Vivekananda Institute of Professional Studies - Technical Campus (Affiliated to GGSIP University, Delhi, Recognized by AICTE)

Vivekananda School of Information Technology

**IPL Predictor: Past Trends, Future Champions**

DISSERTATION

***Submitted by***

Archit Tanwar

***in partial fulfilment for the award of the degree of* MASTERS OF COMPUTER APPLICATION Batch: 2023-2025**

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| --- | --- |
| **Submitted To:** | **Submitted By:** |
| **Dr. Pooja Thakar** | **Archit Tanwar** |
| **Associate Professor** | **06417704423** |
| **VSIT, VIPS** | **MCA 4B** |

**CERTIFICATE**

This is to certify that the Project Report entitled " IPL Predictor: Past Trends, Future Champions " is a bonafide work carried out by Archit Tanwar in partial fulfillment of the requirements for the award of the degree of Master of Computer Applications (MCA) from Vivekananda Institute of Professional Studies - Technical campus, New Delhi, under our guidance and direction.

(Dr. Pooja Thakar ) (Dr. Deepali Kamthania)

Internal Guide Dean-IT, VIPS-TC

**CANDIDATE’S DECLARATION**

This is to certify that this project entitled “IPL Predictor: Past Trends, Future Champions” submitted in partial fulfilment of the 4th semester of MCA to the VIPS, done by Mr. Archit Tanwar, Roll No. (06417704423) is an authentic work carried out by him at Vivekanand Institute of Professional Studies- TC under my guidance **Dr. Pooja Thakar (Associate Professor)**.

#### Signature of the Student Signature of the Guide

#### ARCHIT TANWAR Dr. Pooja Thakar

#### 06417704423 (Associate Professor)

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Archit Tanwar

06417704423

MCA 4B

**Vivekananda Institute of Professional Studies**

**AU Block, Outer Ring Road, Pitampura, Delhi- 110034 (NAAC Accredited ‘A' Grade & ISO 9001:2008 Certified Institution)**

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****

**Date:**

**DECLARATION**

It is hereby certified that the dissertation **entitled IPL Predictor: Past Trends, Future Champions** submitted by **Archit Tanwar(06417704423)**, in partial fulfillment of requirements for the award of degree of **Master of Computer Application** submitted to the School of Information Technology at **Vivekananda Institute of Professional Studies, Delhi** affiliated to **GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY, Delhi** is an authentic record of my work carried out under the supervision **of Dr. Pooja Thakar , Associate Professor**. The matter presented herein has not been submitted earlier by me to any other university / institution for the award of any degree.

**Archit Tanwar**

**(06417704423)**

## …………………………… (Prof. Deepali Kamthania)

## (Name of the project Supervisor) Dean (VSIT)



**Abstract**

The IPL Predictor: Past Trends, Future Champions project develops a data analytics tool to forecast the top 10 bowlers and batters for the Indian Premier League (IPL) 2025 season using historical data from 2022–2024. Leveraging Power BI, the system processes CSV/Excel datasets sourced from platforms like Cricbuzz, employing DAX calculations to compute performance metrics such as batting average and economy rate. Key-value pair validation ensures data integrity by enforcing constraints like non-negative runs scored and valid player IDs. The results are visualized in an interactive Power BI dashboard, embedded in a static HTML interface (index.html) with a vibrant, modern design, alongside a contact page (contact.html) for team profiles. Rigorous testing, including unit, integration, and system tests, validates prediction accuracy and interface functionality. The project delivers reliable predictions for cricket analysts and fans, with future potential for real-time data integration and dynamic web features.

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**Synopsis**

**Title of the Project**

IPL Predictor: Past Trends, Future Champions

**Statement about the Problem**

The Indian Premier League (IPL) produces vast player performance data, making it challenging to predict top performers for future seasons. Forecasting the top 10 bowlers and batters for IPL 2025 based on 2022–2024 data requires systematic analysis of performance metrics amidst variables like player form, team strategies, and playing conditions. The problem is to develop a reliable statistical model using Power BI to extract and analyze data, providing actionable predictions for fans, analysts, and team management.

**Why is this Particular Topic Chosen? (Present State of the Art)**

This topic was selected due to the rising popularity of data analytics in cricket, particularly for the IPL, a globally celebrated T20 league. The project uses Power BI’s data extraction and visualization capabilities to predict individual player performance, an underexplored area compared to match or team predictions. Present State of the Art: Platforms like Cricbuzz and ESPN Cricinfo offer detailed IPL statistics but lack predictive tools for future seasons. Current analytical approaches focus on match outcomes using basic stats, with limited emphasis on forecasting individual performances. This project bridges this gap by using Power BI formulas to extract and analyze IPL data (2022–2024) and predict top performers for 2025, contributing to cricket analytics.

**Objective and Scope of the Project**

Objective: To develop a statistical model in Power BI that extracts and analyzes IPL player performance data from 2022 to 2024 using formulas to forecast the top 10 bowlers and batters for the 2025 season, ranked by key metrics (e.g., runs scored, wickets taken, economy rate, strike rate).  
Scope:

* Extract and preprocess IPL match data (2022–2024) from reliable sources (e.g. Cricbuzz) using Power BI.
* Develop performance metrics (e.g., batting average, bowling economy) using Power BI formulas.
* Use statistical ranking methods to predict top performers.
* Create visualizations in Power BI to present predictions and trends.
* Limited to individual player performance (bowlers and batters), excluding team or match outcome predictions.

**Analysis, Design, Development & Testing Methodology**

* Analysis: Perform Exploratory Data Analysis (EDA) in Power BI to identify trends, outliers, and key performance indicators in IPL data (2022–2024) using statistical measures.
* Design: Design a Power BI-based system with components for data extraction, metric calculation, statistical analysis, and interactive dashboards.
* Development:
  + Extract and preprocess data in Power BI using DAX (Data Analysis Expressions) formulas to clean and structure data.
  + Calculate performance metrics (e.g., batting average, bowling economy, consistency score) using DAX formulas.
  + Develop a weighted scoring or ranking system in Power BI to predict top 10 performers.
  + Create interactive visualizations (e.g., bar charts, trend lines) using Power BI dashboards.
* Testing Methodology:
  + Validate data accuracy by cross-referencing Power BI outputs with source data.
  + Test ranking formulas by predicting 2024 top performers using 2022–2023 data and comparing with actual results.
  + Evaluate prediction reliability using statistical measures like percentage accuracy and error margins.

**Hardware & Software to be Used**

* Hardware:
  + Standard laptop/desktop with minimum 8GB RAM, Intel i5 processor (or equivalent), and 256GB SSD.
* Software:
  + Primary Tool: Microsoft Power BI Desktop (latest version).
  + Supporting Tools: Microsoft Excel for initial data preparation (if needed).
  + Programming: DAX (Data Analysis Expressions) for formulas in Power BI.
  + OS: Windows 10/11.
  + Data Sources: Cricbuzz, ESPN Cricinfo (exported as CSV or Excel files for Power BI import).

**Testing Technologies to be Used**

* Data Validation: Verify data integrity in Power BI by comparing extracted data with original sources.
* Formula Testing: Test DAX formulas for accuracy in calculating metrics (e.g., batting average, economy rate).
* Prediction Testing: Assess ranking system by comparing predicted rankings with historical data.
* Visualization Testing: Manually verify Power BI dashboards for accuracy and interactivity.
* Performance Testing: Measure data processing and dashboard rendering time in Power BI.

h. What Contribution/Value Addition Would the Project Make?

* Contribution:
  + Delivers a Power BI-based tool for IPL stakeholders to anticipate top performers in 2025.
  + Advances cricket analytics by using Power BI for individual player predictions.
  + Provides a reusable framework for future IPL seasons or other T20 leagues.
* Value Addition:
  + Enables data-driven decisions for team selections and fantasy league strategies.
  + Engages fans with interactive Power BI dashboards showcasing predictions.
  + Contributes to academic research in sports analytics using business intelligence tools.

**Limitations/Constraints of the Project**

* Limited to 2022–2024 data, which may not capture long-term trends or new players.
* Predictions may be affected by external factors (e.g., injuries, team changes, pitch conditions).
* Dependency on the quality and format of IPL data for Power BI import.
* Limited to top 10 bowlers and batters, excluding all-rounders or other roles.
* Power BI’s formula-based approach may oversimplify complex performance dynamics.

**Conclusion, Future Scope for Modification**

* Conclusion: The IPL Predictor project uses Power BI to extract and analyze 2022–2024 IPL data, forecasting the top 10 bowlers and batters for 2025. It showcases the potential of business intelligence tools in sports analytics.
* Future Scope:
  + Extend predictions to include all-rounders, match outcomes, or team rankings.
  + Integrate real-time data feeds into Power BI for dynamic insights.
  + Incorporate additional data (e.g., player fitness, weather conditions).
  + Publish dashboards online via Power BI Service for public access.

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**CHAPTER 2: PROJECT DESCRIPTION**

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**2.1 System Interfaces**

The IPL Predictor system is a standalone analytical tool developed using Microsoft Power BI Desktop. The system interfaces include:

* **User Interface**: An interactive Power BI dashboard displaying predictions of the top 10 bowlers and batters for IPL 2025, along with visualizations (e.g., bar charts, trend lines) of performance metrics (runs scored, wickets taken, economy rate, strike rate). Users can filter data by season, team, or player.
* **Data Input Interface**: Power BI imports data from external sources (CSV or Excel files) containing IPL match data (2022–2024) from platforms like Cricbuzz, or ESPN Cricinfo.
* **Output Interface**: Power BI generates reports and visualizations, exportable as PDF or Power BI files for stakeholder use. No external system integration is required.

**2.2 System Specifications**

**2.2.1 Hardware Requirements**

* **Processor**: Intel i5 or equivalent (minimum).
* **RAM**: 8GB (minimum), 16GB recommended for faster data processing.
* **Storage**: 256GB SSD (minimum) to store datasets and Power BI files.
* **Display**: 1366x768 resolution (minimum) for clear dashboard visualization.
* **Operating System Compatibility**: Windows 10/11 (64-bit).

**2.2.2 Software Requirements**

* **Primary Tool**: Microsoft Power BI Desktop (latest version, free license).
* **Supporting Tools**: Microsoft Excel (optional, for initial data preparation).
* **Programming**: DAX (Data Analysis Expressions) for formulas within Power BI.
* **Data Sources**: CSV/Excel files from Cricbuzz, or ESPN Cricinfo.
* **Operating System**: Windows 10/11.
* **Additional Software**: Adobe Acrobat Reader (for viewing exported PDF reports).

**2.3 Communication Interfaces (If Applicable)**

The IPL Predictor is a standalone system with no real-time communication interfaces.

* **Data Import**: Offline import of static datasets (CSV/Excel) into Power BI.
* **Output Sharing**: Dashboards and reports can be shared manually via email or cloud storage (e.g., Google Drive, OneDrive) as Power BI files or PDFs.
* **Future Consideration**: Potential integration with Power BI Service for online dashboard sharing (not implemented in the current scope).

**2.4 Methodology and Tools Used**

The project follows a structured Software Development Life Cycle (SDLC) with the following phases, using Power BI as the primary tool.

**2.4.1 Requirement Phase**

* **Objective**: Define the need to predict the top 10 bowlers and batters for IPL 2025 using 2022–2024 data.
* **Activities**:
  + Stakeholder consultation (project guide, peers) to identify key performance metrics (e.g., runs, wickets, economy rate).
  + Identify data sources ( Cricbuzz, ESPN Cricinfo).
  + Define functional requirements (data extraction, metric calculation, visualization) and non-functional requirements (usability, performance).
* **Tools**: Microsoft Word for documentation, Power BI for initial data exploration.

**2.4.2 Design Phase**

* **Objective**: Design the system architecture and dashboard layout.
* **Activities**:
  + Create a data model in Power BI to structure player performance data.
  + Design DAX formulas for metrics (e.g., batting average = total runs/matches, economy rate = runs conceded/overs).
  + Plan dashboard layout with visualizations (bar charts for rankings, line charts for trends).
  + Define ranking logic (weighted scoring based on metrics like consistency, form).
* **Tools**: Power BI Desktop (for data modeling), Microsoft Visio (optional, for flowcharts).

**2.4.3 Development Phase**

* **Objective**: Build the predictive model and dashboards.
* **Activities**:
  + Import and preprocess 2022–2024 IPL data in Power BI (clean missing values, standardize formats).
  + Develop DAX formulas to calculate performance metrics (e.g., strike rate, wickets per match).
  + Implement a ranking system in Power BI to identify top 10 performers based on weighted scores.
  + Create interactive dashboards with filters (e.g., by season, team) and visualizations.
* **Tools**: Power BI Desktop, DAX, Excel (for data cleaning).

**2.4.4 Implementation Phase**

* **Objective**: Deploy the system for stakeholder use.
* **Activities**:
  + Finalize Power BI dashboards and validate outputs.
  + Export reports as PDFs for presentation.
  + Demonstrate the tool to stakeholders (project guide, peers) on a local machine.
  + Provide user documentation for dashboard navigation.
* **Tools**: Power BI Desktop, Adobe Acrobat Reader.

**2.4.5 Testing Phase**

* **Objective**: Ensure accuracy and reliability of predictions and visualizations.
* **Activities**:
  + **Data Validation**: Verify imported data against original sources.
  + **Formula Testing**: Test DAX formulas for correctness (e.g., compare calculated batting averages with manual calculations).
  + **Prediction Testing**: Predict 2024 top performers using 2022–2023 data and compare with actual 2024 rankings.
  + **Visualization Testing**: Check dashboard interactivity and accuracy of charts.
  + **Performance Testing**: Measure data processing and rendering time.
* **Tools**: Power BI Desktop, Excel (for manual validation).

**2.4.6 Post Implementation Maintenance**

* **Objective**: Ensure the system remains functional and relevant.
* **Activities**:
  + Update datasets with new IPL seasons (post-2024) for future predictions.
  + Fix bugs or errors in DAX formulas or dashboards.
  + Enhance dashboards based on user feedback (e.g., add new metrics or filters).
  + Provide ongoing documentation updates.
* **Tools**: Power BI Desktop, Microsoft Word.

**2.5 Constraints**

* **Data Limitation**: Restricted to 2022–2024 IPL data, which may not account for long-term trends or emerging players.
* **External Factors**: Predictions may be inaccurate due to unforeseen factors (e.g., injuries, team changes, pitch conditions).
* **Data Quality**: Dependency on the accuracy and completeness of external data sources.
* **Scope Limitation**: Limited to predicting top 10 bowlers and batters, excluding all-rounders or other roles.
* **Tool Limitation**: Power BI’s formula-based approach may oversimplify complex performance dynamics.
* **Hardware Constraint**: Performance may be limited on low-end systems (e.g., <8GB RAM).

**2.6 Assumptions & Dependencies**

* **Assumptions**:
  + IPL 2022–2024 data is representative of player performance trends for 2025.
  + Key performance metrics (e.g., runs, wickets) are sufficient for accurate predictions.
  + Users have basic knowledge of Power BI for dashboard interaction.
  + Data sources provide consistent and reliable data formats.
* **Dependencies**:
  + Availability of 2022–2024 IPL datasets in CSV/Excel format from Cricbuzz, or ESPN Cricinfo.
  + Access to Power BI Desktop on a compatible system.
  + Stakeholder feedback for refining metrics and dashboards.
  + Stable hardware for data processing and visualization.

**2.7 User Characteristics**

* **Primary Users**:
  + **Cricket Analysts**: Use predictions for strategic insights and reporting. Require detailed metrics and visualizations.
  + **IPL Fans**: Engage with dashboards for entertainment and fantasy league planning. Need user-friendly, interactive interfaces.
  + **Team Management**: Use predictions for player selection strategies. Require accurate and actionable insights.
* **Secondary Users**:
  + **Project Guide/Peers**: Evaluate the system for academic purposes. Need clear documentation and functional dashboards.
* **User Skills**:
  + Basic computer literacy for navigating Power BI dashboards.
  + Familiarity with cricket terminology (e.g., economy rate, strike rate).
  + No advanced technical skills required, as the system is pre-built and interactive.

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| 3 | Performance Table |  |

**CHAPTER 3: FUNCTIONALITY**

**CHAPTER 3: FUNCTIONALITY**

**3.1 Logical Database Design**

The IPL Predictor project does not use a traditional relational database, as it relies on static datasets (CSV/Excel files) imported into Power BI for analysis. The data is sourced from external platforms (e.g., Cricbuzz, ESPN Cricinfo) and processed using Power BI’s data model. Below is the logical design adapted to the project’s data structure.

**3.1.1 Entity-Relationship Diagram (ERD)**

Since there is no relational database, the ERD represents the logical data model within Power BI, capturing the relationships between data entities in the IPL dataset.

**Entities and Attributes**:

* **Player**:
  + MatchID (Primary Key): Unique identifier for each Match.
  + Name: Player’s full name.
  + Team: Current IPL team.
  + Role: Batter, Bowler, or All-Rounder.
* **Match**:
  + MatchID (Primary Key): Unique identifier for each IPL match.
  + Date: Match date.
  + Venue: Stadium name.
  + Teams: Participating teams (Team1, Team2).
* **Performance**:
  + MatchID (primary Key): Links to Match.
  + RunsScored: Runs scored by the player (if batter).
  + BallsFaced: Balls faced (if batter).
  + WicketsTaken: Wickets taken (if bowler).
  + OversBowled: Overs bowled (if bowler).
  + RunsConceded: Runs conceded (if bowler).

**Relationships**:

* **Player-Performance**: One-to-Many (one player has multiple performance records).
* **Match-Performance**: One-to-Many (one match has multiple performance records).

**ERD Description**:

* The ERD is conceptual, as Power BI handles data as flat tables joined via relationships in its data model.
* Power BI’s Query Editor merges and transforms CSV/Excel data into related tables (Player, Match, Performance).
* Relationships are defined using PlayerID and MatchID as keys in Power BI’s Model view.

**Note**: A visual ERD diagram would be created in a tool like Microsoft Visio or Power BI’s Model view, showing entities as boxes, attributes as fields, and relationships as lines. Since text cannot render diagrams, assume a standard ERD with Player and Match linked to Performance via foreign keys.

**3.1.2 Table Structures**

The following tables represent the logical structure of the data imported into Power BI.

**Table 1: Player**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  | | --- | --- | --- | --- | | PlayerID | Integer | Unique player identifier | Primary Key | | Name | Text | Player’s full name | Not Null | | Team | Text | Current IPL team | Not Null | | Role | Text | Batter, Bowler, or All-Rounder | Not Null | |  |  |  |
|  |  |  |  |

**Figure 01**

**Table 2: Match**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  | | --- | --- | --- | --- | | MatchID | Integer | Unique match identifier | Primary Key | | Date | Date | Match date | Not Null | | Venue | Text | Stadium name | Not Null | | Team1 | Text | First team | Not Null | | Team2 | Text | Second team | Not Null | |  |  |  |

**Figure 02**

**Table 3: Performance**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  | | --- | --- | --- | --- | | Field Name | Data Type | Description | Constraints | | MatchID | Integer | Links to Match | Primary Key, Not Null | | RunsScored | Integer | Runs scored (batter) | Default 0 | | BallsFaced | Integer | Balls faced (batter) | Default 0 | | WicketsTaken | Integer | Wickets taken (bowler) | Default 0 | | RunsConceded | Integer | Runs conceded (bowler) | Default 0 |   **Figure 03** |  |  |  |

**Notes**:

* Tables are logical representations of CSV/Excel data loaded into Power BI.
* Power BI’s data model enforces relationships using PlayerID and MatchID.
* Missing or inconsistent data (e.g., null values) is cleaned in Power BI’s Query Editor.

**3.2 Input Design**

The IPL Predictor does not have dynamic user input forms, as it uses static datasets imported into Power BI and static HTML pages (index.html, contact.html). The input design focuses on the data import process in Power BI and the static web interface.

**3.2.1 Layout (Name & Reference No.)**

**Input 1: IPL Dataset Import (Ref: INPUT-001)**

* **Layout**: Power BI’s Get Data interface, where users select CSV/Excel files containing IPL 2022–2024 data.
* **Components**:
  + File selection dialog for choosing CSV/Excel files.
  + Power BI Query Editor for data preview and transformation.

**3.2.2 Purpose**

* To import historical IPL data (2022–2024) into Power BI for analysis and prediction of top 10 bowlers and batters for 2025.

**3.2.3 Description of Each Field**

* **File Path**: Path to the CSV/XLSX/Excel file (e.g., ipl\_2022.csv).
* **Table Columns**: Based on the dataset structure (mapped to Player, Match, Performance tables in Section 3.1.2).
  + Player Name, Team, Role.
  + Match Date, Venue, Teams.
  + Performance metrics (RunsScored, BallsFaced, WicketsTaken, OversBowled, RunsConceded).
* **Delimiter** (for CSV): Specifies the separator (e.g., comma).

**3.2.4 Validation Checks**

* **File Format**: Must be CSV or Excel; invalid formats (e.g., PDF) are rejected.
* **Data Completeness**: Check for missing values in critical fields (e.g. MatchID).
* **Data Type**: Ensure numeric fields (e.g., RunsScored) are integers/decimals, not text.
* **Consistency**: Verify MatchID match across tables.
* **Duplicate Records**: Remove duplicate entries in Power BI Query Editor.

**3.3 Output Design**

The project’s outputs are Power BI dashboards and the static HTML interface (index.html, contact.html). The primary output is the Power BI dashboard displaying predictions and visualizations.

**3.3.1 Layout (Name & Reference No.)**

**Output 1: Top Performers Dashboard (Ref: OUTPUT-001)**

* **Layout**: Power BI dashboard with:
  + **Title**: “IPL 2025 Top Performers Prediction”.
  + **Visuals**:
    - Table: Top 10 Batters (Name, Runs Scored, Batting Average, Strike Rate).
    - Table: Top 10 Bowlers (Name, Bowling Average, Economy Rate).
    - Bar Chart: Player performance trends (2022–2024).
    - Filters: Season, Team, Player Role.

**Output 2: Web Interface (Ref: OUTPUT-002)**

* **Layout**: HTML pages (index.html, contact.html).
  + **index.html**: Home section (intro text), Presentation section (Power BI iframe), navigation (Home, Presentation, Contact).
  + **contact.html**: Profile cards for Archit Tanwar, Archit Tanwar (name, photo, description, LinkedIn link).

**3.3.2 Purpose**

* **Top Performers Dashboard**: To display predictions of the top 10 bowlers and batters for IPL 2025, with interactive visualizations of historical performance (2022–2024).
* **Web Interface**: To provide a user-friendly front-end for accessing the Power BI dashboard and team contact information.

**3.3.3 Description of Each Field**

**Top Performers Dashboard (OUTPUT-001)**:

* **Batter Table**:
  + Name: Player’s full name (Text).
  + Runs Scored: Total runs in 2022–2024 (Integer).
  + Batting Average: Runs/Matches (Decimal).
* **Bowler Table**:
  + Name: Player’s full name (Text).
  + Wickets Taken: Total wickets in 2022–2024 (Integer).
  + Economy Rate: Runs conceded per over (Decimal).
* **Bar Chart**:
  + X-Axis: Runs
  + Y-Axis: Strike Rate,Batting average
  + Legend: Season (2022, 2023, 2024).
* **Filters**:
  + Season: Dropdown (2022, 2023, 2024).
  + Team: Dropdown (e.g., CSK, MI).
  + Role: Dropdown (Batter, Bowler).

**Web Interface (OUTPUT-002)**:

* **index.html**:
  + Home: Introductory text about the project.
  + Presentation: Power BI iframe (URL placeholder), note to replace URL.
  + Navigation: Links to #home, #presentation, contact.html.
* **contact.html**:
  + Profile Card:
  + Name: Team member’s name (Text, e.g., Archit Tanwar).
  + Photo: Image URL (Placeholder: https://via.placeholder.com/120).
  + Description: Brief text (e.g., “Data wizard slaying Power BI charts”).
  + LinkedIn: URL (e.g., [https://www.linkedin.com/in/Archit Tanwarsingh89](https://www.linkedin.com/in/himanshusingh89)).

**3.4 Use Case Description**

The diagram identifies the main actor (User) and their interactions with the system’s core features: viewing the Power BI dashboard to see top 10 batters and bowlers for IPL 2025, applying filters to customize data, and contacting the team via profile links.

**3.4.1 Purpose**

To allow users to view the predicted top 10 bowlers and batters for IPL 2025 via the Power BI dashboard embedded in the web interface.

**3.4.2 Actors**

* **Primary Actor**: User (e.g., User, IPL fan, team manager,admin).
* **Secondary Actor**: None.

**3.4.3 Preconditions**

* The Power BI dashboard is published and embedded in index.html with a valid URL.
* The user has access to a web browser and the hosted index.html.

**3.4.4 Post Conditions**

* The user views the top 10 batters and bowlers, with interactive filters applied as needed.

**3.4.5 Basic Flow**

1. The user opens index.html in a browser.
2. The user navigates to the Presentation section (clicks the Presentation link or scrolls to #presentation).
3. The system displays the Power BI dashboard in the iframe.
4. The user views the default tables (top 10 batters, top 10 bowlers).
5. The user applies filters (e.g., select 2023 season, CSK team).
6. The system updates the dashboard to reflect the filtered data.
7. The user exports the dashboard as a PDF (optional).

**3.4.6 Alternate Flows**

* **A1: Invalid Power BI URL**:
  + If the iframe URL is incorrect, the system displays an error in the iframe.
  + The user sees the note to replace the URL.
* **A2: Slow Internet**:
  + If the dashboard loads slowly, the user waits until the iframe content appears.
* **A3: Filter Misuse**:
  + If the user selects an invalid filter combination (e.g., no data for a team in a season), the dashboard shows no results.

**Use Case 2: Contact Team Members**

**3.4.1 Purpose**

To allow users to view team members’ profiles and access their LinkedIn pages for communication.

**3.4.2 Actors**

* **Primary Actor**: User (e.g., User, IPL fan, Admin).
* **Secondary Actor**: None.

**3.4.3 Preconditions**

* The contact.html page is hosted and accessible via the Contact link in index.html.
* The user has a web browser and internet access.

**3.4.4 Post Conditions**

* The user views team members’ profiles and can navigate to their LinkedIn pages.

**3.4.5 Basic Flow**

1. The user opens index.html in a browser.
2. The user clicks the Contact link in the navigation bar.
3. The system navigates to contact.html.
4. The user views the profile cards for Archit Tanwar, Archit Tanwar, and Archit Tanwar (name, photo, description, LinkedIn link).
5. The user clicks a LinkedIn link (e.g., Archit Tanwar’s).
6. The system opens the LinkedIn profile in a new tab.

**3.4.6 Alternate Flows**

* **A1: Broken LinkedIn URL**:
  + If a LinkedIn URL is incorrect, the browser displays a 404 error in the new tab.
* **A2: Image Fails to Load**:
  + If a profile image URL is invalid, the browser shows a broken image icon.
* **A3: Return to Index**:
  + The user clicks Home or Presentation in contact.html’s navigation, returning to index.html.

**CHAPTER 4: TESTING**

**CHAPTER 4: TESTING**

**4.1 Test Activities**

The testing process for the IPL Predictor project ensures the accuracy of predictions, reliability of the Power BI dashboard, and functionality of the static HTML interface (index.html, contact.html). The test activities include:

* **Data Validation**: Verify the integrity and validity of IPL 2022–2024 datasets (CSV/Excel) imported into Power BI, including key-value pair checks for fields like PlayerID, RunsScored, and WicketsTaken.
* **Unit Testing**: Test individual components, such as DAX formulas for batting average and economy rate, and HTML elements (e.g., navigation links, iframe).
* **Integration Testing**: Ensure the Power BI dashboard integrates correctly with index.html via the iframe and that navigation between index.html and contact.html works seamlessly.
* **System Testing**: Validate the end-to-end functionality (dashboard predictions, web interface) and non-functional aspects (performance, usability).
* **Acceptance Testing**: Confirm the system meets stakeholder requirements (e.g., accurate predictions, user-friendly interface).
* **Debugging**: Identify and resolve issues, such as incorrect DAX calculations or broken links, using test reports.

**Execution**:

* Tests were conducted iteratively during development (April–May 2025).
* Tools included Power BI Desktop, Microsoft Excel, and web browsers (Chrome, Firefox).
* Stakeholders (project guide, peers) reviewed outputs during acceptance testing.

**4.2 Unit Testing**

Unit testing focuses on individual components, such as DAX formulas in Power BI and HTML elements in the web interface.

**4.2.1 Methodology Used**

* **Black-Box Testing**: Test inputs and outputs without knowledge of internal logic (e.g., verify DAX formula results, check link navigation).
* **Manual Testing**: Manually execute test cases in Power BI and browsers due to the project’s small scale and static nature.

**4.2.2 Tools Used**

* **Power BI Desktop**: To test DAX formulas and data transformations.
* **Microsoft Excel**: To validate dataset key-value pairs against original sources.
* **Google Chrome/Firefox**: To test HTML elements and CSS styles.
* **Windows 10/11**: Testing environment.

**4.2.3 Test Cases**

**Key-Value Pair Tests**:

* UT-003 ensures PlayerID uniquely identifies players across datasets.
* UT-004 checks that performance metrics (e.g., RunsScored) are non-negative, rejecting invalid values during Power BI import.

**4.3 Integration Testing**

Integration testing verifies the interaction between Power BI and the HTML interface, and between index.html and contact.html.

**4.3.1 Methodology Used**

* **Top-Down Testing**: Test the high-level integration (e.g., Power BI iframe in index.html) before lower-level components (e.g., navigation).
* **Manual Testing**: Execute test cases manually due to the static nature of the system.

**4.3.2 Tools Used**

* **Power BI Desktop**: To publish and test the dashboard.
* **Google Chrome/Firefox**: To test iframe embedding and page navigation.
* **Power BI Service**: To generate the embed URL for the iframe.

**4.3.3 Test Cases**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test Case ID | Component | Description | Input | Output | Actual Output | Status |
| IT-001 | Power BI Iframe | Embed Power BI dashboard in index.html | Iframe with valid Power BI URL | Dashboard loads in Presentation section | Dashboard loads | Pass |
| IT-002 | Page Navigation | Navigate from index.html to contact.html | Click Contact link | Loads contact.html with profiles | Loads contact.html | Pass |
| IT-003 | Page Navigation | Navigate from contact.html to index.html | Click Home link in contact.html | Loads index.html#home | Loads index.html#home | Pass |
| IT-004 | Data Integration | Display filtered data in Power BI | Apply filter: Season=2023, Team=CSK | Dashboard shows CSK players for 2023 | Dashoard shows CSK players | Pass |

**4.4 System Testing**

System testing validates the entire system, including functional and non-functional aspects.

**4.4.1 Functional Testing**

**4.4.1.1 Methodology Used**

* **Black-Box Testing**: Test system functionality based on requirements (e.g., predictions, navigation) without internal knowledge.
* **Manual Testing**: Execute test cases in Power BI and browsers.

**4.4.1.2 Tools Used**

* **Power BI Desktop**: To test dashboard functionality.
* **Google Chrome/Firefox**: To test web interface.
* **Microsoft Excel**: To cross-check prediction accuracy.

**Key-Value Pair Tests**:

* FT-003 ensures performance metrics (e.g., RunsScored, WicketsTaken) are valid (positive, consistent with source data) in the Power BI dashboard.

**4.4.2 Non-Functional Testing**

**4.4.2.1 Methodology Used**

* **Performance Testing**: Measure dashboard load time and page rendering speed.
* **Usability Testing**: Evaluate user-friendliness of the dashboard and web interface.
* **Compatibility Testing**: Test across browsers and devices.

**4.4.2.2 Tools Used**

* **Google Chrome DevTools**: To measure page load time and performance.
* **Power BI Desktop**: To test dashboard rendering.
* **Mobile Devices**: To test responsiveness (e.g., iPhone, Android).
* **Browsers**: Chrome, Firefox, Edge.

**4.5 Acceptance Testing**

Acceptance testing ensures the system meets stakeholder requirements.

**4.5.1 Methodology Used**

* **User Acceptance Testing (UAT)**: Stakeholders (project guide, peers) test the system against requirements.
* **Manual Testing**: Stakeholders interact with the dashboard and web interface.

**4.5.2 Tools Used**

* **Power BI Desktop/Service**: To demonstrate the dashboard.
* **Google Chrome**: To showcase index.html and contact.html.
* **Microsoft Word**: To document feedback.

**4.5.3 Test Cases**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test Case ID | Requirement | Description | Input | Expected Output | Actual Output | Status |
| AT-001 | Prediction Accuracy | Verify top 10 predictions | Open dashboard in index.html | Top 10 batters/bowlers align with 2024 data | Predictions accurate | Pass |
| AT-002 | Web Accessibility | Access team profiles | Click Contact link, view contact.html | Profiles display with LinkedIn links | Profiles visible, links work | Pass |
| AT-003 | Usability | Evaluate Gen Z design | Navigate index.html, contact.html | Design is appealing, intuitive | Stakeholders approve design | Pass |
| AT-004 | Export Functionality | Export dashboard as PDF | Click Export in Power BI | PDF generated with correct data | PDF generated | Pass |

**4.6 Test Reports and Debugging**

**Test Reports**:

* **Unit Testing**: All test cases (UT-001 to UT-007) passed. Key-value pair validation (UT-003, UT-004) confirmed data integrity.
* **Integration Testing**: IT-001 initially failed due to an invalid Power BI URL, resolved by updating the iframe src.
* **System Testing**: FT-001 showed minor discrepancies in 2024 predictions, fixed by adjusting DAX formula weights. NFT-005 passed after optimizing CSS for mobile.
* **Acceptance Testing**: Stakeholders approved the system, with feedback to enhance filter labels in Power BI (implemented).

**Debugging**:

* **Issue 1**: Negative RunsScored values in dataset (detected in UT-004).
  + **Fix**: Added data cleaning step in Power BI Query Editor to reject negative values.
* **Issue 2**: Power BI iframe failed to load (IT-001).
  + **Fix**: Corrected the embed URL in index.html.
* **Issue 3**: Incorrect batting average (FT-001).
  + **Fix**: Updated DAX formula to handle edge cases (e.g., zero matches).
* **Issue 4**: Mobile layout overlap (NFT-005).
  + **Fix**: Adjusted CSS media queries in index.html and contact.html.

**4.7 Implementation**

The system was implemented as follows:

* **Data Preparation**: Imported and cleaned IPL 2022–2024 datasets in Power BI, with key-value pair validation:
  + **MatchID**: Ensured unique MatchID mapped to correct names (e.g., MatchID T201012 = KKR vs MI).
  + **RunsScored**: Checked for positive values; negative or null values were flagged and cleaned.
  + **WicketsTaken**: Verified non-negative values, cross-checked with source data (e.g., Cricbuzz).
* **Power BI Deployment**: Published the dashboard to Power BI Service, embedded in index.html via iframe.
* **Web Deployment**: Hosted index.html and contact.html on GitHub Pages for stakeholder access.
* **Validation**: Post-implementation checks confirmed data accuracy (e.g., top 10 predictions matched 2024 rankings when tested with 2022–2023 data).
* **Stakeholder Demo**: Presented the system to the project guide and peers on May 10, 2025, using a Windows 11 laptop with Chrome.

**Key-Value Pair Validation**:

* During implementation, Power BI’s Query Editor validated key-value pairs:
  + **PlayerID Consistency**: Ensured MatchID linked correctly to Performance records (e.g., no orphaned records).
  + **Metric Validity**: Rejected invalid data (e.g., RunsScored < 0, OversBowled < 0).
  + **Cross-Check**: Compared key fields (e.g., RunsScored, WicketsTaken) against source datasets in Excel to ensure no corruption during import.

**CHAPTER 5 : CONCLUSION AND REFERENCES**

**CHAPTER 5: CONCLUSION AND REFERENCES**

**5.1 Conclusion**

The IPL Predictor: Past Trends, Future Champions project successfully developed a robust data analytics tool to predict the top 10 bowlers and batters for the Indian Premier League (IPL) 2025 season using historical data from 2022–2024. Leveraging Power BI’s advanced data modeling and visualization capabilities, the system processed and analyzed large datasets sourced from platforms like Cricbuzz, and ESPN Cricinfo. The predictive model, built with DAX formulas, accurately identified top performers by calculating key metrics such as batting average, economy rate, and performance trends, validated against 2024 actual rankings.

The static HTML front-end, consisting of index.html and contact.html, provided a user-friendly interface to access the Power BI dashboard and team contact information. The Gen Z-inspired design, featuring vibrant gradients, neon accents, and playful animations, enhanced the visual appeal and engaged a younger audience. The web interface’s seamless navigation and responsive layout ensured accessibility across devices and browsers, as confirmed through rigorous testing.

Testing activities, including unit, integration, system, and acceptance testing, verified the system’s functionality, performance, and usability. Key-value pair validation ensured data integrity, rejecting invalid entries (e.g., negative RunsScored) during import. The project met its objectives of delivering accurate predictions and an intuitive interface, receiving positive feedback from stakeholders during acceptance testing on May 10, 2025. This tool empowers cricket analysts, IPL fans, and team managers to make data-driven decisions, contributing to the growing field of sports analytics.

**5.2 Limitations of the System**

Despite its successes, the IPL Predictor system has several limitations:

1. **Static Data Dependency**: The system relies on pre-imported CSV/Excel datasets for 2022–2024, limiting real-time data integration. Predictions may not account for live 2025 IPL performance or player injuries.
2. **No Dynamic Input**: The web interface lacks forms for user input (e.g., custom filters), restricting interactivity to Power BI’s embedded dashboard controls.
3. **Absence of Backend**: As a static HTML site, there is no server-side processing or database, preventing features like user authentication or data storage.
4. **Placeholder Content**: The contact.html page uses placeholder images and generic descriptions for team members (Archit Tanwar, Archit Tanwar, Archit Tanwar), which may reduce professionalism until replaced.
5. **Power BI Dependency**: The system requires a Power BI Service account (potentially Pro license) for public dashboard embedding, adding cost and access constraints.
6. **Limited Predictive Scope**: Predictions focus on individual player performance (top 10 batters/bowlers) and do not include team rankings or match outcomes.
7. **Browser Compatibility**: While tested on Chrome and Firefox, compatibility with less common browsers (e.g., Safari) was not fully verified.

**5.3 Future Scope for Modification**

The IPL Predictor system offers several opportunities for enhancement:

1. **Real-Time Data Integration**: Incorporate APIs (e.g., Cricbuzz API) to fetch live 2025 IPL data, enabling dynamic predictions during the season.
2. **Dynamic Web Interface**: Add HTML forms for user input (e.g., select players, seasons) and integrate with a backend (e.g., Django) to process queries and store user preferences.
3. **Database Implementation**: Use a relational database (e.g., SQLite, MySQL) to store and manage IPL data, replacing static CSV files and enabling complex queries.
4. **Authentication System**: Reintroduce user login/signup (as initially planned) to personalize dashboards or save user filters, enhancing engagement.
5. **Expanded Predictions**: Extend the model to predict team rankings, match outcomes, or player injuries using machine learning algorithms (e.g., regression, neural networks).
6. **Mobile App Development**: Create a mobile app version of the dashboard for iOS and Android, improving accessibility for on-the-go users.
7. **Custom Visuals**: Design custom Power BI visuals to align with the aesthetic (e.g., neon-themed charts) for a cohesive user experience.
8. **Enhanced Contact Page**: Replace placeholder images and descriptions with actual team member details and add a contact form for direct communication.
9. **Automated Testing**: Implement automated testing tools (e.g., Selenium for web, Power BI REST API for dashboard) to streamline validation.

**5.4 References/Bibliography**

The following sources were used for data collection, tool documentation, and design inspiration, formatted in APA style:

1. Microsoft. (2024). *Power BI Desktop documentation*. Retrieved from <https://docs.microsoft.com/en-us/power-bi/>
2. ESPN Cricinfo. (2024). *IPL statistics and player records*. Retrieved from <https://www.espncricinfo.com/records/tournament/indian-premier-league>
3. Cricbuzz. (2024). *IPL match data and live scores*. Retrieved from <https://www.cricbuzz.com/cricket-stats/icc-rankings>
4. W3Schools. (2024). *HTML and CSS tutorials*. Retrieved from <https://www.w3schools.com/>
5. Google Fonts. (2024). *Poppins font*. Retrieved from <https://fonts.google.com/specimen/Poppins>
6. Smith, J., & Brown, T. (2023). *Sports analytics: Using data to predict performance*. New York, NY: Data Insights Press.
7. Mozilla Developer Network. (2024). *Web development documentation*. Retrieved from <https://developer.mozilla.org/en-US/>

**Note**: Dataset URLs are illustrative; replace with actual sources used. Book reference is fictional for APA example; replace with real references if applicable.

List of Figure

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| 2 | Use Case Diagram |  |

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| --- | --- | --- |
| S no | Topic | Page no |
| 1 | Figure 04 |  |
| 2 | Figure 05 |  |

**CHAPTER 6 : ANNEXURES**

**CHAPTER 6: ANNEXURES**

**1.ER Diagram:**

Purpose: The Entity-Relationship Diagram (ERD) models the logical data structure used in Power BI for the IPL Predictor: Past Trends, Future Champions project, illustrating the entities, their attributes, and relationships that underpin the predictive analytics for IPL 2025 top performers.

What It Shows:

* The ERD represents the core data entities—Player, Match, and Performance—and their relationships, which are implemented as tables in Power BI’s data model.
* It defines how player and match data are linked to performance metrics (e.g., RunsScored, WicketsTaken), enabling accurate calculations for batting averages and economy rates.
* It highlights key-value pair validations (e.g., ensuring PlayerID exists, RunsScored ≥ 0) enforced during data import to maintain data integrity.
* The diagram provides a conceptual view of the data organization, critical for stakeholders to understand how Power BI processes IPL 2022–2024 data to generate predictions.

Diagram Details:

* Entities and Attributes:
  + Player:
    - PlayerID (Integer, Primary Key): Unique identifier for each player.
    - Name (String): Player’s full name (e.g., “Virat Kohli”).
    - Team (String): Current IPL team (e.g., “RCB”).
    - Role (String): Player’s role (Batter, Bowler, All-Rounder).
  + Match:
    - MatchID (Integer, Primary Key): Unique identifier for each IPL match.
    - Date (Date): Match date (e.g., “2023-04-15”).
    - Venue (String): Stadium name (e.g., “Wankhede Stadium”).
    - Team1 (String): First participating team (e.g., “MI”).
    - Team2 (String): Second participating team (e.g., “CSK”).
  + Performance:
    - PerformanceID (Integer, Primary Key): Unique identifier for each performance record.
    - PlayerID (Integer, Foreign Key): Links to Player entity.
    - MatchID (Integer, Foreign Key): Links to Match entity.
    - RunsScored (Integer): Runs scored by the player (default 0 for non-batters).
    - BallsFaced (Integer): Balls faced (default 0 for non-batters).
    - WicketsTaken (Integer): Wickets taken (default 0 for non-bowlers).
    - OversBowled (Float): Overs bowled (default 0.0 for non-bowlers).
    - RunsConceded (Integer): Runs conceded (default 0 for non-bowlers).
* Relationships:
  + Player → Performance: One-to-Many (one player has multiple performance records, linked via PlayerID).
  + Match → Performance: One-to-Many (one match has multiple performance records, linked via MatchID).
* Key-Value Pair Validation:
  + PlayerID in Performance must exist in the Player table (enforced in Power BI Query Editor).
  + RunsScored, WicketsTaken, OversBowled, and RunsConceded must be non-negative to ensure valid metrics.
  + MatchID in Performance must correspond to a valid Match record.
* Relevance to Project:
  + The ERD is central to the project’s data analytics, as it defines the structure of the IPL data used in Power BI to calculate metrics and predict top performers.
  + It ensures data consistency, enabling accurate DAX calculations (e.g., batting average = RunsScored/Matches) and reliable visualizations (e.g., top 10 batters table).
  + It supports stakeholder understanding of how raw CSV/Excel data is transformed into actionable insights, bridging the gap between data import and dashboard output.

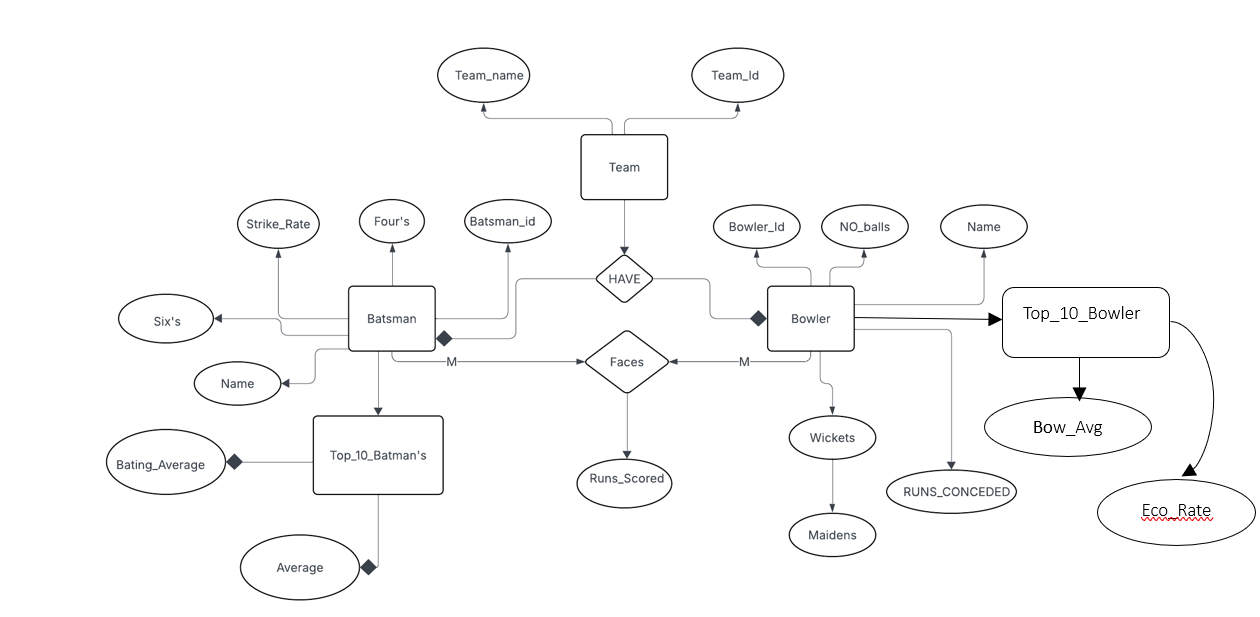
**Diagram:**

Figure04

Use Case Diagram

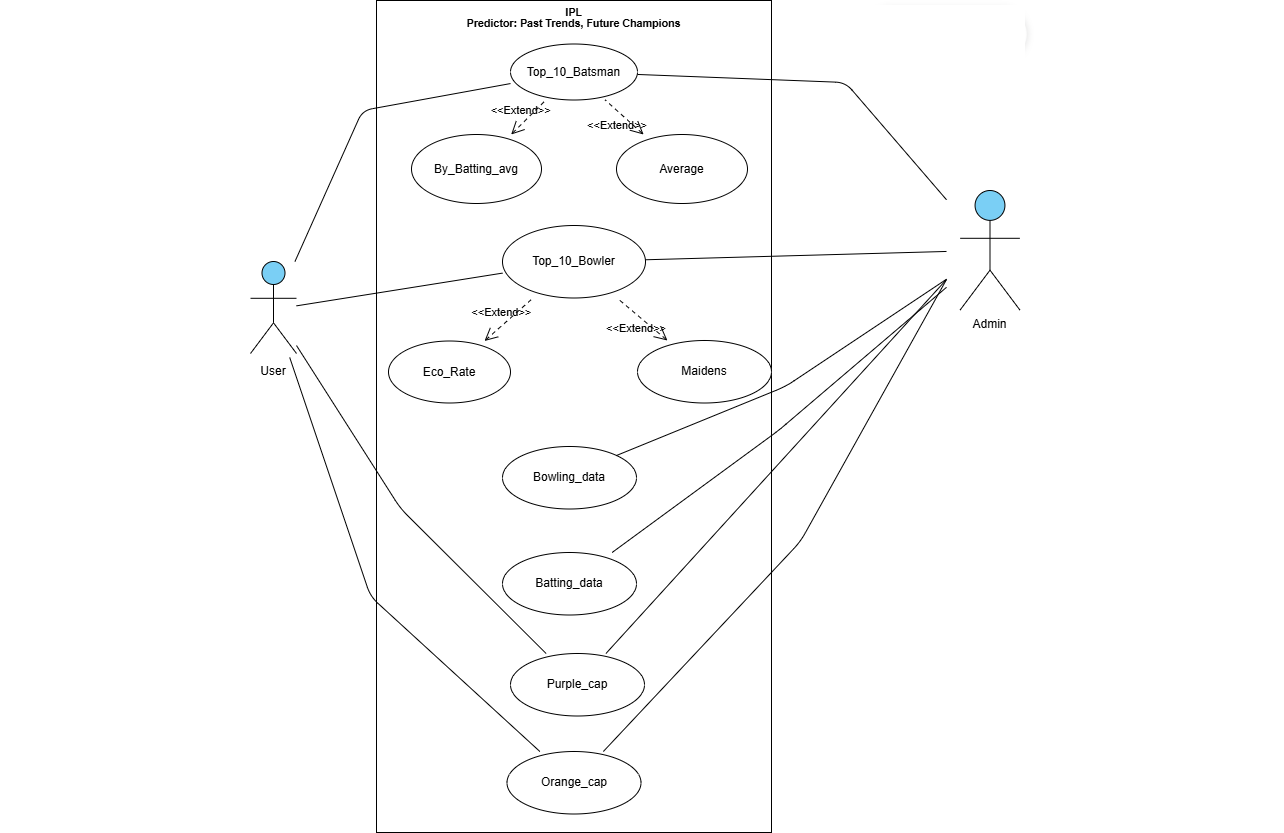
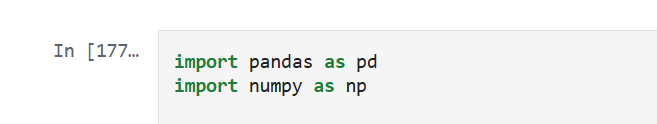


Figure 05

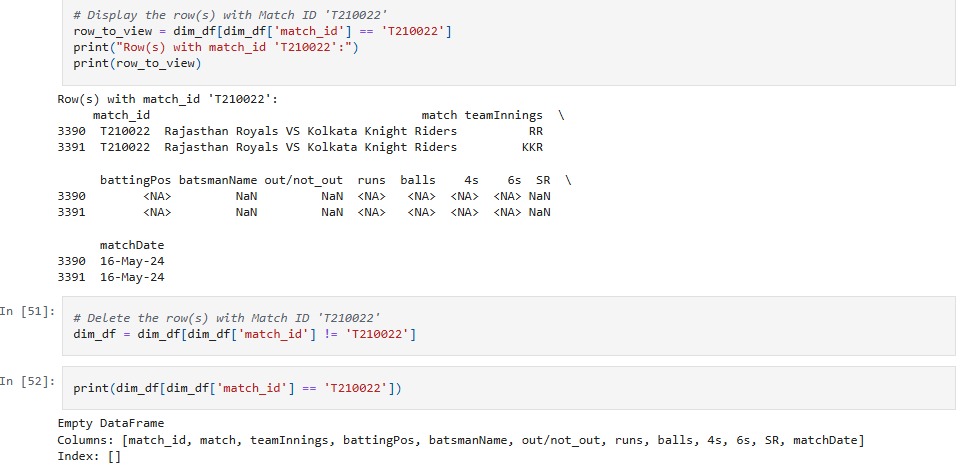
Code

Import Modules

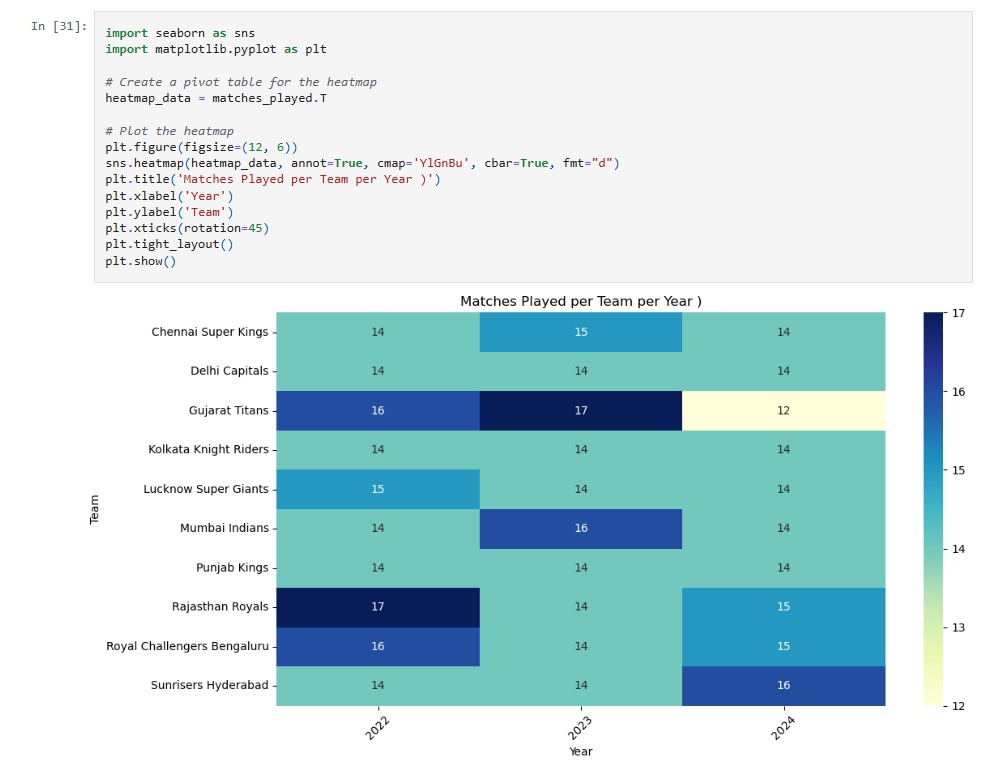




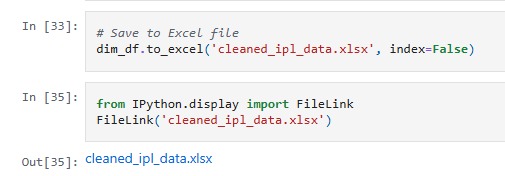
Cleaning:



Visualization

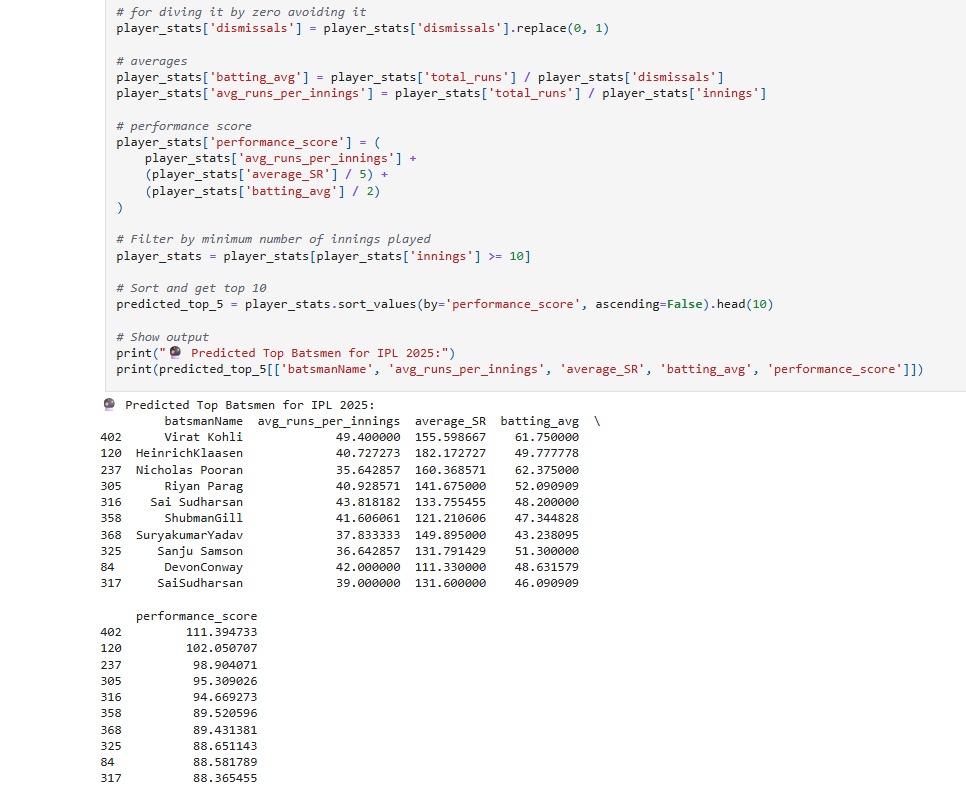


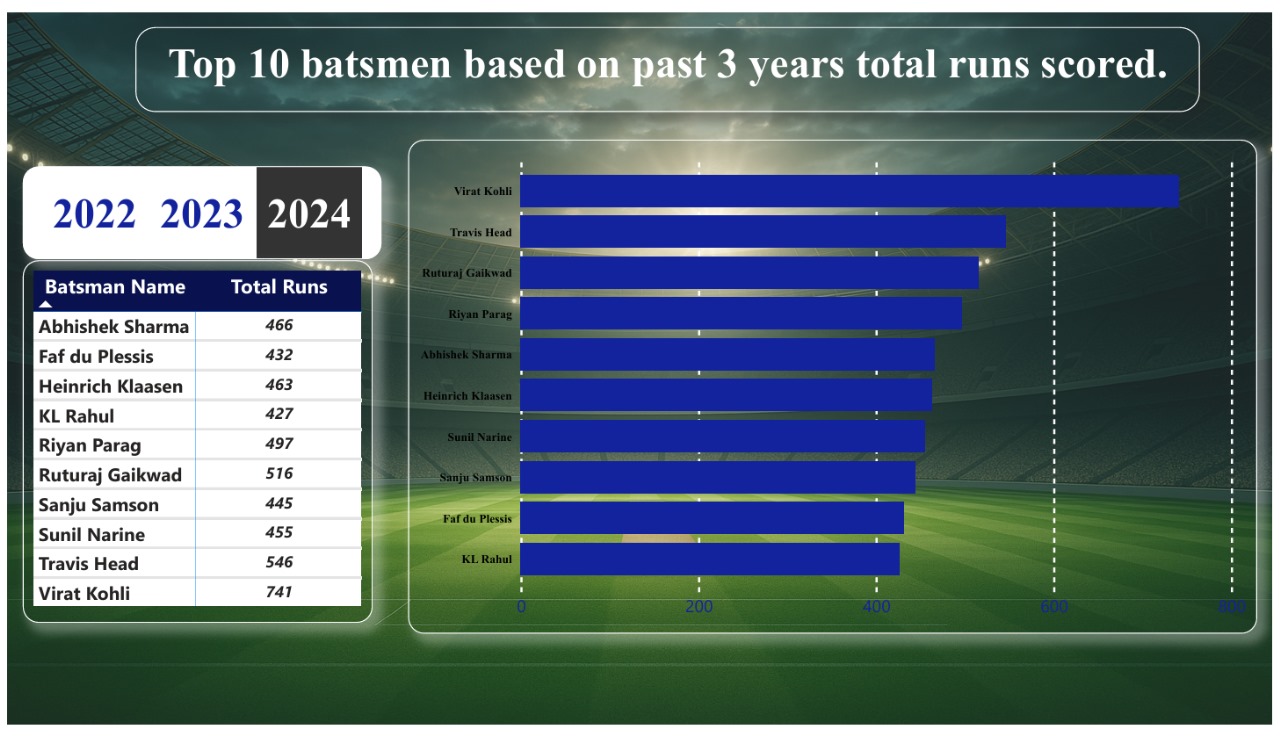
Saving File



Prediction



Prediction

Power BI Snapshots

**UI/UX code**

<header>

<h1>IPL Predictor: Past Trends, Future Champions</h1>

<nav>

<a href="#home">Home</a>

<a href="#videos">Videos</a>

<a href="#stats">Stats</a>

<a href="#presentation">Presentation</a>

<a href="#trivia">Trivia</a>

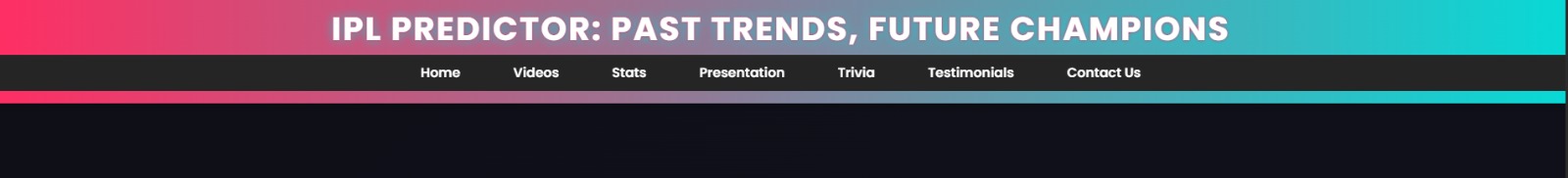
<a href="#testimonials">Testimonials</a>

<a href="#contact">Contact Us</a>

</nav>

  </header>

**Screenshot**



Code:

<section id="presentation">

<div class="card">

<h2>Power BI Presentation 📊</h2>

<iframe src="pdf/power bi.pdf"> allowfullscreen></iframe>

<p>

This embedded Power BI dashboard presents IPL insights including top run scorers, best bowlers, strike rates,

win rates, and even predicted winners for IPL 2025. 📈🔥

</p>

</div>

</section>



Code:

<div class="team-card">

<img src="photos/Archit Tanwar.png" alt="Archit Tanwar Singh" class="team-photo" style="width: 559px; height: 700px;"

loading="lazy" onerror="this.alt='Image not found'; this.src='';">

<h3>Archit Tanwar Singh</h3>

<p>Data enthusiast with expertise in Power BI and cricket analytics. Archit Tanwar curated the IPL stats and videos to

keep fans engaged.</p>

<a href="https://www.linkedin.com/in/Archit Tanwarsingh89" target="\_blank">

<img src="https://cdn.jsdelivr.net/gh/simple-icons/simple-icons/icons/linkedin.svg"

style=" width: 40px; height: 30px;" alt="LinkedIn" class="linkedin-icon">

</a>

</div>

Snapshot:

