor's expansion formula, any function (originally, not a polynomial) can be expressed as the sum of polynomials. Fourier series converts any random non periodic function to the sum of periodic/ harmonic functions. A polynomial function is easily computable using basic mathematical operators. It is infinitely smooth and also easy to visualize graphically. Hence, polynomial representation of functions is highly preferred. ML will come to play a huge role in a variety of applications.

What makes machine learning so ubiquitous is that it can be used with many other existing branches. For example, in the case of image analysis and pattern recognition, ML algorithms can be used to develop a system to classify unknown images. Such a system is highly useful in making diagnoses and prognoses in the field of healthcare. (http://web.mit.edu/profit/PDFS/EdwardTolson.pdf). Machine learning to be used in the field of trading is highly popular nowadays. Combining ML algorithms with High frequency trading algorithms will effectively decide the number of stocks to buy and also at what price it will yield highest profits. Decision making processes will heavily depend on ML in the years to come. Combining this with AI, a machine can learn to do something of its own accord, the only input needed are some initial state conditions.