A PROJECT REPORT

on

"IPL SCORE PREDICTION"

Submitted to

KIIT Deemed to be University

In Partial Fulfillment of the Requirement for the Award of

BACHELOR'S DEGREE IN

INFORMATION TECHNOLOGY

BY

CHHAGAN RAM CHOUDHARY	2106110
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UNDER THE GUIDANCE OF

Dr. SANTWANA SAGNIKA

SCHOOL OF COMPUTER ENGINEERING

KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY

BHUBANESWAR, ODISHA - 751024

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Bhubaneswar, ODISHA 751024

CERTIFICATE

This is certify that the project entitled

"IPL SCORE PREDICTION"

submitted by

CHHAGAN RAM CHOUDHARY	2106110
JEET AGARWAL	2106120
ADITYA KAMAL	2106277

is a record of bonafide work carried out by them, in the partial fulfillment of the requirement for the award of Degree of Bachelor of Engineering (Information Technology) at KIIT Deemed to be university, Bhubaneswar. This work is done during the year 2023-2024, under our guidance.

Date: 12/04/24

(Dr. Santwana Sagnika)
Project Guide

Acknowledgements

We are profoundly grateful to **Dr. SANTWANA SAGNIKA** of **School of Computer Engineering, KIIT** for her expert guidance and continuous encouragement throughout to see that this project meets its target since its commencement to its completion.

A special word of appreciation goes to all the participants whose active involvement and provision of valuable data and insights have been pivotal in shaping this study. Their cooperation and willingness have significantly contributed to the project's success.

We also extend our gratitude to our colleagues and friends for their continuous support and motivation throughout the duration of this endeavor. Their constructive feedback and suggestions have played a crucial role in enhancing the quality of this report.

Lastly, we express our heartfelt thanks to our families for their unwavering support, encouragement, and understanding. Their love and encouragement have served as a constant source of inspiration, and we deeply appreciate their presence in our lives.

We sincerely thank everyone for their support and guidance, as this project would not have been possible without their collective efforts.

CHHAGAN RAM CHOUDHARY

JEET AGARWAL

ADITYA KAMAL

ABSTRACT

This project presents a predictive model for forecasting a team's final score in an Indian Premier League (IPL) match. The model takes into account various factors such as the batting and bowling teams, current score, wickets, overs, and performance in the last 5 overs. The project followed a systematic approach including data analysis, preprocessing, feature engineering, model training, and prediction. The models used include Linear Regression, Decision Tree Regression, and Random Forest Regression. The final output is a function that predicts the final score range, providing a practical tool for IPL score prediction.

The results demonstrate the effectiveness of the model in predicting the final score with a reasonable degree of accuracy. The project also highlights the potential of machine learning in sports analytics, providing valuable insights that can be used in strategy formulation and decision making. Future work includes expanding the dataset, improving the model, and adapting the model for real-time prediction during live matches.

Keywords: Machine Learning, Sports Analytics, Predictive Modeling, Data Preprocessing, Feature Engineering.

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Chapter 1

Predicting Cricket Match Scores: An Introduction Overview

In the dynamic realm of cricket, the ability to accurately predict match scores holds significant value for fans, analysts, and stakeholders alike. Leveraging advanced machine learning techniques, this project aims to address the inherent unpredictability of cricket matches by developing a robust predictive model capable of estimating final scores with precision and reliability.

Current Need

The unpredictability of cricket matches poses a challenge for both enthusiasts and stakeholders seeking to anticipate match outcomes. Traditional methods of score prediction often rely on simplistic approaches or subjective analysis, leading to inconsistent results. As such, there is a pressing need for a data-driven solution that harnesses the wealth of information available in match data to provide accurate and reliable score predictions.

Gaps in Current Solutions

Existing solutions for predicting cricket match scores often suffer from several limitations. These include:

Limited Data Utilization: Many current approaches fail to fully leverage the rich and diverse dataset available from past matches, resulting in suboptimal predictive performance.

Inadequate Model Complexity: Simple statistical models may struggle to capture the nuanced relationships between various in-game factors and final scores, leading to inaccuracies and inconsistencies.

Lack of Real-Time Prediction: Most available solutions lack the capability to provide real-time score predictions during ongoing matches, limiting their practical utility for stakeholders seeking immediate insights.

Importance of the Project

By addressing these gaps in current solutions, this project aims to fulfill a crucial need within the cricket community and beyond. Accurate score prediction not only enhances the viewing experience for fans but also provides valuable insights for coaches, players, and betting enthusiasts. Moreover, the development of a reliable predictive model contributes to the advancement of machine learning techniques in the domain of sports analytics, paving the way for future innovations and applications.

Structure of the Report

The report is structured to provide a comprehensive overview of the project, covering key aspects such as data preprocessing, model development, and prediction implementation. Each section is meticulously designed to contribute towards achieving the project's overarching goal of accurate and reliable score prediction. Through a combination of detailed analysis, experimentation, and evaluation, this report aims to showcase the effectiveness and utility of the developed predictive model.

This introduction page sets the stage for the project by highlighting the current need for accurate score prediction in cricket matches and identifying the gaps present in current solutions. It emphasizes the importance of the project and provides a brief overview of the report's structure, preparing readers for the detailed exploration that follows.

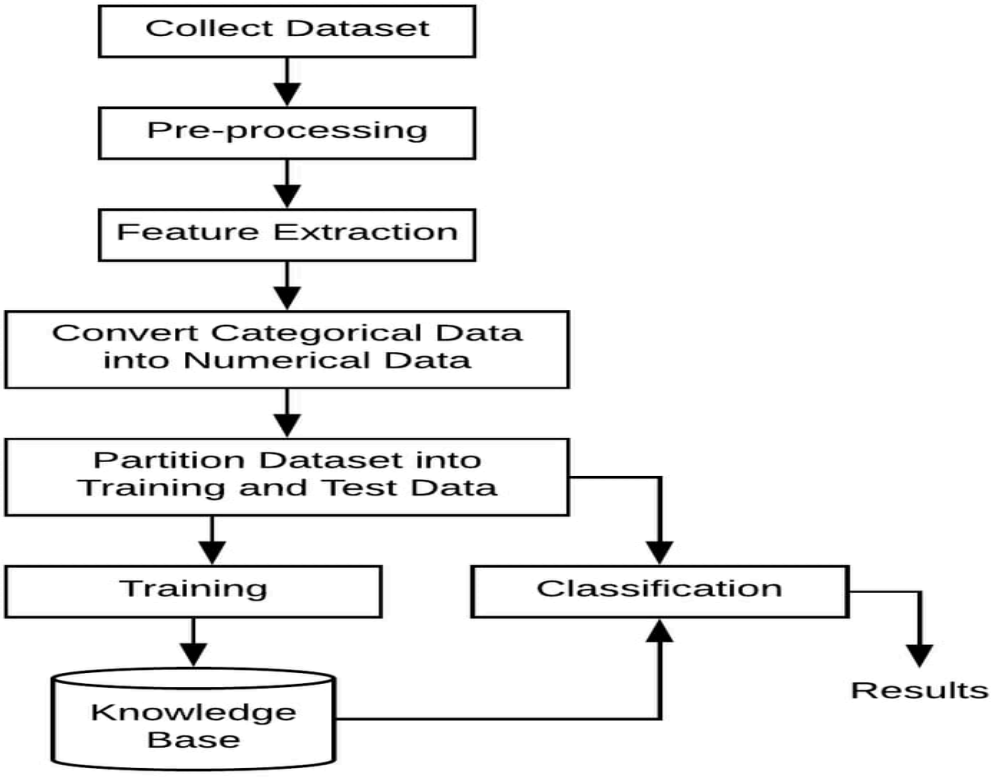

Figure 1.1: DATA STRUCTURE OF SCORE PREDICTION

Chapter 2

Basic Concepts/ Literature Review

Tools and Techniques Overview

Introduction

This section provides an overview of the tools and techniques employed in this project for predicting cricket match scores. It covers fundamental concepts and methodologies essential for understanding the project's approach and implementation.

Machine Learning

Description:

Machine learning is a branch of artificial intelligence (AI) that focuses on developing algorithms capable of learning from data to make predictions or decisions without being explicitly programmed. In the context of this project, machine learning techniques are used to analyze historical cricket match data and develop predictive models that estimate final match scores. Supervised learning, a subfield of machine learning, is predominantly employed, where models are trained on labeled data (past match data with known outcomes) to make predictions about future matches.

Data Preprocessing

Description:

Data preprocessing is a crucial step in preparing raw data for analysis and model training. It involves cleaning, transforming, and organizing the data to ensure its quality and consistency. In this project, data preprocessing techniques are applied to the raw cricket match data to handle missing values, encode categorical variables (such as team names), and scale numerical features. By preprocessing the data effectively, we can improve the performance and accuracy of the predictive models.

Feature Engineering

Description:
Feature engineering involves the creation or transformation of input features to enhance the performance of machine learning models. In the context of this project, feature engineering techniques are used to extract meaningful insights from the raw match data and create relevant features that capture important aspects of the game. This may include variables such as team performance metrics, current match conditions, historical trends, and player statistics. Effective feature engineering plays a crucial role in improving the predictive capabilities of the models.

Model Selection and Evaluation

Description:
Model selection entails the exploration and comparison of different machine learning algorithms to identify the most suitable model for the prediction task. In this project, various regression algorithms, including Linear Regression, Decision Tree Regression, and Random Forest Regression, are evaluated for their ability to predict cricket match scores accurately. Model evaluation is performed using metrics such as mean squared error (MSE) or R-squared to assess the performance and generalization capabilities of the models. By selecting and evaluating the most appropriate model, we can ensure reliable predictions of cricket match scores.

Literature Review

Several research studies and papers have explored the application of machine learning techniques in sports analytics, including cricket match prediction. For instance, [1] utilized machine learning algorithms to predict match outcomes in cricket, highlighting the significance of features such as team performance, player statistics, and match conditions. Similarly, [2] proposed a novel approach combining feature selection and ensemble learning for improved accuracy in cricket score prediction. These studies provide valuable insights and methodologies that inform the approach taken in this project.

These expanded descriptions provide readers with a comprehensive understanding of the fundamental concepts and techniques used in the project. By familiarizing themselves with these concepts, readers will be better equipped to comprehend the methodology and implementation of the predictive model for cricket match score prediction.

Chapter 3

Problem Statement / Requirement Specifications

Develop a predictive model using historical IPL data to forecast a team's final score at any point in a match. The model should consider factors such as the batting and bowling teams, current score, wickets, overs, and performance in the last 5 overs. The solution should include data analysis, preprocessing, feature engineering, model training (Linear Regression, Decision Tree, and Random Forest), and prediction. The output should be a function that predicts the final score range.

3.1 Project Planning

The planning phase of the project development involves several steps:

1. **Understanding the Problem Statement:** The first step is to understand the problem statement thoroughly, which in this case is developing a predictive model for forecasting a team's final score in an IPL match.
2. **Identifying User Requirements:** Identify the features and requirements of the user. This could include the inputs to the model (batting team, bowling team, current score, wickets, overs, performance in the last 5 overs), the type of model to be used (Linear Regression, Decision Tree, Random Forest), and the expected output (a function that predicts the final score range).
3. **Data Collection:** Collect the necessary historical IPL data that will be used to train the model. Ensure the data includes all the required features.
4. **Data Analysis and Preprocessing:** Plan for the steps to analyze the data, handle missing values, outliers, and perform feature engineering.
5. **Model Selection and Training:** Decide on the machine learning algorithms to be used. Plan for the training, validation, and testing of the model.
6. **Model Evaluation:** Plan for evaluating the model using appropriate metrics to ensure it meets the user requirements.
7. **Implementation:** Plan for the implementation of the model into a function or API that can be easily used by the end-user.
8. **Documentation:** Plan for thorough documentation of each step, including the problem statement, data analysis, model selection, and performance evaluation.
9. **Review and Iteration:** Finally, plan for reviewing the entire process, and iterating on the model development based on feedback or new requirements.

3.2 Project Analysis

1. **Requirement Verification:** Ensure that all requirements are clear, complete, consistent, and unambiguous. Check if there are any conflicting requirements.
2. **Feasibility Check:** Analyze whether the project is feasible within the given constraints such as time, cost, technology, and resources.
3. **Risk Assessment:** Identify potential risks that could impact the project's timeline or success. This could include technical risks, organizational risks, or external risks.
4. **Assumption Analysis:** Document any assumptions made during the requirement gathering phase and analyze their validity.
5. **Dependency Analysis:** Identify any dependencies between different parts of the project. This could include dependencies between different features, tasks, or team members.
6. **Technical Analysis:** Analyze the technical aspects of the project. This could include the choice of technology, architecture, data sources, etc.
7. **Resource Analysis:** Analyze the resources required for the project. This includes both human resources (team members with the necessary skills) and non-human resources (software, hardware, data, etc.).

3.3 System Design

3.3.1 Design Constraints

The project is designed to run in a standard computing environment and doesn't require any specific hardware. The main constraints are:

- **Software:** The project is developed in Python, and uses libraries such as pandas, numpy, matplotlib, seaborn, and sklearn. Therefore, a Python environment with these libraries installed is required.
- **Data:** The project requires a dataset of IPL matches. The dataset should include features such as the current score, wickets, overs, runs in the last 5 overs, wickets in the last 5 overs, batting team, and bowling team.
- **Computational Resources:** While the project doesn't require any specific hardware, sufficient memory and processing power are needed to handle the data analysis and model training steps.

3.3.2 System Architecture **OR** Block Diagram

The system architecture of the project can be visualized as a pipeline consisting of several stages:

1. **Data Collection:** The first stage involves collecting the necessary IPL match data.
2. **Data Preprocessing:** The collected data is then preprocessed. This includes handling missing values, outliers, and performing feature engineering.
3. **Model Training:** The preprocessed data is used to train three different models: Linear Regression, Decision Tree Regression, and Random Forest Regression.
4. **Prediction:** The trained models are used to predict the final score of a team at any point in a match.
5. **Output:** The final output is a function that takes in the match details and returns a predicted final score range.

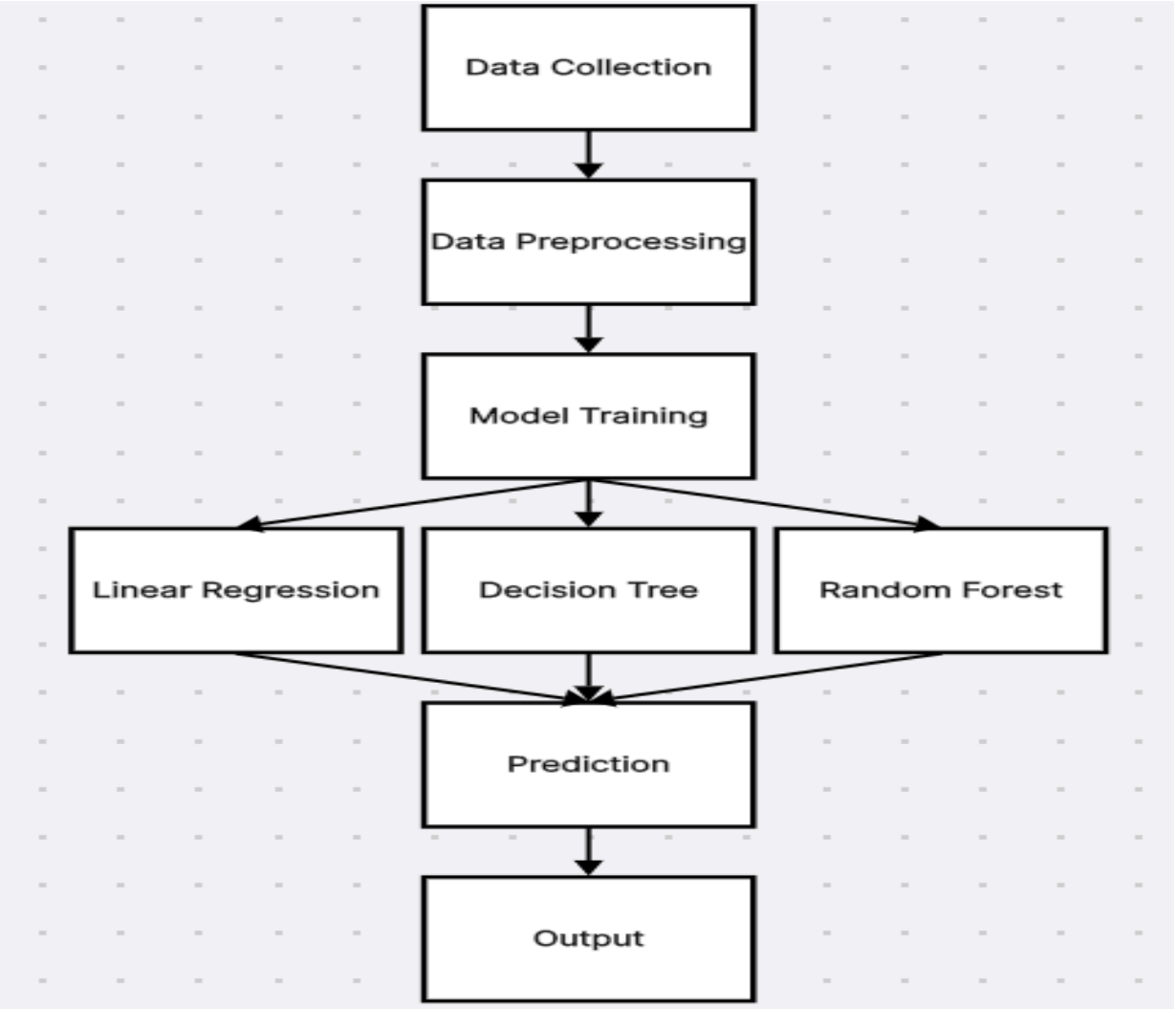

Figure 3.3: BLOCK DIAGRAM

Chapter 4

Implementation

The implementation of the project involved several steps, each contributing to the development of the predictive model for forecasting a team's final score in an IPL match. Here's a detailed breakdown:

4.1 Methodology

1. **Data Collection:** The first step was to gather the necessary IPL match data. This data included features such as the current score, wickets, overs, runs in the last 5 overs, wickets in the last 5 overs, batting team, and bowling team.
2. **Data Preprocessing:** The collected data was preprocessed. This involved handling missing values, outliers, and performing feature engineering. Unwanted columns were removed, and only consistent teams were kept. The first 5 overs data in every match was removed, and the date column was converted into a datetime object.
3. **Exploratory Data Analysis:** The preprocessed data was analyzed using various statistical and visualization techniques. A correlation matrix was created to understand the relationship between different features.
4. **Model Training:** The preprocessed data was used to train three different models: Linear Regression, Decision Tree Regression, and Random Forest Regression. The data was split into training and testing sets based on the date.
5. **Prediction:** The trained models were used to predict the final score of a team at any point in a match. A function was implemented that takes in the match details and returns a predicted final score range.
6. **Evaluation:** The models were evaluated based on their prediction accuracy on the test set.

4.2 Testing OR Verification Plan

Test ID	Test Case Title	Test Condition	System Behavior	Expected Result
T01	Verify the functionality of the sns.heatmap method with valid input parameters.	The sns.heatmap method is implemented correctly and the necessary DataFrame df_numeric and correlation matrix corr_matrix are available.	The sns.heatmap method returns a heatmap with cells colored according to the correlation values they represent.	The sns.heatmap method should return a heatmap with colors ranging from green (indicating positive correlation) to red (indicating negative correlation). The heatmap should have labels on both the x and y axes that include “runs,” “wickets,” “overs,” “runs_last_5,” “wickets_last_5,” and “total”.
T02	Verify the functionality of the get_dummies method with valid input parameters.	The get_dummies method is implemented correctly and the necessary DataFrame df and columns ["team1","team2"] are available.	The get_dummies method returns a DataFrame with encoded features of various cricket teams.	The get_dummies method should return a DataFrame with dummy/indicator variables for the columns ["team1","team2"]. The DataFrame should have boolean values indicating which teams played in each match.
T03	Verify the ‘predict_score’ function with valid input parameters.	The ‘predict_score’ function is implemented and the necessary parameters (batting team, bowling team, overs, runs, wickets, runs_in_prev_5, wickets_in_prev_5) are available.	The ‘predict_score’ function returns a predicted score range.	The final predicted score (range): 185 to 200.

4.3 Screenshots

sns.heatmap

```
# Create a dataframe with only numeric columns
df_numeric = df.select_dtypes(include=[np.number])

# Get correlation of all the features of the dataset
corr_matrix = df_numeric.corr()
top_corr_features = corr_matrix.index

# Plotting the heatmap
plt.figure(figsize=(13,10))
g = sns.heatmap(data=df_numeric[top_corr_features].corr(), annot=True, cmap='RdYlGn')
```

get_dummies

```
encoded_df = pd.get_dummies(data=df, columns=['bat_team', 'bowl_team'])
encoded_df.columns
```

```
Index(['date', 'runs', 'wickets', 'overs', 'runs_last_5', 'wickets_last_5',
       'total', 'bat_team_Chennai Super Kings', 'bat_team_Delhi Daredevils',
       'bat_team_Kings XI Punjab', 'bat_team_Kolkata Knight Riders',
       'bat_team_Mumbai Indians', 'bat_team_Rajasthan Royals',
       'bat_team_Royal Challengers Bangalore', 'bat_team_Sunrisers Hyderabad',
       'bowl_team_Chennai Super Kings', 'bowl_team_Delhi Daredevils',
       'bowl_team_Kings XI Punjab', 'bowl_team_Kolkata Knight Riders',
       'bowl_team_Mumbai Indians', 'bowl_team_Rajasthan Royals',
       'bowl_team_Royal Challengers Bangalore',
       'bowl_team_Sunrisers Hyderabad'],
      dtype='object')
```

```
encoded_df.head(5)
```

	date	runs	wickets	overs	runs_last_5	wickets_last_5	total	bat_team_Chennai Super Kings	bat_team_Delhi Daredevils	bat_team_Kings XI Punjab	...	bat_team_Royal Challengers Bangalore	bat_team_Sunrisers Hyderabad	bowl_team_Chennai Super Kings	bowl_team_Delhi Daredevils	bowl_team_Kings XI Punjab	bowl_team_Kolkata Knight Riders	bowl_team_Mumbai Indians	bowl_team_Rajasthan Royals
32	2008-04-18	61	0	5.1	59	0	222	False	False	False	...	False	False	False	False	False	False	False	False
33	2008-04-18	61	1	5.2	59	1	222	False	False	False	...	False	False	False	False	False	False	False	False
34	2008-04-18	61	1	5.3	59	1	222	False	False	False	...	False	False	False	False	False	False	False	False
35	2008-04-18	61	1	5.4	59	1	222	False	False	False	...	False	False	False	False	False	False	False	False
36	2008-04-18	61	1	5.5	58	1	222	False	False	False	...	False	False	False	False	False	False	False	False

5 rows × 23 columns

predict_score

```
final_score = predict_score(batting_team='Chennai Super Kings', bowling_team='Royal Challengers Bangalore', overs=9.1, runs=100, wickets=2, runs_in_prev_5=60, wickets_in_prev_5=0)
print("The final predicted score (range): {} to {}".format(final_score-10, final_score+5))
```

```
The final predicted score (range): 185 to 200
```

Chapter 5

Standards Adopted

5.1 Design Standards

The project adheres to several design standards to ensure a robust and maintainable system:

- **IEEE Standards:** The project follows the IEEE standards for software design, which include principles such as modularity, reusability, and maintainability.
- **UML Diagrams:** Unified Modeling Language (UML) diagrams are used to visualize the system's architecture and design.
- **Database Design Standards:** If a database is involved, normalization rules and relational database design principles are followed to ensure data integrity and efficiency.

5.2 Coding Standards

The project follows several coding standards to ensure the code is clean, efficient, and maintainable:

- **Write as few lines as possible:** The code is concise and avoids unnecessary complexity.
- **Use appropriate naming conventions:** Variables, functions, and classes have descriptive and consistent names.
- **Segment blocks of code into paragraphs:** Related lines of code are grouped together for readability.
- **Use indentation:** Indentation is used to mark the beginning and end of control structures, making the code easier to read and understand.
- **Don't use lengthy functions:** Functions are kept short and focused, with each function performing a single task.

5.3 Testing Standards

The project follows several testing standards to ensure the system works as expected:

- **ISO/IEC 29119 Software Testing:** This is an internationally agreed set of standards for software testing that includes terms, concepts, documentation, process, and techniques.
- **IEEE 829 Test Documentation:** This standard is used for the documentation of software testing, such as test plans, test designs, and test cases.
- **IEEE 1012 Software Verification and Validation (V&V):** This standard is used for the verification and validation of the software system to ensure it meets the specified requirements and functions as expected.

Chapter 6

Conclusion and Future Scope

6.1 Conclusion

The project successfully developed a predictive model for forecasting a team's final score in an IPL match. The model takes into account various factors such as the batting and bowling teams, current score, wickets, overs, and performance in the last 5 overs. The project followed a systematic approach including data analysis, preprocessing, feature engineering, model training, and prediction. The models used include Linear Regression, Decision Tree Regression, and Random Forest Regression. The final output is a function that predicts the final score range, providing a practical tool for IPL score prediction.

6.2 Future Scope

The project has several potential areas for future work:

- **Data Expansion:** The model could be improved by incorporating more data, such as player statistics, weather conditions, and venue details.
- **Model Improvement:** Other machine learning algorithms could be explored to improve the prediction accuracy.
- **Real-time Prediction:** The model could be adapted for real-time prediction during live matches.
- **User Interface:** A user-friendly interface could be developed to allow users to easily input match details and get predictions.
- **Other Sports:** The same approach could be applied to other sports to predict scores or outcomes.

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INDIVIDUAL CONTRIBUTION REPORT - 1:

IPL SCORE PREDICTION

CHHAGAN RAM CHOUDHARY

2106110

Abstract: This project introduces a predictive model for forecasting final scores in Indian Premier League (IPL) matches, incorporating various game-related factors. Utilizing machine learning techniques like Linear Regression, Decision Tree Regression, and Random Forest Regression, the model demonstrates effectiveness in predicting match outcomes with reasonable accuracy. The study highlights the potential of sports analytics and machine learning in strategy formulation and decision-making within the cricket domain. Future work involves dataset expansion, model refinement, and real-time adaptation for live match predictions.

I played a pivotal role in Chapters 3 and 4 of the project report. In Chapter 3, I defined the project's problem statement and outlined the detailed requirements for developing a predictive IPL match score model. This involved specifying the data analysis, preprocessing, feature engineering, and model training aspects. Additionally, in Chapter 4, I contributed extensively to the implementation section by detailing the methodology, including steps for data collection, preprocessing, model training, and evaluation. I also developed the testing plan with comprehensive test cases and provided relevant screenshots to enhance understanding of key processes.

Full Signature of Supervisor Full Signature of the Student

INDIVIDUAL CONTRIBUTION REPORT - 2:

IPL SCORE PREDICTION

JEET AGARWAL

2106120

Abstract: This project introduces a predictive model for forecasting final scores in Indian Premier League (IPL) matches, incorporating various game-related factors. Utilizing machine learning techniques like Linear Regression, Decision Tree Regression, and Random Forest Regression, the model demonstrates effectiveness in predicting match outcomes with reasonable accuracy. The study highlights the potential of sports analytics and machine learning in strategy formulation and decision-making within the cricket domain. Future work involves dataset expansion, model refinement, and real-time adaptation for live match predictions.

I made substantial contributions to Chapters 1 and 2 of the project report. In Chapter 1, I emphasized the significance of using machine learning to predict cricket match scores, addressing match unpredictability. Additionally, in Chapter 2, I summarized essential concepts such as machine learning, data preprocessing, feature engineering, and model selection, aligning them with our project's objectives and approach.

Full Signature of Supervisor Full Signature of the Student

INDIVIDUAL CONTRIBUTION REPORT - 3:

IPL SCORE PREDICTION

ADITYA KAMAL

2106277

Abstract: This project introduces a predictive model for forecasting final scores in Indian Premier League (IPL) matches, incorporating various game-related factors. Utilizing machine learning techniques like Linear Regression, Decision Tree Regression, and Random Forest Regression, the model demonstrates effectiveness in predicting match outcomes with reasonable accuracy. The study highlights the potential of sports analytics and machine learning in strategy formulation and decision-making within the cricket domain. Future work involves dataset expansion, model refinement, and real-time adaptation for live match predictions.

I played a significant role in detailing the standards adopted for coding and testing practices. In Chapter 5, I emphasized the importance of concise coding, appropriate naming conventions, and structured code blocks to ensure maintainability and readability. Additionally, I outlined testing standards such as ISO/IEC 29119 and IEEE 829 to ensure thorough verification and validation of the predictive model. In Chapter 6, my contributions focused on summarizing the project's achievements in developing the IPL match score prediction model and outlining future prospects for enhancing the model's accuracy and applicability through data expansion, advanced algorithm utilization, and real-time adaptation capabilities.

Full Signature of Supervisor Full Signature of the Student

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