Param Poojya Dr. Babasaheb Ambedkar Smarak Samiti's

Dr. Ambedkar College Deekshabhoomi, Nagpur

One Day International Webinar

Topic: "Applications of Artificial Intelligence in Statistics and Mathematics"

Organised by

Department of Statistics, Department of Computer Science and Department of Mathematics

Date: 18th September 2021

REPORT

Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention. Machine Learning has a significant presence in top emerging jobs in today's era. It's one of the fastest growing skills and almost every industry has been trying to implement it in their processes. Machine Learning covers a variety of statistical & mathematical techniques, computer coding skills which are useful for data analysis and central to the recent developments in deep learning.

Statistics and Computer Science form the core of data analytics. They are widely used in the field of machine learning to analyse, visualize and to interpret data so as to discover insights of data. Probability, which is a very important part of Statistics, has found a broad range of applications in several industries. Data analytics uses computer technology and the techniques in Statistics for collecting, pre-processing, and using the data for arriving at useful conclusions. Some of the topics of Statistics, which data analyst needs to know, are Descriptive Statistics, Probability Distributions, Hypothesis Testing, Regression Analysis, Sampling theory etc.

The concepts of mathematics are required to the large extent in the field of machine learning. It is another foundation skill required to become an expert in machine learning. One needs to know linear algebra to understand how each algorithm works. Concepts in linear algebra help to implement machine learning algorithms from scratch. This includes working with vectors and matrix operations in n-dimensional space. The topics of mathematics like Vectors and Matrix Properties, Matrix Transposition, Dot Product,

Eigenvalues and Eigen vectors, Matrix Factorization, Principal Component Analysis, and Orthogonality are very important in machine learning.

Considering all of the above aspects a One-day International Webinar on "Applications of Artificial Intelligence in Statistics and Mathematics" was organised by the Department of Statistics, Department of Computer Science and Department of Mathematics. The main objective of the webinar was to create the awareness among the students about the use of artificial intelligence in statistical analysis and mathematics. Two eminent speakers Mr. Satyajit Pattnaik, Head, Data Science, Xccelerate, Hong Kong and Dr. Hemant Jalota, Quantitative Analyst, Equtick, Noida, were invited to enlighten the students and teachers on the topic. The response to the webinar was encouraging as **254** participants registered for this webinar.

The Webinar commenced with a General Welcome speech by Dr. J. J. Tripathi in which he welcomed both the guest speakers and the audience present. It was followed by an Inaugural Address by Dr. Mrs. B. A. Mehere, Principal, Dr. Ambedkar College, Nagpur. In the opening note she welcomed the speakers and gave a brief introduction of both of them. She gave information regarding the history of Dr. Ambedkar College to the participants of the webinar. She whole heartedly congratulated all the Organising Committee members of the Webinar.

After the Principal's Inaugural Address Dr. J.J. Tripathi of Department of Mathematics invited Mrs. Anjali Badar, Head of Department of Statistics for the Convenor's Address. Mrs. Anjali Badar started the speech by welcoming everyone followed by in-depth introduction of the topic of the webinar which was Machine Learning. She also gave an insight of the importance of Machine Learning and the growth perspectives in this subject.

Session-I "Machine Learning and Regression Analysis" was conducted by Mr. Satyajit Pattnaik, Head, Data Science, Xccelerate, Hong Kong. The speaker commenced his session by introducing himself stating that he has 10 years of industrial experience out of which 6+ years in Machine Learning and teaching data science. He gave information of different domains in which he is working. He started his presentation with the topic "Machine Learning and Regression". He put forward his agenda for the presentation which was divided into four parts

1. Basic Understanding of Machine Learning
2. Regression Problems
3. Time series analysis
4. Real life use cases
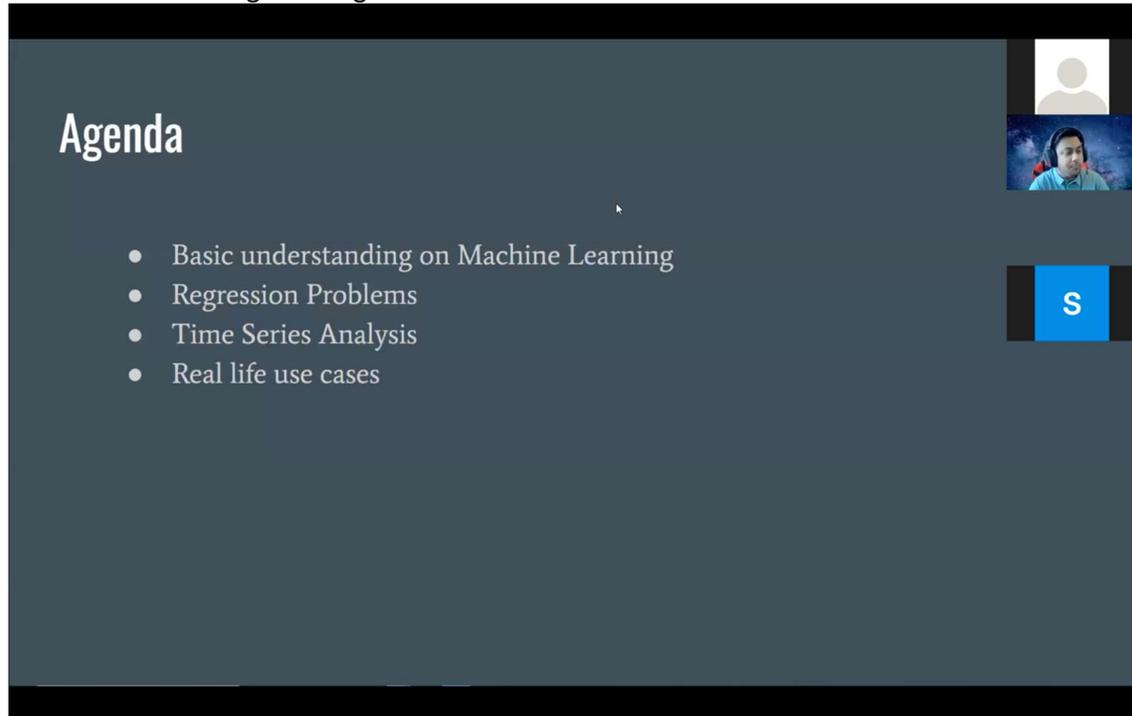
The screenshot of agenda is given below:

Fig : Agenda of the Session – I

He started his presentation by informing the audience that machine learning is categorised into three ways namely, **Supervised Learning, Unsupervised Learning and Regression Learning** which he explained briefly with the help of a diagram. Then he explained the audience about how Regression falls under Supervised Learning. Continuing the topic of Regression, he then elaborately explained the concept of Linear Regression. With the help of paint application in Microsoft Windows he explained what are the dependent and independent variables in Linear regression with some examples. He gave information about the various types of Regression algorithms. He explained the Linear regression followed by polynomial regression with the help of different graphs. He discussed real life examples to explain the topic and gave information of the tool (https://scikit-learn.org/stable/modules/generated/sklearn.linear_model.LinearRegression.html) which can be used by feeding the training data.

After Linear Regression the speaker talked about Multiple Linear Regression, which he explained in detail with the help of examples. The next topic was Time series Analysis which was very wonderfully explained with an example in real life and graph which was drawn with the help of paint application. He also explained about the components of a time series which are Trend, Seasonality, Cyclic/Irregularity and Noise. He again used the paint application to explain the concepts with an example and explained the components of time series. The last topic of his presentation was Machine Learning Project Timeline in which he explained different stages in the timeline which are Data Gathering, Data Exploration, Feature Engineering + Model Building lastly followed by Model Exploration which can be seen in the following screenshot.
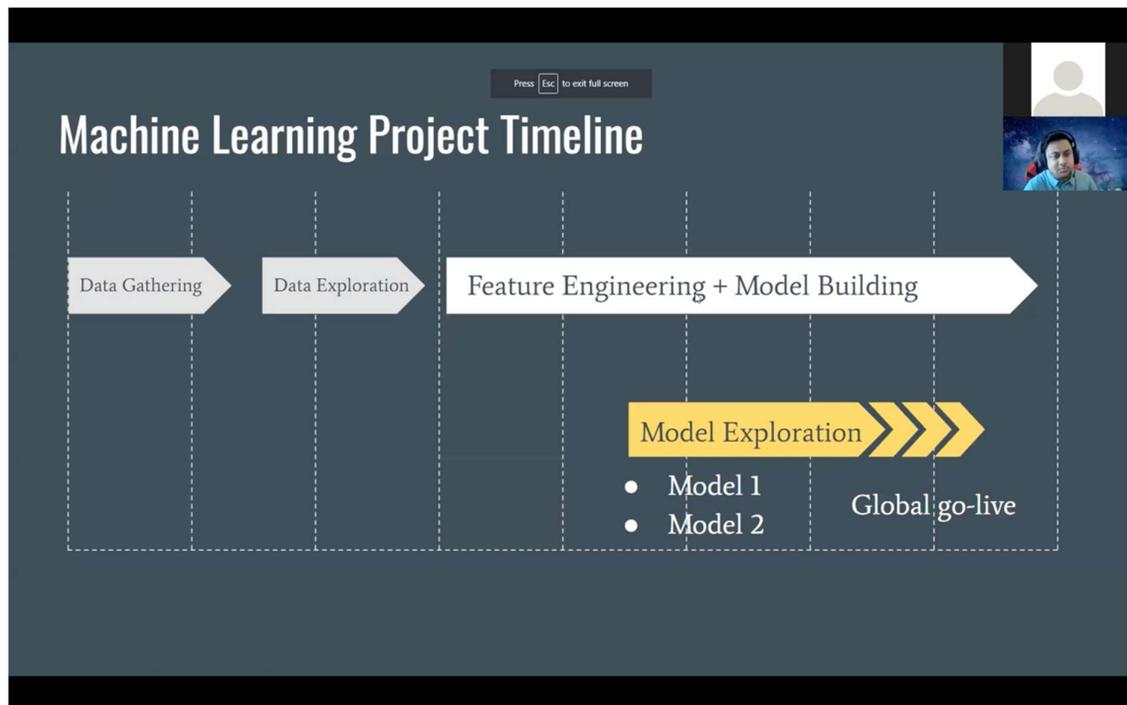
Machine Learning Project Timeline

He concluded his session by encouraging the participants to explore more about the topic and informing the participants about his YouTube channel where anyone can get knowledge about relevant fields. The session was then open to audience for their queries related to topic.

After the conclusion of the Session – I, Dr. Avinash Hedao gave an introduction of the next topic Artificial Intelligence. Dr. Hedao gave a brief introduction of the next speaker Dr. Hemant Jalota.

Session-II "Applications of Mathematics in Machine Learning" by **Dr. Hemant Jalota, Quantitative Analyst, Equtick, Noida**. In the beginning he gave brief introduction of himself.

The guest speaker started his session by sharing power point presentation of contents of his topic. He explained **Bayesian Classification** in detail using the graph diagram in his presentation. He then moved to his next slide which was **Support Vector Machine** which again was very nicely explained with the help of a diagram on the slide, which can be seen in the next screenshot.

Support Vector Machine

Then he talked about the **Non-Linear Support Vector Machine** in his next slide and explained it nicely with the help of a diagram. He gave information about Kernel functions. Then he explained how only the important information is passed to the system while using **Principal Component Analysis** in his next slide, which can be seen in the next screenshot.

He gave inputs of Linear **Regression** in his next slide and continued on the base given by first speaker Mr. Satyajit Pattnaik and explained it with the help of a graph diagram in his slide. Then the speaker made the concept of **K-Mean cluster** clear to the audience with the help of a graph depicting K-Mean cluster, he talked about clusters and centroids in brief. Next, he informed the audience about **Training and Testing Data,** in which he covered terms like Underfitting, Overfitting, Test errors and Training errors. He concluded his session by giving an example of stock market on the website Kites by Zerodha, which is shown in the next screenshot.
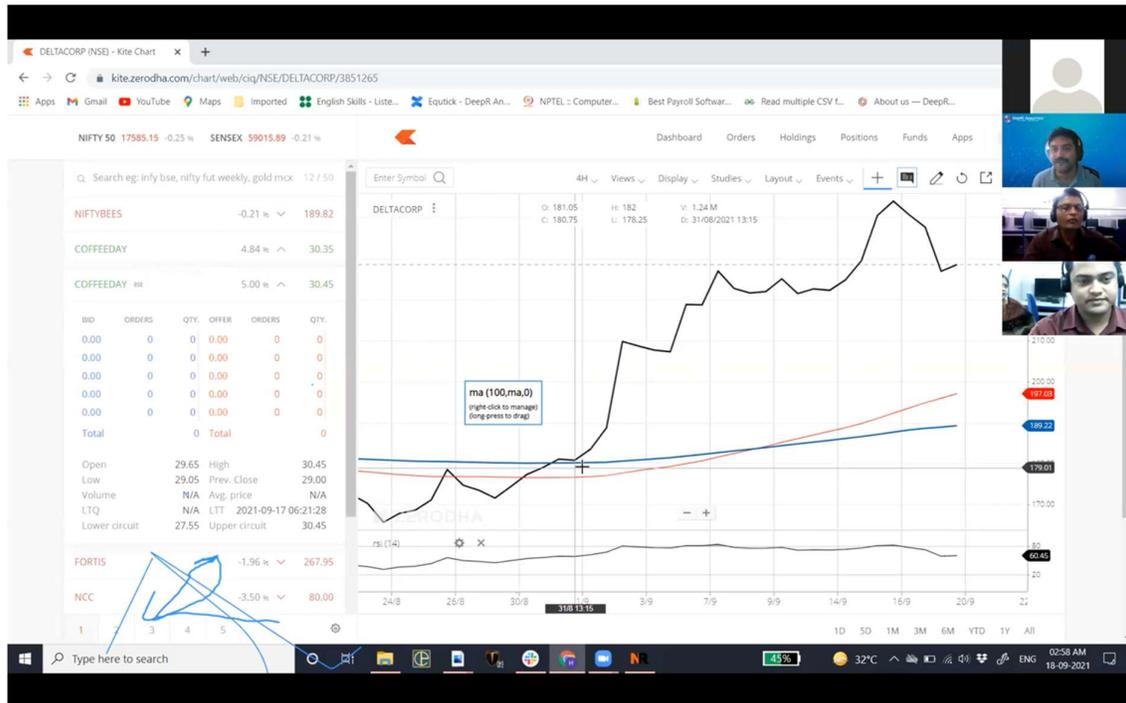
A short question answer session was followed after conclusion of second session. The speakers gave satisfactory answers to all queries asked by the teachers and students in the audience.

After the conclusion of the final session a formal vote of thanks was given by Dr. P.V. Nimbalkar, Head, Department of Computer Science, Dr. Ambedkar College, Nagpur. He declared that webinar has been successfully carried out with its main theme and imparted knowledge of upcoming subject Machine Learning to the participants.