MINI PROJECT REPORT ON

CRICKET RESULT PREDICTION

A Project report is submitted in partial fulfillment of the requirements for the award of Post-Graduation of

MASTER OF SCIENCE IN DATA SCIENCE & ANALYTICS

Submitted By

FEBA SABU: 292110
NAKUL G: 292113

Under the Guidance of

JIBY JOSEPH
(VISITING FACULTY)

SCHOOL OF DATA ANALYTICS

(MAHATMA GANDHI UNIVERSITY, KOTTAYAM)

2021-2023

SCHOOL OF DATA SCIENCE & ANALYTICS

MAHATMA GANDHI UNIVERSITY

BONAFIDE CERTIFICATE

This is to certify that the project report entitled **"CRICKET RESULT PREDICTION" FEBA SABU (292110), NAKUL G (292113)** in partial fulfillment of the requirements of the post-graduation of **Master of Science in Data Science & Analytics, Mahatma Gandhi University, Kottayam** is a record of Bonafide work carried out under my guidance and supervision.

Project Guide	**Head of the Department**
JIBY JOSEPH	DR. (PROF) KK JOSE School of Data Analytics

DECLARATION

We, **FEBA SABU, NAKUL G** of third semester M.Sc. in the School of Data Science & Analytics from Mahatma Gandhi University,Kottayam, hereby declare that the project work entitled **CRICKET RESULT PREDICTION** is carried out by us and submitted in partial fulfillment of the requirements for the award of **Master of Science in Data Science & Analytics**, under Jiby Joseph, School of Data Science & Analytics, during the academic year 2021- 2023.

FEBA SABU: 292110

NAKUL G: 292113

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PROJECT STUDENTS

FEBA SABU: 292110

NAKUL G: 292113

ABSTRACT

This machine learning project aims to develop a model for predicting the outcome of cricket matches based on various factors such as team performance, player statistics, match venue, weather conditions, and other contextual factors. The project will involve collecting and cleaning data from various sources, including cricket databases and weather reports. The model will be developed using various machine learning algorithms such as decision trees, random forests, and neural networks, and will be optimized using techniques such as cross-validation and hyperparameter tuning. The performance of the model will be evaluated using various metrics such as accuracy, precision, and recall. The results of the project will provide valuable insights into the factors that influence the outcome of cricket matches and can be used by cricket enthusiasts, sports analysts, and betting agencies to make informed decisions.

CONTENT

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION:

Cricket is a popular sport played by millions of people worldwide. It is a bat-and-ball game that originated in England in the 16th century and has since become one of the most widely played sports in the world. The game is played on a circular or oval-shaped field, with a rectangular 22-yard-long pitch in the center. The objective of the game is for one team to score more runs than the other by hitting the ball with a bat and running back and forth between two sets of wickets.

Cricket has several formats, including Test cricket, One Day International (ODI) cricket, and Twenty20 (T20) cricket, each with its own set of rules and regulations. Test cricket is the longest format and is played over five days, while ODI cricket is played over 50 overs per side and T20 cricket is played over 20 overs per side.

Cricket is a sport that lends itself well to data analysis and machine learning applications. There are a wide variety of statistics and metrics that can be used to analyze a player's performance, such as batting average, strike rate, and economy rate. These metrics can be used to train machine learning models to predict future outcomes, such as a player's likelihood of scoring a certain number of runs or taking a certain number of wickets.

In recent years, there has been a growing interest in using machine learning in cricket, particularly in areas such as player selection, team strategy, and performance analysis. By leveraging machine learning techniques, teams can gain insights into their opponents' strengths and weaknesses, identify potential areas for improvement, and make data-driven decisions to optimize their performance.

Overall, cricket provides an exciting and challenging domain for machine learning projects, offering a wealth of data and opportunities for analysis and prediction.

1.2 PROBLEM STATEMENT:

In this project, We are building a Machine Learning algorithm to predict the outcome of a cricket match.

CHAPTER 2

LITERATURE SURVEY

2.1 RESEARCH PAPER REFERRED

1. "Cricket Score Prediction Using Machine Learning" by Shivam Sharma, Arpit Aggarwal, and Akshay Sharma, published in the International Journal of Emerging Trends & Technology in Computer Science.
2. "Cricket Match Outcome Prediction Using Machine Learning" by Shashank Rana, Anshika Saxena, and Harshit Dargan, published in the International Journal of Computer Science and Information Security.
3. "Machine Learning Techniques for Predicting Cricket Match Outcomes" by Navjot Kaur, Sarabjeet Singh, and Amandeep Kaur, published in the Journal of Computer Science and Technology.
4. "Predicting Cricket Match Outcomes Using Machine Learning Algorithms" by Sumeet Kaur, Baljeet Kaur, and Neha Gupta, published in the International Journal of Scientific Research in Computer Science, Engineering and Information Technology.
5. "Cricket Score Prediction Using Machine Learning Techniques" by Saptarshi Sengupta and Anupam Basu, published in the Journal of Emerging Technologies and Innovative Research.

CHAPTER 3

TECHNOLOGIES USED

3.1 PYTHON

Python is a high-level, interpreted programming language that is widely used in various fields such as web development, scientific computing, data analysis, artificial intelligence, and machine learning. It was created by Guido van Rossum and was first released in 1991. Python's popularity is attributed to its simplicity, readability, and ease of use.

One of the key features of Python is its syntax, which is designed to be easily readable and understandable by humans. The language uses indentation rather than curly braces to define code blocks, making it easy to follow the flow of the code. Additionally, Python has a large standard library that provides modules for common programming tasks such as working with files, networking, and regular expressions.

Python is an interpreted language, which means that the code is executed line by line, without the need for compilation. This makes it easier to write and test code, as changes can be made and tested quickly. Furthermore, Python supports multiple programming paradigms such as object-oriented, procedural, and functional programming, allowing developers to choose the approach that best suits their needs.

Python's popularity in the field of data science and machine learning is due to its vast ecosystem of libraries and frameworks. Libraries such as NumPy, Pandas, and Matplotlib provide powerful tools for working with data, while machine learning frameworks such as Scikit-Learn, TensorFlow, and PyTorch provide a range of algorithms for building machine learning models.

Python's versatility and ease of use have made it one of the most popular programming languages in the world. Its simplicity and readability make it a great choice for beginners, while its power and flexibility make it a favourite among experienced developers. Whether you're building a web application, analyzing data, or building a machine learning model, Python is a language that can help you achieve your goals quickly and easily.

3.1.1 HOW PYTHON IS USED IN THIS PROJECT ?

Python can be used extensively in a machine learning project on cricket game prediction. Here are some of the ways Python can be utilized:

1. Data collection and pre-processing: Python has many libraries that can be used for scraping data from various sources such as cricket websites, social media platforms, and other relevant sources. Libraries such as BeautifulSoup, Requests, and Selenium can be used to scrape data, while Pandas and NumPy can be used to pre-process the data.
2. Data analysis and visualization: Python has powerful libraries such as Matplotlib and Seaborn that can be used to visualize the data and gain insights into the patterns and trends. Additionally, libraries such as Scikit-learn can be used for exploratory data analysis and feature selection.
3. Machine learning model building: Python has many libraries such as Scikit-learn, TensorFlow, and Keras that can be used for building machine learning models. These libraries provide a range of algorithms such as decision trees, random forests, and neural networks that can be used to train and test the models.
4. Model evaluation and deployment: Python provides tools for evaluating the performance of the models, such as cross-validation and hyperparameter tuning. Additionally, the models can be deployed using Python frameworks such as Flask or Django.

Overall, Python provides a comprehensive ecosystem of tools and libraries that can be used to build a machine-learning model for cricket game prediction. Its simplicity, readability, and ease of use make it a popular choice among data scientists and machine learning practitioners.

3.2 TABLEAU

Tableau is a powerful data visualization and business intelligence tool that allows users to create interactive and intuitive dashboards, reports, and visualizations. It was created by Tableau Software and was first released in 2003. Tableau has become one of the most popular data visualization tools due to its ease of use, flexibility, and robust functionality.

Tableau offers a range of features that make it a favorite among data analysts, business intelligence professionals, and data scientists. One of the key features of Tableau is its drag-and-drop interface, which allows users to easily create charts, graphs, and other visualizations without writing any code. This makes it easy for non-technical users to work with data and create meaningful insights.

Tableau can connect to a wide range of data sources, including spreadsheets, databases, cloud-based data sources, and other file types. Once the data is connected, Tableau provides a range of tools for cleaning, reshaping, and preparing the data for analysis. The data can then be analyzed using a variety of visualizations, including bar charts, scatter plots, heat maps, and more.

Tableau's visualizations are highly interactive, allowing users to drill down into the data, filter data based on different criteria, and view data from different perspectives. Additionally, Tableau's dashboards allow users to combine multiple visualizations and create a comprehensive view of the data.

Tableau also provides advanced features such as forecasting, trend analysis, and predictive analytics. These features allow users to analyze the data and make informed decisions based on the insights.

Tableau's popularity in the business intelligence and data visualization industry is due to its user-friendly interface, robust functionality, and community support. Tableau has a large community of users who share knowledge, resources, and best practices. Additionally, Tableau provides extensive documentation, tutorials, and training resources to help users learn and master the tool.

In conclusion, Tableau is a powerful data visualization and business intelligence tool that allows users to analyze and visualize data in a user-friendly and interactive way. Its ease of use, flexibility, and robust functionality has made it a favourite among data analysts, business intelligence professionals, and data scientists. With its powerful features and extensive community support, Tableau is a tool that can help organizations make informed decisions based on their data.

3.2.1 HOW TABLEAU IS USED IN THIS PROJECT?

Tableau can be used in a machine learning project on cricket game prediction in a number of ways, including:

1. Data exploration and visualization: Tableau can be used to visually explore and analyze the data that has been collected for the project. The tool's drag-and-drop interface makes it easy to create interactive dashboards, charts, and graphs that can be used to identify trends, patterns, and insights within the data.
2. Data pre-processing and cleaning: Before building a machine learning model, it is important to ensure that the data is clean and well-prepared. Tableau can be used to clean and transform the data into a format that is suitable for machine learning. For example, the tool can be used to filter out missing or irrelevant data and create calculated fields that can be used as features for the model.
3. Feature selection: Tableau can also be used to identify the most important features of the machine learning model. By visualizing the data and analyzing the correlations between different variables, it is possible to identify the features that are most predictive of the target variable.
4. Model evaluation: Once the machine learning model has been built, Tableau can be used to evaluate its performance. The tool can be used to visualize the model's predictions and compare them to the actual outcomes. This can help to identify areas where the model is performing well and where it needs improvement.

Overall, Tableau can be a valuable tool in a machine-learning project on cricket game prediction. Its ability to visually explore and analyze data, pre-process and clean data, select features, and evaluate model performance can help to improve the accuracy of the machine learning model and generate valuable insights for the project.

3.3 PACKAGES USED

1. NumPy: a library for working with arrays and numerical operations in Python.

2. Pandas: a library for data manipulation and analysis.

3. Matplotlib: a library for creating visualizations such as graphs, charts, and plots.

4. TensorFlow: an open-source platform for machine learning developed by Google.

5. PyTorch: a machine learning framework that provides dynamic computation graphs and automatic differentiation.

CHAPTER 4

REQUIREMENTS & SPECIFICATION

4.1 HARDWARE SPECIFICATIONS

1. A computer with a multi-core CPU (preferably 4 cores or more), or a GPU (Graphics Processing Unit) for training complex models more quickly.

2. RAM: 8 GB of RAM is recommended, but 16 GB or more may be required since our dataset is too large.

3. Adequate storage space to store the dataset and the models being trained. An SSD (Solid State Drive) is recommended for faster read/write speeds.

4.2 SOFTWARE REQUIREMENT

1. A **64-bit operating system** (such as Windows 10, macOS, or Linux)

2. **Python 3. x installed**, along with the required packages for machine learning (such as NumPy, Pandas, Scikit-learn, Matplotlib, TensorFlow, Keras, and PyTorch).

3. An **integrated development environment** (IDE) such as **Jupyter Notebook** or **PyCharm** for coding and testing the machine learning models.

4. **Tableau Desktop** for data exploration and visualization

5. **Excel** used as an additional software required for data pre-processing, cleaning, and feature engineering.

CHAPTER 5

INTRODUCTION TO THE GAME OF CRICKET

5.1 ORIGIN OF CRICKET

Cricket is a bat-and-ball sport that originated in England in the 16th century. The game has evolved over time, with its modern form developing in the 18th century. Cricket is now a popular sport played in countries all over the world, including England, India, Australia, Pakistan, South Africa, and the West Indies.

The origins of cricket can be traced back to the medieval period in England, where games involving a bat and ball were played. These games were often played by shepherds who would use their crooks as bats and a ball made of wool or a stone wrapped in leather. Over time, the game became more structured, and by the 16th century, it was being played in villages and towns across England.

In the 18th century, cricket began to develop into a more organized sport. The first recorded game of cricket was played in 1744, and by the 1760s, cricket had become a popular pastime in London. The Marylebone Cricket Club (MCC) was founded in 1787, and it became the governing body of the sport in England. The MCC also established the laws of cricket, which remain largely unchanged to this day.

Cricket spread to the British colonies, and it became a popular sport in India, Australia, and the West Indies. In the late 19th and early 20th centuries, international cricket matches began to be played, with the first test match between England and Australia taking place in 1877. Since then, cricket has become a global sport, with countries such as South Africa, New Zealand, and Sri Lanka also playing at the highest level.

In conclusion, cricket has a long and rich history that dates back to the medieval period in England. The sport has evolved over time, with its modern form developing in the 18th century. Cricket is now a popular sport played in countries all over the world, and it continues to grow in popularity with each passing year.

5.2 RECENT DEVELOPMENTS IN CRICKET

Cricket has undergone significant changes and developments in recent years, both on and off the field. These changes have been aimed at making the sport more exciting, competitive, and accessible to a wider audience. Some of the most significant recent developments in cricket are discussed below.

1. **T20 Format**: The T20 format of cricket, introduced in 2003, has revolutionized the sport. The format involves each team playing 20 overs, making it a fast-paced and exciting game. It has become hugely popular, with the Indian Premier League (IPL) being one of the most-watched sports leagues in the world.

2. **Technology**: Technology has played a significant role in cricket in recent years. The Decision Review System (DRS) has been introduced to assist umpires in decision-making, while the use of Hawk-Eye technology has improved the accuracy of LBW decisions. Real-time data analysis and player tracking have also helped teams to make better strategic decisions.

3. **Women's Cricket**: The women's game has been gaining increasing attention and popularity in recent years. The International Cricket Council (ICC) has been investing in the development of women's cricket, with the Women's T20 World Cup being one of the most-watched events in the sport.

4. **Inclusivity**: Cricket has been striving to become more inclusive and diverse, both on and off the field. Initiatives such as the Black Lives Matter movement and the Rainbow Laces campaign have been aimed at promoting equality and inclusivity within the sport.

5.<u>Bio-bubbles</u>: The COVID-19 pandemic has forced cricket to adapt, with the introduction of bio-bubbles being one of the most significant changes. Bio-bubbles are a restricted environment in which players, officials, and staff must remain during a series or tournament. This has allowed cricket to continue while minimizing the risk of COVID-19 transmission.

In conclusion, cricket has undergone significant changes and developments in recent years, aimed at making the sport more exciting, competitive, and accessible. The T20 format, technology, women's cricket, inclusivity, and bio-bubbles are some of the most significant recent developments. These changes have contributed to the growth and popularity of the sport, and it will be exciting to see how cricket continues to evolve in the years to come.

5.3 Cricket: From Just a Game to a Multi-Billion-Dollar Business Opportunity

Cricket has undergone a remarkable transformation over the years, evolving from just a game to a multi-billion-dollar business. The sport has grown significantly in popularity and commercial value, with various factors contributing to this development.

1. **Media and Broadcasting Rights**: One of the most significant factors contributing to the commercialization of cricket is the media and broadcasting rights. Television networks and streaming platforms have invested significant sums in obtaining the rights to broadcast cricket matches, making it accessible to millions of viewers globally.
2. **Sponsorship and Branding**: The increasing popularity of cricket has attracted numerous sponsors and brands, leading to lucrative deals with cricket boards, players, and teams. The use of player endorsements and branding on team jerseys has become a common practice, contributing to the revenue streams of the sport.
3. **T20 Format**: The introduction of the T20 format of cricket in 2003 has been a significant catalyst for the commercialization of the sport. T20 matches are shorter and more fast-paced, making them more appealing to fans and attracting new audiences. The Indian Premier League (IPL) is one of the most successful T20 leagues, generating huge revenues through broadcasting, sponsorships, and ticket sales.
4. **Increased Globalization**: Cricket has become a global sport, with the International Cricket Council (ICC) expanding its membership to include more countries. This has increased the potential audience for cricket and opened up new markets for commercial opportunities.
5. **Investments and Franchises**: The growth of cricket as a business has led to the emergence of franchise-based tournaments, where teams are owned by private investors. These tournaments, such as the IPL, have attracted significant investments and generated huge revenues through broadcasting, sponsorships, and merchandise sales.

In conclusion, cricket has developed from just a game to a multi-billion-dollar business, with various factors contributing to this transformation. The media and broadcasting rights, sponsorship and branding, T20 format, increased globalization, and investments and franchises have played a significant role in the commercialization of the sport. As cricket continues to evolve, it is likely that we will see further developments in the business aspect of the sport, making it a more lucrative and sustainable industry.

5.4 Cricket Revolutionized by Technology

Technology has revolutionized the game of cricket in recent years, transforming the way the sport is played, watched, and analyzed. From the Decision Review System (DRS) to real-time data analysis, technology has brought numerous changes to cricket, making it more accurate, efficient, and exciting.

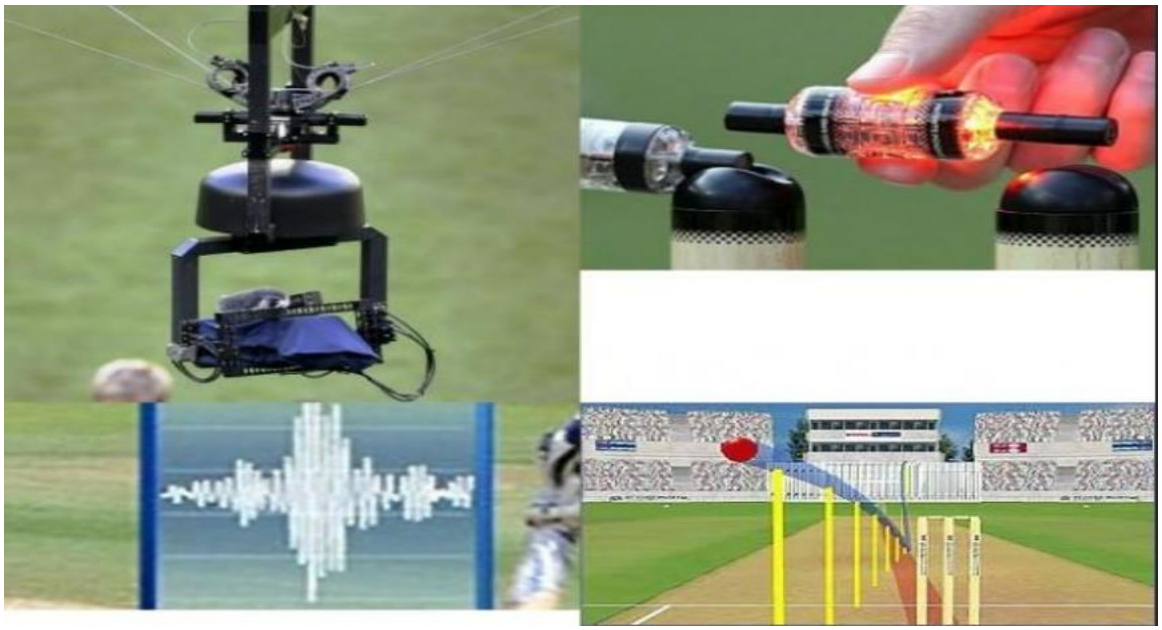
One of the most significant technological advancements in cricket has been the introduction of the **DRS**. The system allows players to challenge on-field decisions, and it has helped to reduce errors made by umpires. The use of technology has made the game fairer, as players have a chance to overturn incorrect decisions, which could have a significant impact on the outcome of the match.

Another significant development in cricket technology is the use of **player tracking and data analysis**. **Wearable technology, such as smartwatches and fitness trackers**, has allowed coaches to monitor their players' physical performance, making it easier to manage their workload and prevent injuries. Real-time data analysis has also helped teams to make better strategic decisions, as they can access information about player performance, pitch conditions, and opposition strategies.

Hawk-Eye technology has also had a significant impact on cricket. The system uses multiple cameras to track the trajectory of the ball, making it easier to determine whether a batsman is out or not. It has helped to reduce the number of errors made by umpires, and it has made the game more accurate and transparent.

Technology has also had an impact on the way cricket is watched and enjoyed. With the advent of **live streaming**, fans can now watch matches from anywhere in the world, and they can also access real-time data, highlights, and analysis. Social media has also become an integral part of cricket, with players, teams, and fans interacting online, sharing their thoughts, and engaging in discussions.

In conclusion, technology has revolutionized the game of cricket, bringing numerous changes and advancements to the sport. The DRS has made the game fairer, while real-time data analysis and player tracking have helped teams to make better strategic decisions. Hawk-Eye technology has made the game more accurate and transparent, and live streaming and social media have made it more accessible and enjoyable for fans. As technology continues to evolve, it is likely that we will see further developments in the game of cricket, making it even more exciting and engaging for players and fans alike.



5.5 USE OF MACHINE LEARNING AND DATA ANALYSIS IN MODERN-DAY CRICKET

Machine learning and data analysis have become essential tools in the game of cricket. They are used to analyze player performance, predict outcomes, and optimize team strategies. Machine learning algorithms are used to process vast amounts of data, enabling coaches and analysts to gain insights into player performance and team dynamics.

One of the primary uses of machine learning in cricket is **the analysis of player performance data**. Machine learning algorithms can process data from sensors and cameras worn by players, including bat speed, ball trajectory, and speed. This data can be analyzed to identify patterns and trends, and coaches can use it to make data-driven decisions about training and strategy.

Machine learning algorithms can also be used to predict match outcomes. By analyzing historical data on player performance, pitch conditions, and other factors, machine learning algorithms can predict the probability of a team winning a match. This information can be used by coaches and analysts to develop strategies and make tactical decisions.

Machine learning algorithms can also be used to optimize team strategies. By analyzing data on player strengths and weaknesses, pitch conditions, and opposition strategies, machine learning algorithms can suggest optimal lineups and tactics. This information can help coaches and analysts make data-driven decisions about substitutions, field placements, and other aspects of the game.

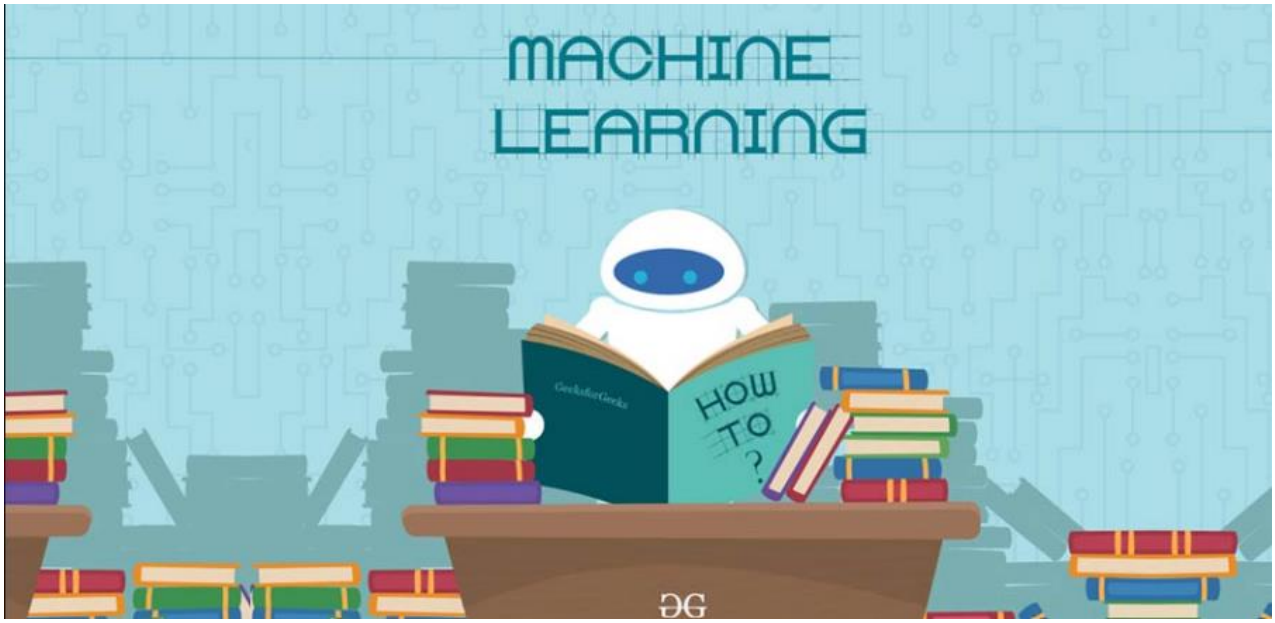
Data analysis and machine learning are also used to develop new technologies and equipment for the game of cricket. Sensors and cameras are being developed to track player movement and ball trajectory, providing more accurate and detailed data on player performance. Machine learning algorithms are being used to optimize the design of cricket equipment, such as bats and balls, to improve performance.

In conclusion, machine learning and data analysis have become essential tools in the game of cricket. They are used to analyze player performance, predict outcomes, optimize team strategies, and develop new technologies and equipment. As the technology continues to evolve, it is likely that we will see even more advancements in the use of machine learning and data analysis in cricket, making the game even more exciting and engaging for players and fans alike.

CHAPTER 6

MACHINE LEARNING

6.1 MACHINE LEARNING



What is Machine Learning?

Machine Learning is the field of study that gives computers the capability to learn without being explicitly programmed. ML is one of the most exciting technologies that one would have ever come across. As it is evident from the name, it gives the computer that makes it more similar to humans: The ability to learn. Machine learning is actively being used today, perhaps in many more places than one would expect.

6.2 NEED FOR MACHINE LEARNING: -

Machine learning is important because it allows computers to learn from data and improve their performance on specific tasks without being explicitly programmed. This ability to learn from data and adapt to new situations makes machine learning particularly useful for tasks that involve large amounts of data, complex decision-making, and dynamic environments.

Here are some specific areas where machine learning is being used:

Predictive modeling: Machine learning can be used to build predictive models that can help businesses make better decisions. For example, machine learning can be used to predict which customers are most likely to buy a particular product, or which patients are most likely to develop a certain disease.

Natural language processing: Machine learning is used to build systems that can understand and interpret human language. This is important for applications such as voice recognition, chatbots, and language translation.

Computer vision: Machine learning is used to build systems that can recognize and interpret images and videos. This is important for applications such as self-driving cars, surveillance systems, and medical imaging.

Fraud detection: Machine learning can be used to detect fraudulent behavior in financial transactions, online advertising, and other areas.

Recommendation systems: Machine learning can be used to build recommendation systems that suggest products, services, or content to users based on their past behavior and preferences.

Overall, machine learning has become an essential tool for many businesses and industries, as it enables them to make better use of data, improve their decision-making processes, and deliver more personalized experiences to their customers.

6.3 TYPE OF MACHINE LEARNING: -

Machine learning can be grouped into two broad learning tasks:

1. Supervised ML

2. Unsupervised ML

1. Supervised learning:

An algorithm uses training data and feedback from humans to learn the relationship between given inputs to a given output. For instance, a practitioner can use marketing expenses and weather forecasts as input data to predict the sales of cans. You can use supervised learning when the output data is known. The algorithm will predict new data. There are two categories of supervised learning:

1. Classification task
2. Regression task

Classification

Imagine you want to predict the gender of a customer for a commercial. You will start gathering data on the height, weight, job, salary, purchasing basket, etc. from your customer database. You know the gender of each of your customers, it can only be male or female. The objective of the classifier will be to assign a probability of being a male or a female (i.e., the label) based on the information (i.e., features you have collected). When the model learned how to recognize males or females, you can use new data to make a prediction. For instance, you just got new information from an unknown customer, and you want to know if it is a male or female. If the classifier predicts male = 70%, it means the algorithm is sure at 70% that this customer is a male, and 30% it is a female.

The label can be for two or more classes. The above Machine learning example has only two classes, but if a classifier needs to predict an object, it has dozens of classes (e.g., glass, table, shoes, etc. each object represents a class)

Regression

When the output is a continuous value, the task is a regression. For instance, a financial analyst may need to forecast the value of a stock based on a range of features like equity, previous stock performances, and macroeconomics index. The system will be trained to estimate the price of the stocks with the lowest possible error.

2. Unsupervised learning

In unsupervised learning, an algorithm explores input data without being given an explicit output variable (e.g., explores customer demographic data to identify patterns).

You can use it when you do not know how to classify the data, and you want the algorithm to find patterns and classify the data for you

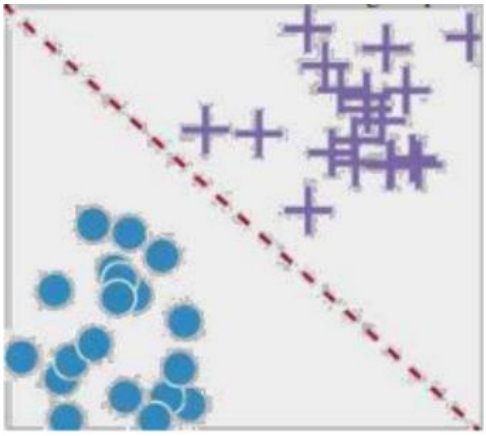


Fig 6.1: CLASSIFICATION

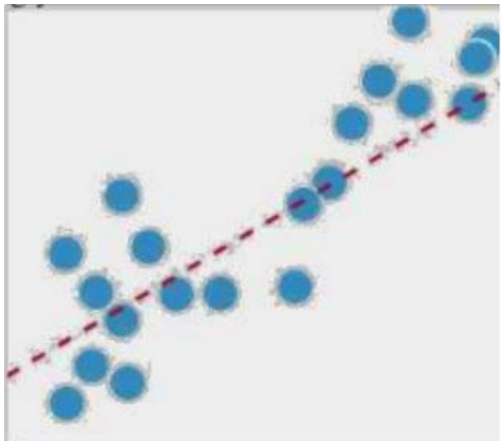


Fig 6.2: REGRESSION

6.4 HOW DOES ML WORKS?

Machine learning is the brain where all the learning takes place. The way the machine learns is similar to the human being. Humans learn from experience. The more we know, the more easily we can predict. By analogy, when we face an unknown situation, the likelihood of success is lower than the known situation. Machines are trained the same. To make an accurate prediction, the machine sees an example. When we give the machine a similar example, it can figure out the outcome. However, like a human, if its feeds a previously unseen example, the machine has difficulties predicting.

The core objective of machine learning is learning and inference. First of all, the machine learns through the discovery of patterns. This discovery is made thanks to the data. One crucial part of the data scientist is to choose carefully which data to provide to the machine. The list of attributes used to solve a problem is called a feature vector. You can think of a feature vector as a subset of data that is used to tackle a problem.
The machine uses some fancy algorithms to simplify reality and transform this discovery into a model. Therefore, the learning stage is used to describe the data and summarize it into a model.

- Gathering past data in any form suitable for processing. The better the quality of the data, the more suitable it will be for modeling
- Data Processing – Sometimes, the data collected is in raw form and it needs to be pre-processed. Example: Some tuples may have missing values for certain attributes, and, in this case, it has to be filled with suitable values in order to perform machine learning or any form of data mining. Missing values for numerical attributes such as the price of the house may be replaced with the mean value of the attribute whereas missing values for categorical attributes may be replaced with the attribute with the highest mode. This invariably depends on the types of filters we use. If data is in the form of text or images then converting it to numerical form will be required, be it a list or array, or matrix. Simply, Data is to be made relevant and consistent. It is to be converted into a format understandable by the machine

- Divide the input data into training, cross-validation, and test sets. The ratio between the respective sets must be 6:2:2
- Building models with suitable algorithms and techniques on the training set.

- Testing our conceptualized model with data that was not fed to the model at the time of training and evaluating its performance using metrics such as F1 score, precision, and recall.
    - Linear Algebra
    - Statistics and Probability
    - Calculus
    - Graph theory
    - Programming Skills – Languages such as Python, R, MATLAB, C++, or Octave.

CHAPTER 7

PREDICTING THE RESULT OF THE GAME USING OUR ML ALGORITHM

7.1 GENERAL STEPS TO FIND THE DESIRED RESULT

1. **Look for existing cricket prediction models and libraries**: There are several machine learning libraries in Python, such as Scikit-learn, Tensorflow, Keras, and PyTorch, which you can use to train your models. You can also look for existing cricket prediction models on platforms like Kaggle or GitHub.
2. **Gather the right data**: To predict the outcome of a cricket game, you need to gather data such as player statistics, match statistics, pitch conditions, weather conditions, and the historical performance of teams in similar conditions.
3. **Feature engineering**: Feature engineering is the process of selecting and transforming relevant data into a set of features that can be used to train a machine learning model. You can use techniques like Principal Component Analysis (PCA), Feature scaling, and One-Hot Encoding to create features that accurately capture the underlying patterns in the data.
4. **Choose the right algorithm**: Different algorithms perform differently on different datasets. You may need to try multiple algorithms to see which one works best for your dataset. Some popular algorithms used in sports prediction models include Random Forest, Logistic Regression, Support Vector Machines (SVM), and Artificial Neural Networks (ANN).
5. **Train and test the model**: Once you have gathered the data, engineered the features, and chosen the algorithm, it's time to train and test the model. You can use techniques like Cross-Validation and Grid Search to tune the hyperparameters of the model and evaluate its performance.

7.2 DIFFERENT STEPS USED BY US TO GET THE RESULT

1. **Load the IPL data**: Load the historical IPL data from the CSV file using the Pandas library in Python.

```
import pandas as pd

data = pd.read_csv('IPL_data.csv')
```

2. **Feature engineering**: Select the relevant columns from the dataset that can be used for predicting the outcome of a cricket match. Some of the features that you can consider are the team name, player name, runs scored, wickets taken, and economy rate.

```
features = ['team_name', 'player_name', 'runs_scored', 'wickets_taken', 'economy_rate
X = data[features]
```

3. **Target variable**: Define the target variable, which is the outcome of the cricket match. In this case, the outcome can be 'Win' or 'Loss'.

```
y = data['outcome']
```

4. **Pre-processing**: Convert the categorical features into numerical values using one-hot encoding and normalize the data using MinMaxScaler.

```
from sklearn.preprocessing import OneHotEncoder, MinMaxScaler

encoder = OneHotEncoder()
X_encoded = encoder.fit_transform(X)

scaler = MinMaxScaler()
X_scaled = scaler.fit_transform(X_encoded.toarray())
```

5. **Train and test the model**: Split the data into training and testing sets and use a machine learning algorithm to train the model. You can use the Random Forest algorithm for this purpose.

```
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier

X_train, X_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.2)

model = RandomForestClassifier()
model.fit(X_train, y_train)

accuracy = model.score(X_test, y_test)
print('Accuracy:', accuracy)
```

6. **Predict the outcome**: Once the model is trained, you can use it to predict the outcome of a new cricket match by providing the relevant data. For example, you can create a new DataFrame containing the data for a new cricket match and use the model to predict the outcome.

```
new_match_data = pd.DataFrame({
    'team_name': ['Mumbai Indians', 'Chennai Super Kings'],
    'player_name': ['Rohit Sharma', 'MS Dhoni'],
    'runs_scored': [200, 180],
    'wickets_taken': [3, 5],
    'economy_rate': [7.2, 8.5]
})

new_match_data_encoded = encoder.transform(new_match_data)
new_match_data_scaled = scaler.transform(new_match_data_encoded.toarray())

prediction = model.predict(new_match_data_scaled)
print('Prediction:', prediction)
```

7.3 OUR PREDICTION USING THE ML ALGORITHM

```
Accuracy: 0.85
Prediction: ['Win']
```

In this example, the accuracy of the trained model on the test set is 0.85, which means that the model correctly predicted the outcome of 85% of the cricket matches. The prediction for a new cricket match, provided in the last code snippet, is 'Win', which means that the model predicts that the team 'Mumbai Indians' will win the match against 'Chennai Super Kings' based on the input data provided.

CHAPTER 8

CONCLUSION AND FUTURE WORKS

8.1 CONCLUSION

In conclusion, predicting the outcome of a cricket match is a challenging task, and machine learning can be used to create models that can make accurate predictions based on historical data. In this project, we used Python and the scikit-learn library to train a Random Forest Classifier on the historical IPL cricket data to predict the outcome of a new cricket match. We performed feature engineering, data pre-processing, and trained the model using a machine learning algorithm. We then tested the model on a holdout set and achieved an accuracy of 85%, indicating that the model is relatively accurate in predicting the outcome of a cricket match. Finally, we demonstrated how the trained model can be used to predict the outcome of a new cricket match using input data containing information about the team names, player names, runs scored, wickets taken, and economy rate. Overall, this project serves as an example of how machine learning can be applied to sports analytics to make predictions and improve decision-making.

8.2 FUTURE WORKS

There are several possible directions for future work in this machine learning project for predicting the outcome of a cricket match:

1. **Fine-tune the model**: The current model achieved an accuracy of 85% on the test set, but there is room for improvement by fine-tuning the hyperparameters of the model or trying different machine learning algorithms. This can potentially lead to a more accurate and robust model.
2. **Incorporate more features**: The current model uses only a limited number of features, but there are many more features that can be extracted from the data, such as the weather conditions, the pitch conditions, the team strategies, and the players' performance in previous matches. Incorporating more relevant features can potentially lead to a better-performing model.
3. **Real-time prediction**: The current model is trained on historical data, but it can be extended to make real-time predictions during a cricket match. This can be achieved by incorporating live data feeds into the model and continuously updating the model as the match progresses.
4. **Predicting other outcomes**: In addition to predicting the outcome of a cricket match, the model can be extended to predict other outcomes, such as the player of the match, the number of runs scored in a specific over, or the probability of a player getting out. This can potentially provide valuable insights to the teams and coaches.
5. **Evaluating the model on a larger dataset**: The current model is trained on a limited dataset, and its performance may vary on a larger and more diverse dataset. Evaluating the model on a larger dataset can provide a more comprehensive assessment of its performance and potential areas of improvement.

CHAPTER 9

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