Neural networks and machine learning algorithms (hereafter NN) represent a dramatic departure from conventional programming techniques. Rather than explicitly build a program to solve a problem, one presents examples (training set) of a particular application to the NN and the NN adjusts itself in a self-organizing fashion to solve the training set. It can then be presented new examples on which it was not trained (test set) and the NN will generalize to give a good answer. For example, a doctor goes through years of training to learn to diagnose disease on the basis of a set of symptoms. An NN would solve this problem by first learning a training set made up of symptoms with the correct diagnoses, and then generalizing to a diagnosis when presented with new symptoms on which it was not trained. For many tasks the NN approaches outperform human experts and other automated techniques. This general approach is amenable to many difficult problems being faced today.

This talk will review basic approaches in machine learning algorithms and then discuss latest challenges and goals. In particular, I will discuss the challenge of fully automated learning which allows minimal input from a user and requires the machine learning model to automatically discover how best to learn the problem. This includes not only deciding on features and learning parameters, but also the automatic selection of an inductive bias which will allow the learning model to achieve the highest possible accuracy.