# Lecture\_1b

Hello and welcome to the second lecture this week, introducing machine learning. In this video, the following topics will be covered, what is machine learning, real world applications of machine learning how machine learning works, overview of supervised learning, overview of unsupervised learning, overview of reinforcement learning, overview of neural networks, overview of machine learning algorithms, and finally, some real world example.

As the name suggests, machine learning simply means making machines specifically computers to learn by teaching them what comes naturally to humans. or animals. Machine learning comes by learning from experience in other words posteriori knowledge driven. Even though priori knowledge could also be relevant to machine learning it mainly uses real world data observations, which is a posteriori knowledge. Machine learning is all about data machine learning algorithms work by employing computation intelligence, to learn information directly from observations on data. And in doing this, they do not need a predetermined model or equations.

Intuitively, as more data samples are made available to machine learning algorithms, their performance tend to increase adaptively and they work by finding natural patterns of structures in data to provide more insights for informed decisions and predictions. Now due to the upsurge in big data machine learning continues to find numerous applications in solving real-world problems. Some examples can be found in energy production, such as price determination, load forecasting and demand side management. We also have examples in computer vision and image processing, such as face recognition and object detection. We also have examples in computation of finance and econometrics, things like algorithm trading, credit analysis and scoring and in the area of computational biology we also have some applications such as DNA sequencing, tumor detection and drug discovery. In the area of predictive maintenance, this is also very important machine learning is used to undertake predictive maintenance in aerospace, automotive and manufacturing industries. and machine learning is also one to be core competence of natural language processing NLP.

How Machine Learning Works? Generally, machine working uses two techniques. The first is supervised learning where a model is trained using unknown input and output data to make the model fit for predicting future outcomes. An example is this model for predicts occurrence of future faults on a machine or equipment. The second technique is unsupervised learning and unsupervised learning is employed to find intrinsic features or hidden patterns in the sets of data that is input and

these sets of data do not have labelled responses, that is they do not have outputs. Examples of this are trend analysis and pattern recognition from a given data set. There is some repetition. Supervised learning involves building models that make predictions based on evidence and the existence of such entity, and then make use of known sets of input data and responses to the data to build models that can make reasonably accurate predictions for responses to new data. Supervised learning broadly uses two techniques to build and train predictive models. The first is classification. Classification metrics walk by predicting discrete responses. An example is a model trained to predict to whether a tumor is cancerous or beign. Or whether an email is genuine or spam, The second technique is regression. Regression modules work by predictive continuous responses. Examples include changes in environmental conditions such as temperature and humidity levels and fluctuations in power demand on a power grid. Unsupervised learning in contrast to supervised learning mainly works by finding interesting structures or patterns in data that can be used to draw inferences for the particular datasets that is being employed. and take note of this.

The data set does not have outputs to that are labelled responses and the most popular technique

for implementing unsupervised learning is clustering. Clustering merely involves exploratory data analysis to find possible patterns or grouping's in the data. Examples could be DNA sequence analysis, market research for business intelligence.

Reinforcement Learning is one of the three broad categories of subfield of machine learning. In contrast to supervised and unsupervised learning, reinforcement learning, the machine lives in an environment. and it is capable of perceiving the state of that environment as a set of features.

And because of this capability, the machine can execute actions in every state. Different actions can bring different rewards and different actions could also move the machine to different states of the environment. Reinforcement learning, premises on learning what to do using data from a dynamic environment by allowing a piece of software called an agent to explore, interact with and learn from the environment. As a result, the agent determines how to map the states of the environment to corresponding actions in the environment. The agent is not told explicitly which actions to take. Rather the agent must discover which actions yields the most rewards by trying. That is, by exploring and interacting with and also learning from the environment. Neural networks, a very popular technique for implementing machine learning. and in simple terms, a neural network can be defined as a model of reasoning based on the human brain. And remember, the brain consists of a densely interconnected set of nerve cells otherwise called basic information- processing units, called neurons. Neurals study the biological zeros in the brain. A typical neural network consists of a group of nodes or processors called neurones. That is artificial neurones. These neurons are connected by weighted links which pass signals from one neuron to another try in a way that makes a typical neurone network a universal function approximator. In order words for the right combination of nodes and connections an neural network, which is a universal function approximator can be set up to model any input and output relationship,

Now due to a plethora of supervised and unsupervised machine learning algorithms selecting the right algorithm can seem challenging. And this is because each algorithm often takes a unique approach to learning and there is no one size fits all. And even for experienced data scientists or analysts finding the right algorithm always seems to involve a bit of trial and error. Now the choice of machine learning algorithm, we mainly depend on the size and type of data the inferences or insights to be drawn from the data and how the inferences, or insights will be applied. Many of the real-world machine learning applications would likely have one or a combination of the following attributes, The first is complexity and in this case, the rules of thumb and equations

governing the problems are just too complex. Some examples will include face recognition, speech recognition. Dynamism. In this case, the rules governing the task are subject to constant changes. An obvious example is fraud detection based on transactional records and third attributes is heterogeneity and in this case, the nature of data keeps changing, such as adaptation to inherent changes are needed. Example is automated trading. We could also have predicted shopping trends and energy demand forecasting as examples as well that come under this category. Now, in this video, we have discussed what is machined learning? some real-world applications of machine learning? How machine learning works? Overview of supervised learning. Overview of unsupervised learning Overview of reinforcement learning, overview of neural networks, overview of machine learning algorithms which are focussed on informed choice. and some real world examples. I am Mobayode.