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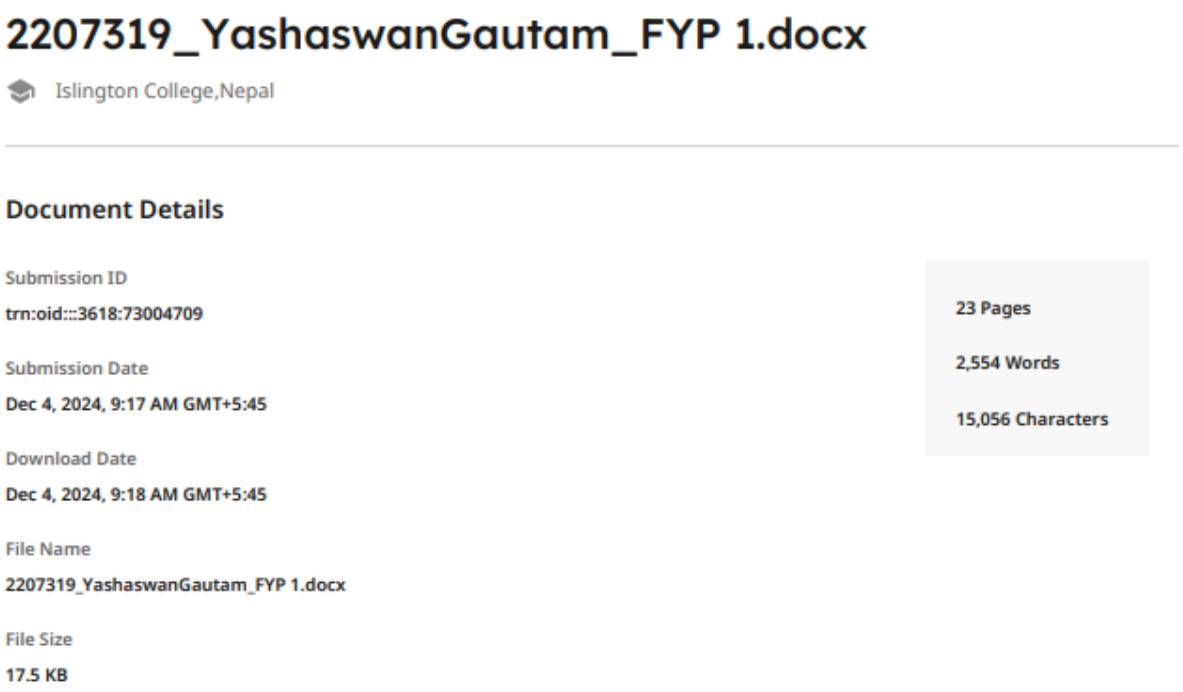

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Abstract

The "Stat Value AI" is an analytical platform designed to offer detailed, side-by-side comparisons of football players' performances through an in-depth visualization approach. The application offers statistical data, machine learning, and interactive visualizations to offer insights into player strengths, weaknesses, and overall playing style. Through features like radar charts, it allows users to compare key performance metrics—such as goals, assists, dribbling, passing, and defensive skills—between players, enabling a deeper understanding of each player's unique contributions on the field.

Currently, there is no dedicated market value prediction system for football players, nor any standardized metrics to effectively analyse market value. This machine learning model addresses that by using data from FIFA editions 2018 to 2025. By analysing key attributes such as a player’s age, current in-game rating, potential in-game rating, team and contract details, as well as their current market value, the model predicts future values for 2026 and beyond.

Contents

List of Figures

1. Introduction

In today's football world, data has become a crucial part of understanding player performance and their value. Fans, analysts, and scouts all rely on detailed metrics to get a better view of a player's skills, strengths, and areas where they can improve. This project introduces a web app that makes comparing football players easy and engaging by using hexagon-shaped charts to visualize their stats. This display allows users to see and compare player's abilities in different attributes quickly and clearly.

The project goes further than simple charts by incorporating artificial intelligence to add some powerful features, like predicting a player's market value and finding players with similar profiles. These AI-driven tools make the app useful for anyone from casual fans to professional analysts, as it can suggest comparable players and provide different insights too.

With user-friendly design, this app has potential uses in team building, scouting, and tactical planning. It aims to make exploring football data easier and more insightful, helping users understand and enjoy player comparisons in a whole new way.

1.1. Problem Statement

In modern football, data plays a crucial role in evaluating player performance, helping fans, analysts, and clubs make better decisions. However, most current tools for comparing player stats are limited to straightforward text or basic charts, which can make it hard for people to draw meaningful conclusions, especially if they do not have advanced analytical skills. While some platforms do allow comparisons, they often miss advanced features that can give deeper insights or predict future market value and are less visually appealing.

Without AI-powered features that can predict player market value or detect similarities in playing styles, it is tough to make a decision for the club regarding player signing, team building and if they might fit into a team. A tool that combines AI for smarter predictions and player similarity analysis, while also offering easy-to-understand and visually appealing comparisons, would address this gap, allowing sporting directors/users to make better-informed assessments.

Those teams, which mainly look at football as a business, could take a lot of advantage from this system. Some insights that the app will provide helps clubs to optimize their investment. This could be a new strategy to gain a competitive financial advantage as less of investment could bring in a better player and sell for higher profit.

1.2. Project as a Solution:

The Football Player Comparison Web App changes the way players are analysed by offering a smart, AI-driven solution that delivers detailed insights. Unlike traditional methods, which lack advanced predictive capabilities and visualizations, this app uses machine learning to predict player's metric of their market value which accounts for goals and assists (and more), helping users gain a more forward-looking view of player abilities and potential.

The app displays player data through visually appealing hexagon charts that make it simple for fans, analysts, and clubs to compare stats. These charts break down complex information in a way that is easy to understand. Additionally, the app includes a player similarity feature those analyses playing styles and stats to suggest players with similar traits, making it a great tool for team selection, scouting, and tactical planning.

By potentially categorizing player roles and forecasting their potential value, the app goes beyond basic comparisons, offering a deeper understanding of each player contribution to the team. It allows users to estimate how player's value could change in upcoming years, which can guide financial decisions and recruitment strategies. This combination of AI-powered predictions and similarity detection makes the app an invaluable tool for any football analysis.

With its user-friendly interface, the app makes it easy for fans and analysts to input and visualize player data quickly, without needing any specialized skills. This interactive, all-in-one tool enhances the accuracy of player comparisons, provides users with advanced insights, and ultimately boosts the efficiency and value of football analysis, serving as a powerful resource for team building and decision-making.

2. Aims and Objectives

2.1. Aims

The goal of this project is to create a web app that lets users compare football players' performance across different metrics using hexagon charts. The app will use machine learning models to predict player's market value. It will also have AI tools to find players with similar attributes and playing styles, which can help with team building and scouting.

2.2. Objectives

The objectives of this projects are:

I. Develop and Train the Player Comparison Model.
II. Create a User-Friendly Web Interface.
III. Develop machine learning models to predict players' market value.
IV. Enhance Data Comparison and Visualization.
V. Evaluate the System.

3. Expected Outcomes and Deliverables

a) **Accurate Player Comparison and Insights:** An AI-powered model that accurately compares players across various performance metrics, such as goals, assists, and other relevant statistics.
b) **Effective Value Prediction:** Machine learning algorithms that predict player's market value based on historical data, providing actionable insights for club and the board.
c) **Player Similarity Detection:** AI-driven features that identify players with similar attributes and playing styles, helping users make informed decisions for team building and scouting.
d) **Interactive and Engaging Visualizations:** Visually engaging and interactive hexagonal charts that make complex data more accessible and easier to interpret for users.
e) **User-Friendly Interface:** A seamless, responsive web interface built with Flask, offering users an easy-to-use platform to compare players, view stats, and interact with features intuitively.
f) **High User Satisfaction:** Positive user feedback and a satisfaction rate of at least 85%, indicating that the app meets the needs of fans, analysts, and football clubs.

4. Project risks, threats and contingency plans

4.1. Risks and Threats:

a) **Accuracy of Performance Prediction:** The machine learning model may face challenges in accurately predicting future player value due to the unpredictability in player behaviour, form, and external factors (e.g., injuries). This could result in less reliable predictions and affect user trust in the system.

b) **Data Integration Challenges:** Integrating player data from various sources and ensuring data consistency could bring in challenges, potentially leading to incorrect comparisons.

c) **Complexity in Player Similarity Detection:** The AI algorithm for detecting players with similar attributes and playing styles might struggle to identify truly comparable players, especially if the data is insufficient or the attributes are not well-defined. This could impact on the accuracy of team-building recommendations.

d) **User Experience and Usability:** If the interface is not easy to navigate, users may struggle to effectively use the web app, leading to frustration, lower user engagement, and reduced satisfaction with the platform.

e) **Integration of AI Tools:** Integrating AI-powered features like market value predictions and player similarity detection could introduce technical complexity, leading to delays or errors in functionality, especially if the machine learning models are not optimized or properly tested.

f) **Data Privacy Concerns and System Security:** If the app manages personal data (e.g., user account information), there could be concerns about privacy. The web application could be vulnerable to security threats such as data breaches or unauthorized access. If proper security measures are not implemented, sensitive player data and user information could be compromised.

g) **External Data Source Dependency:** The app's reliance on external football data sources or APIs could create risks if these sources become unavailable or change their data format which may disturb the app's functionality and user experience.

4.2. Contingency Plans:

a) **Accuracy of Value Prediction:** Continuously update the model with fresh data and combine statistical models with expert input to account for unpredictable factors like injuries and transfers.

b) **Data Integration Challenges:** Implement data validation techniques and use multiple data sources as backups.

c) **Complexity in Player Similarity Detection:** Enhance algorithms by collecting more detailed player data and incorporate user feedback to improve accuracy.

d) **User Experience and Usability:** Conduct regular usability testing, provide in-app tutorials, and gather user feedback to improve UI/UX.

e) **Integration of AI Tools:** Test AI tools before integration, use modular components for easy updates, and have backup algorithms in place.

f) **Data Privacy Concerns and System Security:** Implement encryption, multi-factor authentication, and conduct regular security measures to identify vulnerabilities.

g) **External Data Source Dependency:** Use multiple data sources and modify the existing model as quickly as possible.

5. Methodology

The Scrum framework will be employed for the Football Player Comparison App project due to its iterative and structured approach, which is ideal for managing complex tasks and adapting to evolving requirements. By dividing the project into sprints, Scrum gives continuous and regular feedback and progress on critical components, such as AI-powered prediction and player comparison functionalities. This approach ensures continuous alignment with user needs and allows me to address any challenges or scope changes quickly and effectively.

Figure 1 Scrum Methodology

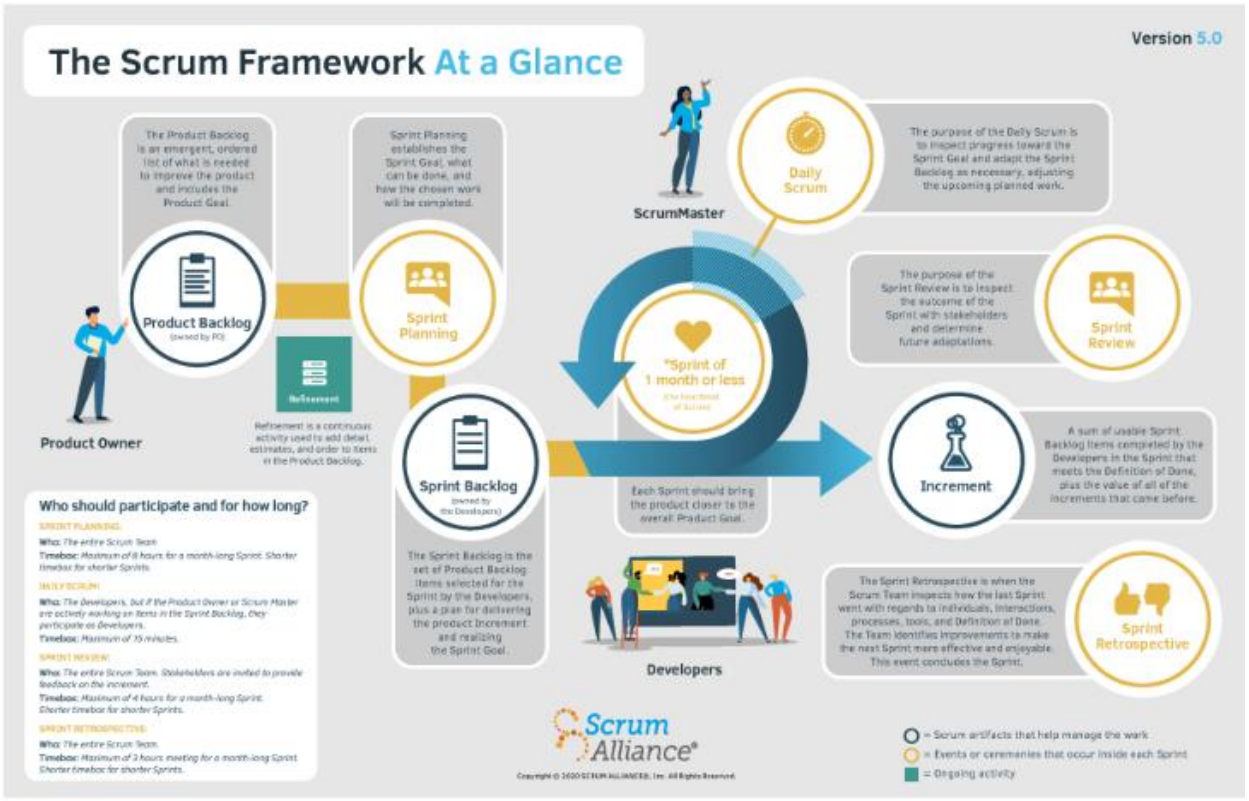

Figure 2 Scrum Methodology overview

6. Resource Requirements

For the successful completion of this project, required tools and technologies are as follows:

Hardware Requirement

Computer System:

- Processor: Minimum Intel i5 or equivalent (preferably i7 or higher for better performance).
- RAM: At least 8 GB.
- Storage: Minimum 256 GB SSD.

Internet Connection:

- Stable broadband connection for accessing online resources and datasets.

Development Environment:

- Operating System: Windows, macOS, or Linux.

Software Requirement

- **Programming Languages:**

    - **Python**: backend, machine learning, artificial intelligence integration, data visualization and web scraping.

HTML structures the content, **CSS** is used to design, and **JS** adds interactivity and animation for the front-end.

- **Web Framework:** Django

- **Tools and Libraries:**

    - Pandas for data manipulation, cleaning, and preparation.
    - Anaconda, Google Collab, Keras
    - NumPy for numerical operations on player stats and performance metrics.
    - Python's Matplotlib, Seaborn, and Plotly libraries allow easy integration of data visualization tools like the hexagonal **charts** for player comparisons, making it ideal for presenting complex data in an accessible format.
    - **Scikit-learn** for simpler models like linear regression or decision trees to predict based on historical data, clustering algorithms like K-Means or K-Nearest Neighbors (KNN) for grouping similar players based on statistical features.

- **Development Tool:** Visual Studio Code

7. Work Breakdown Structure

A work breakdown structure (WBS) is a great tool to help overcome complexity by breaking even the most cryptic projects down into bite-size chunks. Not only will WBS help to stay more organized, but it will also build clarity across the team, reduce risk, and enable better control of the project's scope. (Elliott, 2024)

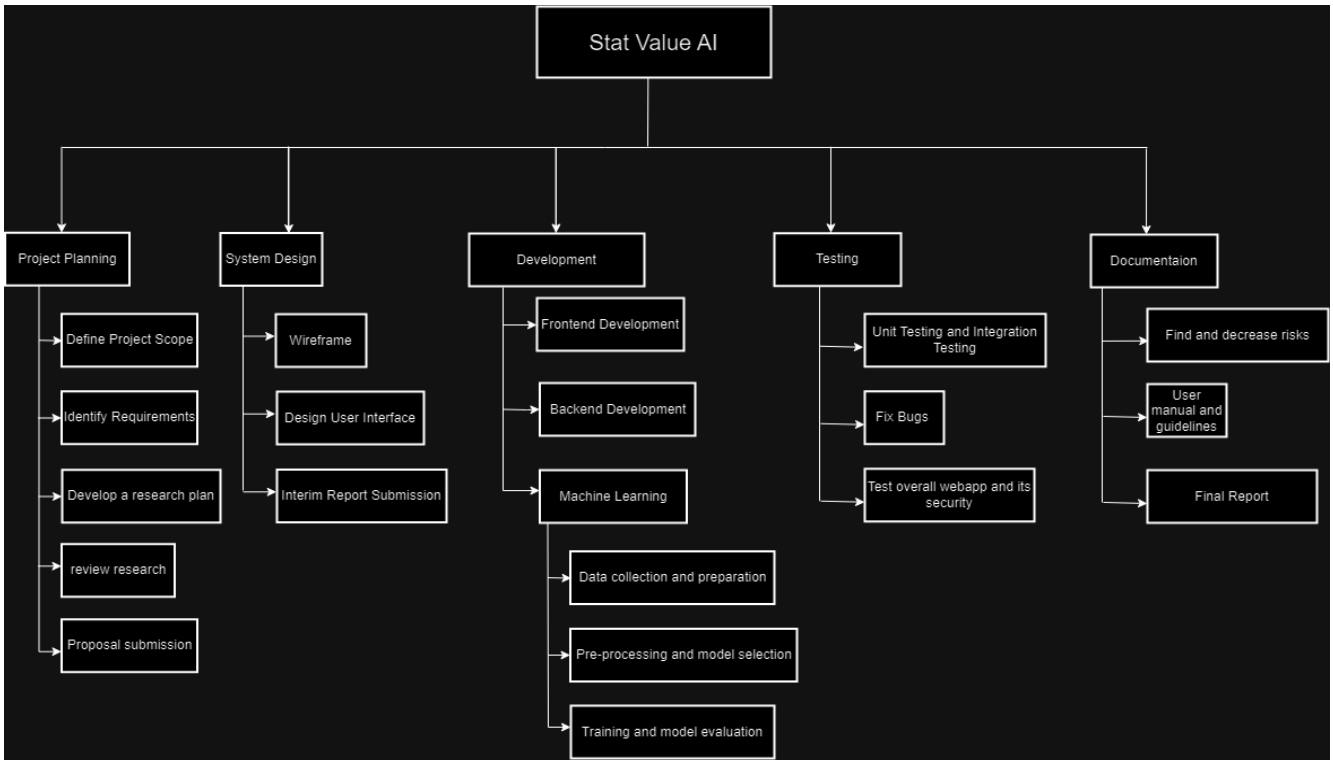

Figure 3 Work breakdown Structure Chart

8. Milestones

A milestone chart is a tool that visually represents these significant milestones along the project timeline. Unlike more detailed Gantt charts, which include every task, a milestone chart focuses only on the most important stages of the project, offering a high-level view of progress and upcoming goals. This condensed view is helpful for stakeholders and managers who need a quick status update. (Row, 2024)

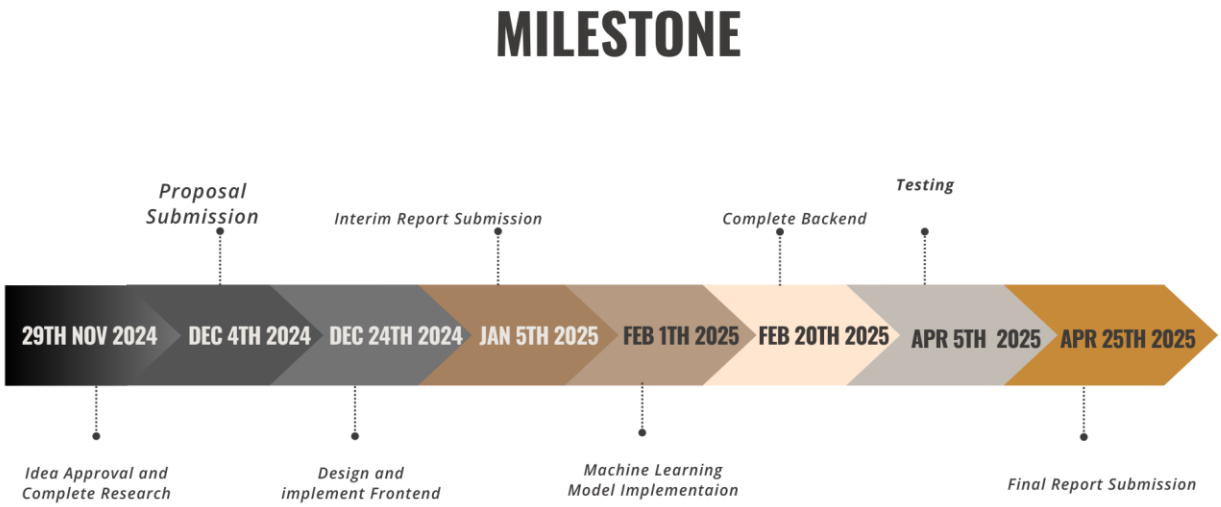

Figure 4 Milestone Chart

9. Project Gantt Chart

Gantt charts are smart project management tools that intuitively track where you are and what needs to be done in a specific project. Gantt charts are essentially horizontal bar charts that provide a graphical representation of a project schedule. (Williams, 2023)

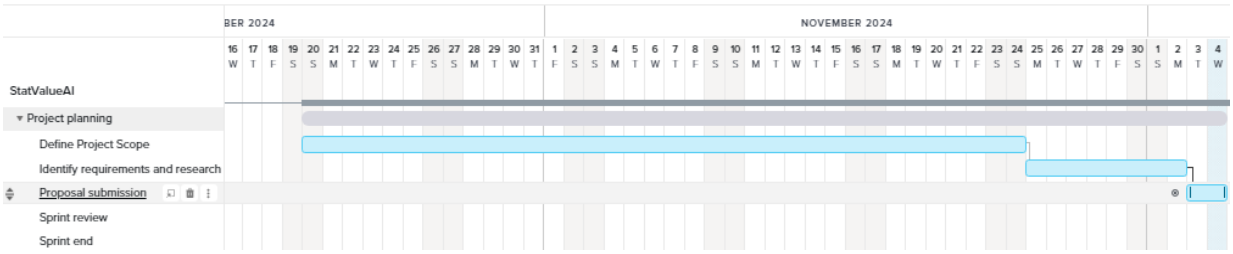

Figure 5 Gantt Chart 1

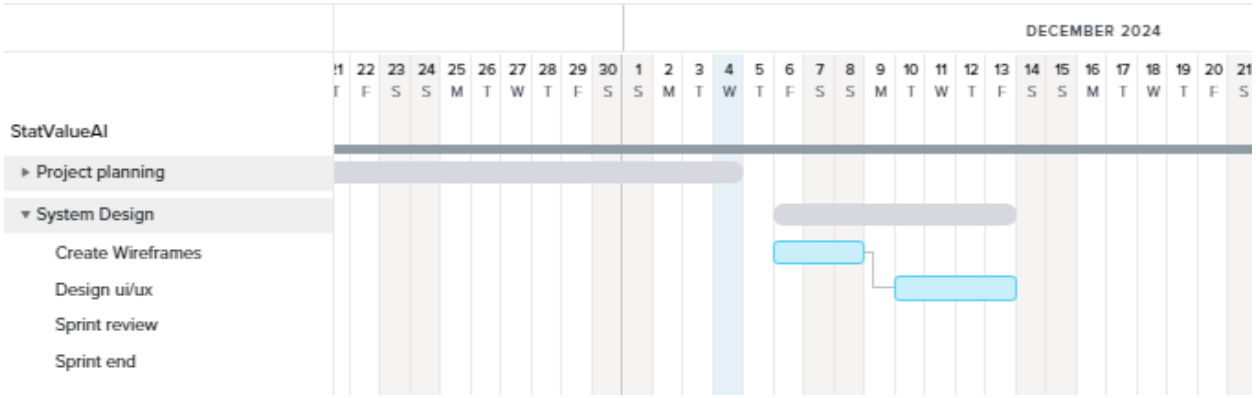

Figure 6 Gantt Chart 2

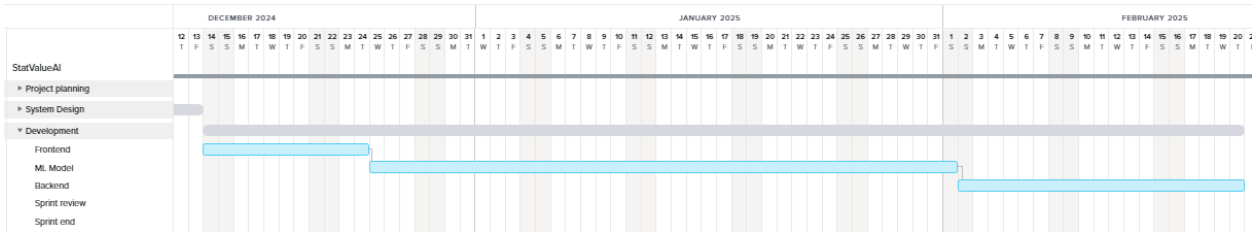

Figure 7 Gantt Chart 3

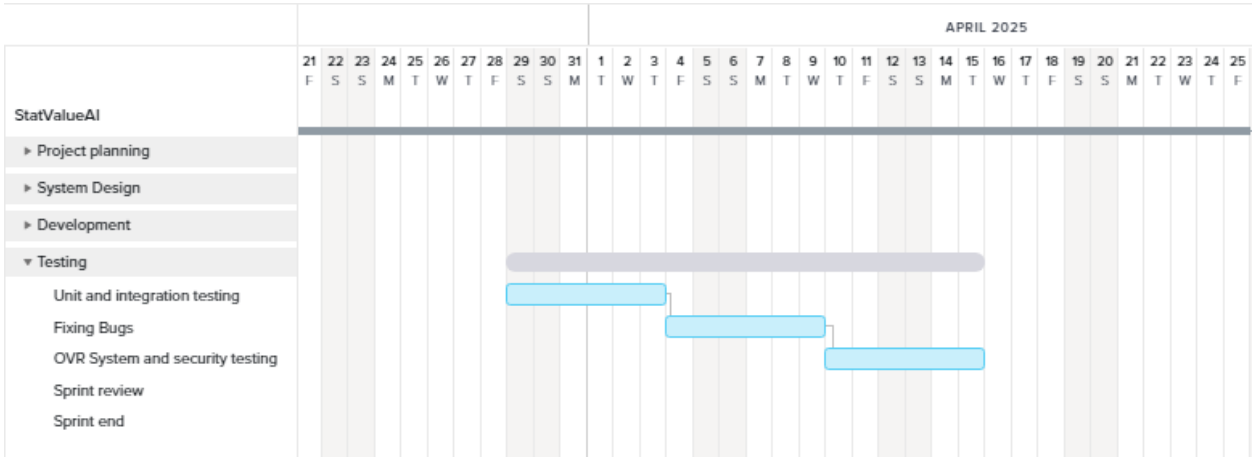

Figure 8 Gantt Chart 4

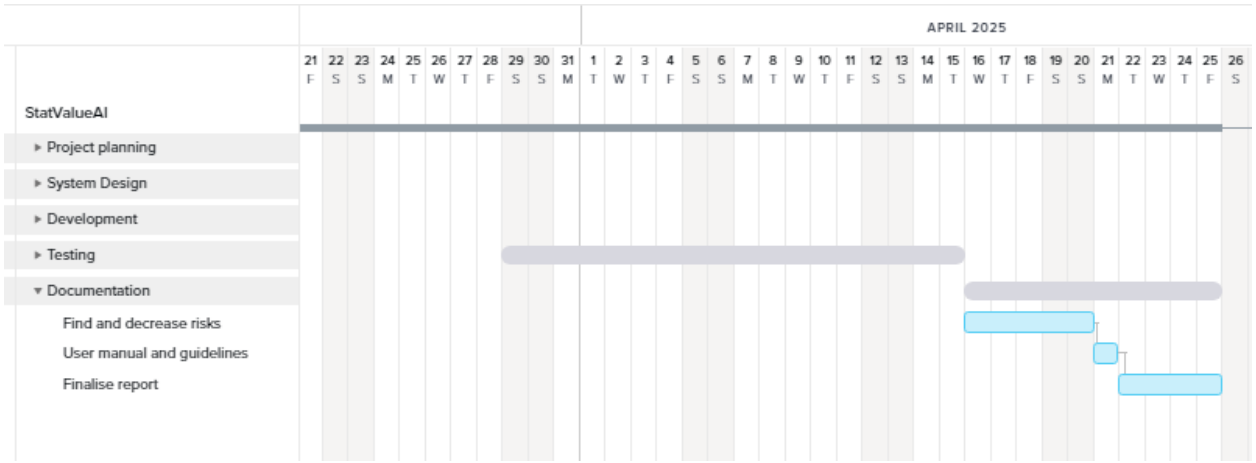

Figure 9 Gantt Chart 5

10. Workflow

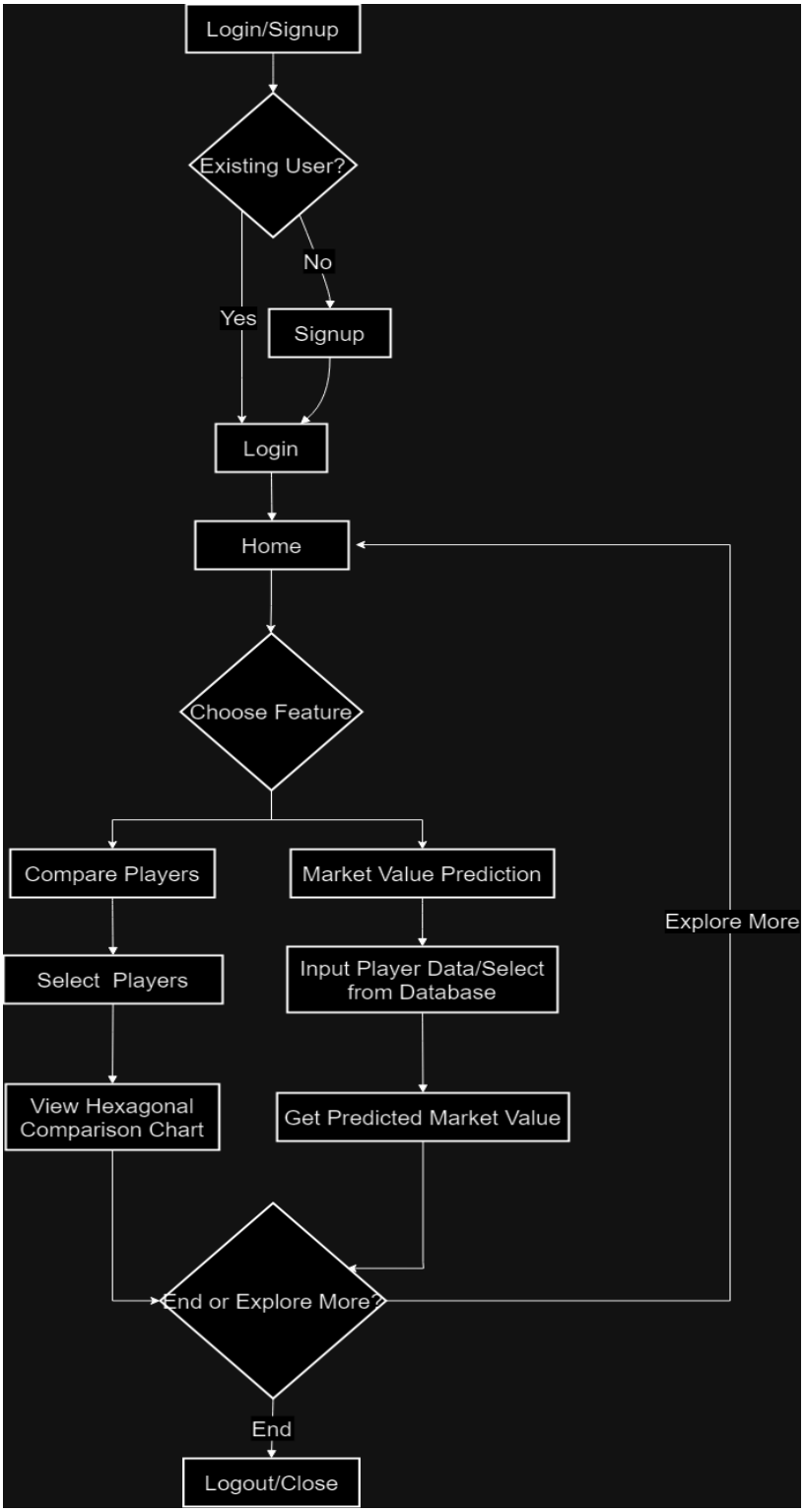

Figure 10 Workflow Diagram

11. Conclusion

In modern football, data plays a crucial role in evaluating player performance and making informed decisions. The Football Player Comparison Web App offers an innovative approach by combining AI-powered insights, machine learning predictions, and user-friendly visualizations. Using hexagonal charts, the app simplifies complex player data, making it easy for fans, analysts, and scouts to compare players across various metrics.

Beyond basic comparisons, the app predicts a player's future market value using past data. This forward-looking feature is valuable for team building, recruitment and financial decisions. The player similarity detection tool, also powered by AI, helps identify players with similar attributes and playing styles, which is particularly useful for scouts and football nerds.

The app provides deeper insights into player performance, making it a powerful tool for casual fans, analysts, and football clubs. In short, this project uses AI and data visualization to transform how players are compared, analysed, and evaluated, benefiting everyone from casual fans to professional teams

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