

PREDICTIVE ANALYTICS USING MACHINE LEARNING TECHNIQUES IN REAL TIME APPLICATIONS

S Habib Mohamed Sathak Amina

Assistant Professor, Department of Computer Science

Thassim Beevi Abdul Kader College For Women, Kilakarai

ABSTRACT

The developments in the field of artificial intelligence and machine learning have changed the world of computation where intelligent computation techniques and algorithms are introduced. Machine Learning models have a very well track record of being used as predictive models. Predictive analytics is the branch of advanced analytics, mainly used in statistical and analytics techniques to make predictions about future outcomes. It uses many techniques from data mining, statistics, modeling, and machine learning to analyze present and past data to make future predictions. Machine Learning has grown rapidly in the context of data analysis and computing which allows the applications to function intelligently. It is the subset of Artificial Intelligence. Machine Learning and predictive analytics is the key to effectively performing data analytics. Machine Learning can learn from past data sets, while predictive analytics focus is on forecasting specific target variables. This paper mainly focuses on Predictive analytics using machine learning in different real-time applications such as Medical, Banking, Security, etc., to predict future outcomes effectively.

Keywords: Predictive Analytics, Predictive Models, Machine Learning, Supervised Learning

I. INTRODUCTION

In this technologically emerging world, humans are in need to accomplish their tasks simply. Machine Learning made this possible by teaching machines how to handle data more efficiently from the experience of data. Machine learning relies on processing a large

amount of data to find common patterns. It uses algorithms to identify and analyze the patterns in the data to predict future outcomes without being explicitly programmed. Predictive analytics is the future of Machine Learning. Historical and transactional data patterns are exploited by these models are used to identify the risks and opportunities for the future. Machine learning and predictive analytics are used together to make better decisions based on the effectiveness of past behavior. Machine learning is an appropriate technique to build predictive models due to their outstanding performance in managing large-scale datasets for their uniform characteristics. Predictive analytics uses many techniques from machine learning to analyze current data to make predictions to forecast future activities, behavior, and trend by extracting patterns from large datasets. Machine Learning algorithms optimize and uncover new statistical patterns to analyze data which form the backbone of predictive analytics.

II. LITERATURE REVIEW

Batta Mahesh et al. [2019] explained various machine learning algorithms. Machine Learning can be Supervised or Unsupervised. If you have a lesser amount of data and clearly labeled data for training, opt for Supervised Learning. Unsupervised Learning would generally give better performance and results for large data sets. This paper also gives an introduction to most of the popular machine learning algorithms.

Vaibhav Kumar, M. L. Garg, et. al. [2018] explained the scope of development of new models for the task of predictive analytics. And also discussed an

opportunity to add additional features to the existing models to improve their performance in the task.

Iqbal H. Sarker et. al., [2021] give an overview of machine learning algorithms for intelligent data analysis and applications. The author briefly discussed how various types of machine learning methods can be used for making solutions to various real-world issues

B. Nithya, Dr. V. Ilango et. al. [2017] discussed Machine Learning and predictive analytics techniques could revolutionize the entire healthcare industry by providing accurate insights and predictions related to symptoms, diagnoses, procedures, and medications. The author also explained different machine learning tools and techniques in health care provinces and their exclusive use in the diagnosis and predictions of various types of cancers.

III. PREDICTIVE ANALYTICS PROCESS

Predictive analytics involves several steps for data analysis to predict the future based on present and past data. The process of predictive analytics is represented in figure 1 given below.



Figure 1: Predictive Analytics Process

A. Problem Definition:

To develop a predictive model, it must be clear what is the objective and scope of prediction. Identify the data sets which will be used by implementing predictive analytics methodology.

B. Data Collection:

It involves collecting the necessary details required for the analysis. It uses the historical or current data which predictive analysis is to be performed. This data may be in the form of structured, semi-structured, or unstructured based on the source of data.

C. Data Analysis:

It is the process of cleaning and removing unnecessary, erroneous, and redundant data to refine our data sets. It involves the exploration of data and analysis to identify some patterns or new outcomes from the data set. This phase helps to discover useful information and concludes by identifying some new patterns or trends.

D. Statistics:

This phase is used to validate the findings, assumptions, and hypotheses by using statistical methods and machine learning techniques. Probability theory and regression analysis are widely used analytics techniques.

E. Predictive Modelling:

This stage involves various algorithms to build predictive models based on statistical methods and the patterns observed. It provides an accurate result of predictive models about the future outcome. In many applications, multi-model evaluation is used to find a better solution.

F. Deployment:

This phase provides an option to deploy the results, reports, or other metrics created by statistical analysis into the real world to perform an effective decision-making process based on modeling.

G. Monitoring:

The results generated by the model are periodically monitored and check the performance to ensure that the desired output is obtained to make accurate predictions.

Predictive analytics is a step-by-step process to make accurate predictions to identify success rates or reduce risk at the early stage

IV. PREDICTIVE ANALYTICS MODELS

Machine learning can increase the speed of processing and analyzing the data for predictive analytics programs. Predictive analytics is driven by predictive modeling. Predictive analytics and machine learning together form predictive models which include

machine learning algorithms. Predictive analytics models are divided into five categories.

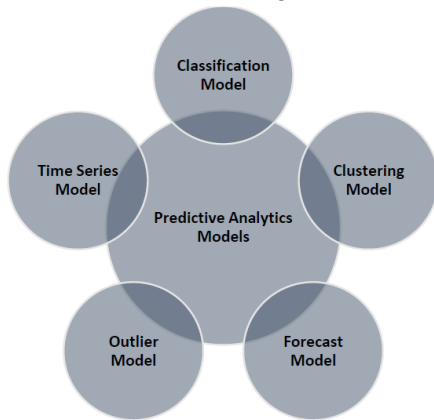


Figure 2: Predictive Analytics Models

A. Classification Model:

It is considered one of the common and simplest models. It categorizes the data based on what it learns from past events.

B. Clustering Model:

This model separates data into different groups based on common or similar attributes.

C. Forecast Model:

It is the most commonly used predictive analytics model. It deals with metric value prediction to estimate the value for new data from the past venture.

D. Outlier Model:

This model works by analyzing abnormal or outlying data entries within datasets. This model helps to identify anomalous data either by themselves or about different categories.

E. Time Series Model:

This model mainly focuses on the sequence of data points where time is the input parameter. This model works by using different data points of historical data to develop a numerical metric that will predict future trends of a specified period.

V. MACHINE LEARNING TECHNIQUES FOR PREDICTIVE MODELING

Predictive analytics uses machine learning for data modeling due to its performance to accurately process large data sets and perform deeper analysis to identify new patterns. Machine learning algorithms are broadly divided into two groups: Supervised learning which is used to construct predictive models, and unsupervised learning that is used to build descriptive models.

Supervised, machine learning algorithms are used to build a model that makes predictions based on past uncertain evidence. There are different machine learning algorithms that can be applied in predictive modeling are listed below.

A. Decision Tree Techniques:

It is one of the predictive modeling approaches. A decision tree is a graph to represent choices and their results in form of a tree to relate the decisions and their possible consequences. This technique is used to identify the ways to separate a data set based on different conditions to make an effective decision

B. Bayesian Methods:

This method is used to construct a statistical model based on Bayes' theorem which terms the events prior and posterior. It takes random variables as parameters to define the probability of occurrence of an event.

C. Artificial Neural Network:

Artificial Neural networks (ANN) or neural networks replicates the human nervous systems intended to simulate the behavior of biological neuron composed of artificial neurons. It is a nonlinear modeling technique where they learn the relationship between the inputs and the outputs through training

D. Ensemble Methods:

This method creates multiple models and then combines them to produce improved results to solve the computational problem. These models are developed by training several similar types of models and finally combining their results for prediction.

E. Instance-Based Learning:

This technique operates by comparing the current instances with the previously trained instances, which have been stored in memory. Its name is derived from the fact that it creates assumptions from the training data instances.

VI. APPLICATIONS OF PREDICTIVE ANALYTICS AND MACHINE LEARNING

Machine learning techniques automate predictive modeling by generating algorithms for training data to recognize new patterns and behaviors. There are many applications of predictive analytics in a variety of domains. From medical analysis to the stock market, prediction can be done by historical data. Some of the popular applications are listed below.

A. Banking and Financial Services:

In the banking and financial services industries, predictive analytics and machine learning are used in conjunction to detect fraudulent behavior and reduce suspicious transactions. It helps to measure market risk and identify profit rates. It helps to scan historical datasets and identify risk areas to prevent risks by making better decisions.

B. Healthcare:

Machine learning predictive analytics has a large scope of application in the field of healthcare and medicine. By training algorithms with large and varied data sets, patient symptoms can be observed. This can further help in providing a faster and more accurate diagnosis at the early stage.

C. Security:

Machine learning predictive analytics play a vital role in security. It helps to improve services and performance to understand consumer behavior and enhance data security. It also helps to detect anomalies, fraud activities. This makes the professionals focus on designing different strategies to protect the system.

VII. CONCLUSION AND FUTURE SCOPE

Machine learning with predictive analytics is becoming key to every organization. Now with the advancements in the field of artificial intelligence and the development of machine learning techniques, there is a trend nowadays of using machine learning techniques in predictive analytics. Predictive Analytics helps not only for the growth of an organization but also prevents the degradation through analysis of fraudulent activities. The process of selecting a machine learning algorithm involves matching the features of the data to be learned in the existing approaches. This paper gives a better understanding and the impact of each algorithm on the prediction. It clearly explains various machine learning techniques for prediction. A literature study is set to identify a different machine learning algorithm to assess the features that impact the prediction model.

The future work of this paper will be comparing and adding additional features to the existing models to improve their performance and get better prediction result in real-time applications

REFERENCES

- [1] Batta Mahesh, "Machine Learning Algorithms - A Review", International Journal of Science and Research (IJSR) ISSN: 2319-7064 Research Gate Impact Factor (2018): 0.28
- [2] Vaibhav Kumar, M. L. Garg, "Predictive Analytics: A Review of Trends and Techniques", International Journal of Computer Applications (0975 – 8887) Volume 182 – No.1, July 2018
- [3] Iqbal H. Sarker, "Machine Learning: Algorithms, Real-World Applications, and Research Directions", SN Computer Science (2021) 2:1604
- [4] Nishchol Mishra, Dr. Sanjay Silakari, "Predictive Analytics: A Survey, Trends, Applications, Opportunities & Challenges" International Journal of

Computer Science and Information Technologies, Vol.
3 (3), 2012, 4434- 4438

[5] B. Nithya, Dr. V. Ilango, “Predictive Analytics in Health Care Using Machine Learning Tools and Techniques”, International Conference on Intelligent Computing and Control Systems ICICCS 2017, 978-1-5386-2745-7

[6] Eric Siegel, 2016, “Predictive Analytics”, John Wiley and Sons Ltd.