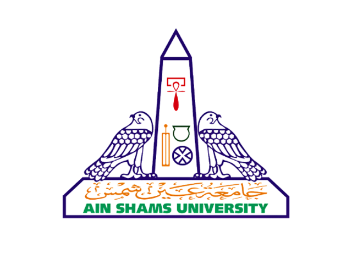
**Ain Shams University**

**Faculty of Computer & Information Sciences**

**Scientific Computing Department**

Game Glimpse

**Football Match Summarization**

**This documentation submitted as required for the degree of bachelor’s in**

**computer and Information Sciences.**

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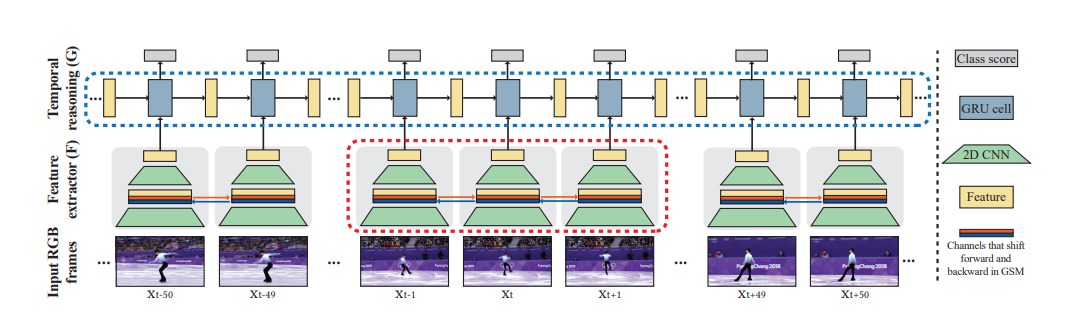
Abstract

In the fast-paced world of sports, fans often struggle to keep up with live soccer matches due to time constraints and busy schedules. To address this issue, our project presents an innovative solution: an intelligent model that automatically summarizes soccer matches, extracting key highlights to provide a comprehensive overview for those who cannot watch the full game.

This project leverages advanced machine learning techniques and deep learning techniques to analyze match footage, identify crucial events such as goals, penalties, and notable plays, and compile them into a concise summary.

Our model delivers a rich, engaging summary that mimics the experience of watching the entire match. This system aims to enhance fan engagement, offering a practical tool for sports enthusiasts to stay updated with minimal time investment. The effectiveness of the model is evaluated through a series of tests comparing the generated summaries with human-compiled highlights, demonstrating its accuracy and relevance.

Our project contributes to the growing field of sports analytics and media consumption, paving the way for more sophisticated automated summarization technologies in the future.



*Model Overview*

# Introduction

1. Problem Definition
   1. History
   2. Applications
2. Motivation
3. Objectives
4. Time plan

## Problem Definition

Soccer, being one of the most popular sports worldwide, attracts millions of viewers and fans. However, due to time constraints and busy schedules, many fans are unable to watch live matches in their entirety.

This leads to a significant demand for concise and informative summaries that capture the essential moments of a match. The challenge lies in creating a model that can automatically and accurately identify and compile these key highlights, providing a comprehensive overview of the game. The aim is to ensure that fans who cannot watch the full match still receive a rich, engaging summary that reflects the most critical aspects of the match.

### History

The concept of video summarization has evolved significantly over the past few decades, with its roots tracing back to the early development of video processing and analysis technologies. Initially, video summarization techniques were rudimentary, relying heavily on manual editing and basic algorithms to extract highlights.

The advent of machine learning and artificial intelligence has revolutionized this field, enabling the automation of highlight detection and summarization. In the context of soccer, early attempts focused on simple event detection, such as goals or fouls, based on predefined rules and basic video analysis. Over time, advancements in computer vision, natural language processing, and deep learning have paved the way for more sophisticated models capable of understanding and interpreting the complexities of a soccer match, including player movements, crowd reactions, and contextual nuances.

### Applications

The applications of soccer match video summarization are extensive and varied, benefiting both fans and industry stakeholders.  
Key applications include:

1. Fan Engagement: Automated summaries provide an accessible way for fans to stay updated on matches they cannot watch live, enhancing their overall engagement and satisfaction.
2. Media Broadcasting: Broadcasters can use summarization models to quickly generate highlight reels for news segments, social media, and post-match analyses, thereby increasing viewer engagement and content reach.
3. Coaching and Analysis: Coaches and analysts can utilize summarized footage to review key moments, strategize for future games, and conduct performance evaluations without sifting through entire match recordings.
4. Content Creation: Sports journalists and bloggers can leverage summarized content to create articles, blogs, and social media posts, providing quick and insightful match analyses to their audience.
5. Historical Archiving: Summarization aids in creating condensed archives of matches for historical reference, making it easier to analyze trends and performances over time.

## Motivation

The motivation for this project stems from the growing need for efficient and effective ways to consume soccer content in an increasingly busy world. Soccer, as the most popular sport globally, commands a vast and passionate audience. However, not all fans can dedicate the time to watch full matches due to demanding schedules and other commitments. This creates a gap between the desire to stay updated with favorite teams and players and the practical limitations of time.

Enhancing Fan Experience:

By developing an intelligent model for summarizing soccer matches, we aim to bridge this gap and enhance the overall fan experience. This project empowers fans by providing them with quick access to the most crucial moments of a match, ensuring they stay informed and connected to the sport they love. This is particularly important in the age of social media, where timely and engaging content is essential for maintaining audience interest and satisfaction.

Leveraging Technological Advancements:

Recent advancements in machine learning, computer vision, and natural language processing present a unique opportunity to create sophisticated summarization models that can deliver high-quality summaries akin to human-generated content. Harnessing these technologies allows us to push the boundaries of automated sports analytics, offering innovative solutions that were previously not feasible.

Addressing Industry Needs:

The media and sports broadcasting industries are continuously seeking ways to optimize content delivery and enhance viewer engagement. Automated summarization can significantly reduce the time and effort required to produce highlight reels and post-match analyses, leading to cost savings and increased efficiency. Moreover, this technology can be a valuable tool for coaches, analysts, and sports journalists, providing them with quick access to relevant match data and insights.

Promoting Accessibility and Inclusivity:

Our project also aims to promote accessibility and inclusivity in sports content consumption. By providing concise and informative summaries, we cater to a diverse audience, including those with limited time, people with disabilities, and casual fans who may not have the inclination to watch full matches. This ensures that soccer remains a universally enjoyable and accessible sport.

Pioneering Future Applications:

Finally, this project serves as a stepping stone towards more advanced applications in sports analytics and media consumption. The development of a robust summarization model lays the groundwork for future innovations, such as real-time summarization, personalized highlight reels, and enhanced interactive viewing experiences.

## Objectives

The primary objective of this project is to develop an intelligent model that can automatically summarize soccer matches by extracting key highlights and deploying this model in a mobile application. This application will also provide additional features such as fixtures, league standings, and match summaries. The detailed objectives of the project are as follows:

1. Develop an Intelligent Summarization Model
   1. Automated Highlight Extraction:
      * + Create a machine learning model capable of analyzing soccer match footage to identify and extract key highlights, such as goals, fouls, penalties, and significant plays.
   2. Multi-modal Analysis:
      * + Integrate audio-visual data and textual commentary to enhance the accuracy and richness of the generated summaries.
   3. Real-time Processing:
      * + Optimize the model for real-time processing to provide quick and timely summaries immediately after or even during the match.
2. Design and Implement a Mobile Application
   1. User-friendly Interface:
      * + Develop a mobile application with an intuitive and easy-to-navigate interface to ensure a seamless user experience.
   2. Fixtures and Standings Display:
      * + Include features to display upcoming fixtures, current league standings, and detailed team and player statistics.
   3. Integrated Match Summaries:
      * + Implement the summarization model within the app to provide users with concise, informative match summaries directly on their mobile devices.
3. Ensure High-Quality Summaries
   1. Accuracy and Relevance:
      * + Continuously evaluate and refine the summarization model to ensure that the highlights are accurate, relevant, and reflective of the most critical aspects of the match.
   2. User Feedback Integration:
      * + Implement mechanisms for users to provide feedback on the summaries, using this feedback to further enhance the model’s performance.
4. Deployment and Maintenance
   1. Scalability:
      * + Design the system architecture to handle a growing user base and increasing data volume efficiently.
   2. Continuous Improvement:
      * + Establish a robust maintenance and update process to keep the application and summarization model up-to-date with the latest advancements and user needs.

By achieving these objectives, the project aims to deliver a comprehensive and engaging mobile application that provides soccer fans with quick and insightful access to match highlights, fixtures, and league standings, enhancing their overall experience and connection to the sport.

## Methodology

1. Data Collection and Preprocessing
   1. Match Footage Acquisition:
      * + Collect a diverse dataset of soccer match videos from various leagues and competitions.
        + Ensure the dataset includes a range of match scenarios, including goals, fouls, penalties, and other significant events.
   2. Annotation:
      * + Manually annotate the collected videos with timestamps and descriptions of key events.
   3. Data Augmentation:
      * + Apply data augmentation techniques to enhance the dataset's diversity and improve the model's robustness.
2. Model Development
   1. Feature Extraction:
      * + Use computer vision techniques to extract visual features from video frames.
        + Utilize natural language processing to analyze and extract key information from textual commentary.
   2. Event Detection:
      * + Develop and train machine learning models (e.g., convolutional neural networks, recurrent neural networks) to detect and classify key events in the match footage.
   3. Highlight Generation:
      * + Implement algorithms to compile detected events into a coherent and concise match summary.
        + Ensure the summarization captures the flow and critical moments of the match.
3. Mobile Application Development
   1. Design and User Interface:
      * + Design an intuitive and user-friendly interface for the mobile application.
        + Ensure the app provides easy access to fixtures, league standings, and match summaries.
   2. Integration:
      * + Integrate the summarization model into the mobile application.
        + Develop APIs to facilitate data exchange between the model and the app.
4. Evaluation and Testing
   1. Model Evaluation:
      * + Test the summarization model on a separate validation dataset to assess its accuracy and relevance.
        + Use metrics such as precision, recall, and F1-score to evaluate model performance.
   2. User Testing:
      * + Conduct user testing to gather feedback on the app's usability, interface, and summarization quality.
        + Iterate on the app design and functionality based on user feedback.
5. Deployment and Maintenance
   1. Deployment:
      * + Deploy the mobile application on iOS and Android platforms.
        + Ensure the app is scalable to handle a growing user base.
   2. Monitoring and Updates:
      * + Continuously monitor the app's performance and user engagement.
        + Implement regular updates to improve features, fix bugs, and incorporate new advancements in summarization technology.
6. Continuous Improvement
   1. Research and Development:
      * + Stay abreast of the latest developments in machine learning, computer vision, and natural language processing.
        + Incorporate new techniques and innovations to continuously improve the summarization model's performance and accuracy.

By following this methodology, we aim to develop a robust and user-friendly mobile application that provides high-quality soccer match summaries, fixtures, and league standings, enhancing the overall experience for soccer fans worldwide.

## Conclusion

This project aims to address the challenge of delivering concise and informative soccer match summaries for fans with limited time. By developing an intelligent summarization model and integrating it into a mobile application, we provide an innovative solution that enhances fan engagement and accessibility.

The application not only offers match highlights but also includes features like fixtures and league standings, ensuring a comprehensive user experience.

The successful implementation of this project will bridge the gap between fans and the sport, allowing them to stay updated and connected despite their busy schedules. Additionally, this project lays the groundwork for future advancements in sports analytics and media consumption, demonstrating the potential of artificial intelligence in transforming how sports content is delivered and consumed. Ultimately, our solution aims to make soccer more enjoyable and accessible for a global audience, fostering greater engagement and appreciation for the sport.

## Time plan

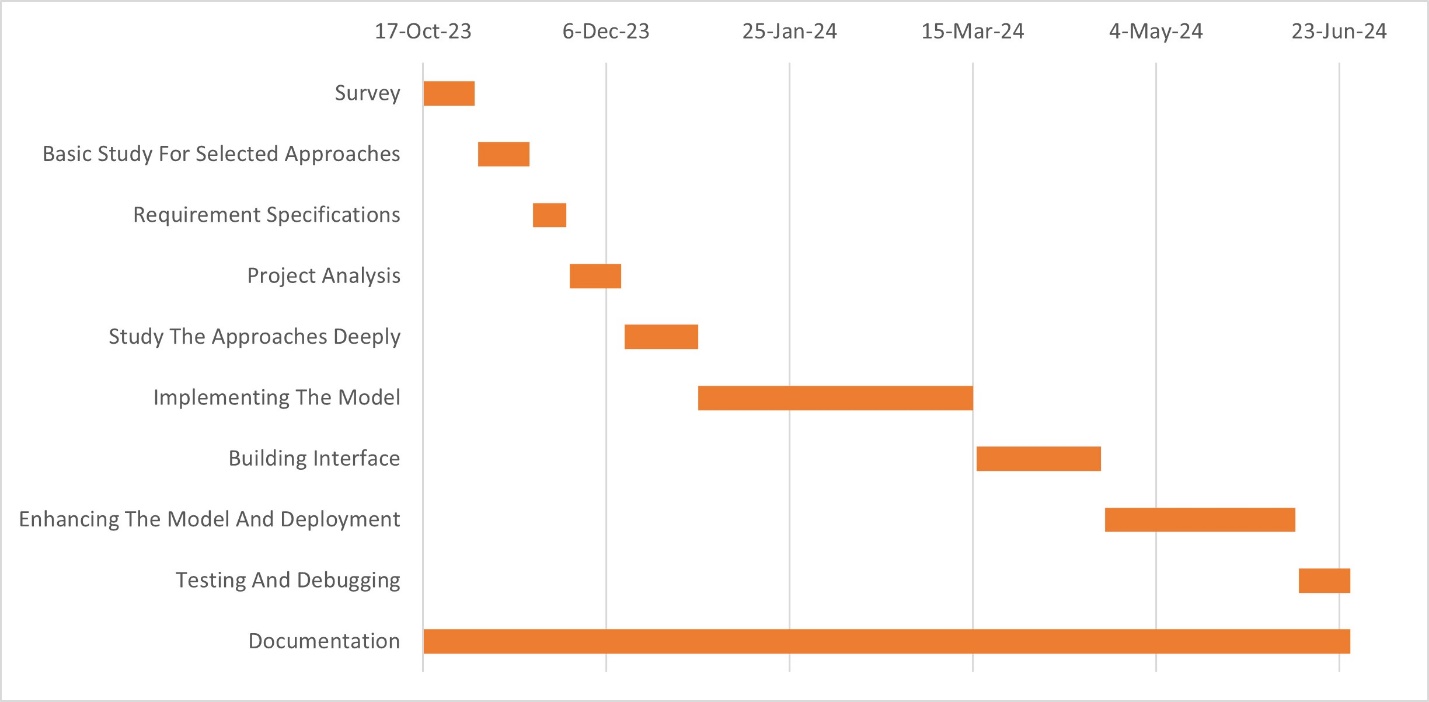


Figure ‎1‑1: Time Plan

|  |  |  |  |
| --- | --- | --- | --- |
| **Tasks** | **Start Date** | **End Date** | **Duration** |
| Survey | 10/17/2023 | 10/31/2023 | 2 Weeks |
| Basic Study For Selected Approaches | 11/1/2023 | 11/15/2023 | 2 Weeks |
| Requirement Specifications | 11/16/2023 | 11/25/2023 | 9 Days |
| Project Analysis | 11/26/2023 | 12/10/2023 | 2 Weeks |
| Study The Approaches Deeply | 12/11/2023 | 12/31/2023 | 20 Days |
| Implementing The Model | 12/31/2023 | 3/15/2024 | 2 Month & 2 Weeks |
| Building Interface | 3/16/2024 | 4/19/2024 | 1 Month & 4 Days |
| Enhancing The Model And Deployment | 4/20/2024 | 6/11/2024 | 1 Month & 3 Weeks |
| Testing And Debugging | 6/12/2024 | 6/26/2024 | 2 Weeks |
| Documentation | 10/17/2023 | 6/26/2024 | 253 Days |

## Thesis Outline

Chapter 2: Literature Review

This section covers the project area of deep learning and deepfake, exploring its scientific foundations, analysis, and research. The goal is to offer a detailed and complete overview of the field, encompassing its history, evolution, and current status. Furthermore, the section includes results from surveys and studies on the topic, emphasizing significant discoveries and insights.

Chapter 3: System Architecture and Methods

This section concentrates on outlining the system architecture and its primary modules. It seeks to give readers a comprehensive understanding of the project's technical components. Furthermore, it will also provide a detailed description of the methods and procedures employed in the development and implementation of the system.

Chapter 4: System Implementation and Results

This section will provide a detailed description of the dataset used in the project and the software tools employed. Additionally, it will cover the configuration steps involved in the application, the design of experiments, and the results obtained. The aim is to give readers a comprehensive understanding of how the dataset was utilized in the project and how the results were achieved. This section will offer a complete overview of the technical processes involved, helping readers understand the methodology used in the project development.

Chapter 5: Run the Application

This section provides a step-by-step guide for users to learn how to use the desktop application, along with the user manual for the mobile application.

Chapter 6: Conclusion and Future work

The section provides a comprehensive summary of the project, including the obtained results. It will also offer insights into potential improvements for the project's performance and suggest additional features or functions to enhance its capabilities.

Chapter 7: Tools

This section offers a detailed overview of the tools, programming languages, development environments, and frameworks used in the project. It will explain how each component was utilized, providing insights into their roles and contributions to the project's development.

# nrny

## lil80

# kkk

…

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# 4444

…

## j8j8j8

## kkkkk

# Run the Application

1. Desktop Application
2. Mobile Application

## Desktop Application

## Mobile Application

GameGlimpse, a mobile application recently developed using Flutter for Android devices, offers soccer enthusiasts a comprehensive platform to stay updated with the latest fixtures, league standings, match summaries, and more. Whether you're a passionate fan tracking your favorite teams or a casual observer keeping tabs on the latest soccer action, GameGlimpse provides a seamless user experience with its intuitive interface and up-to-date information. With features designed to enhance the soccer viewing experience, GameGlimpse is your go-to app for everything soccer-related on Android devices.

### Splash Screen

The Splash Screen serves as a fundamental component of our application, greeting users upon launch as the initial interface they encounter. It visually embodies the application's branding, delivering a concise introduction and aesthetic appeal to captivate users. Designed with animation, the splash screen exemplifies a dynamic representation, as illustrated in the figure 5-1 provided.

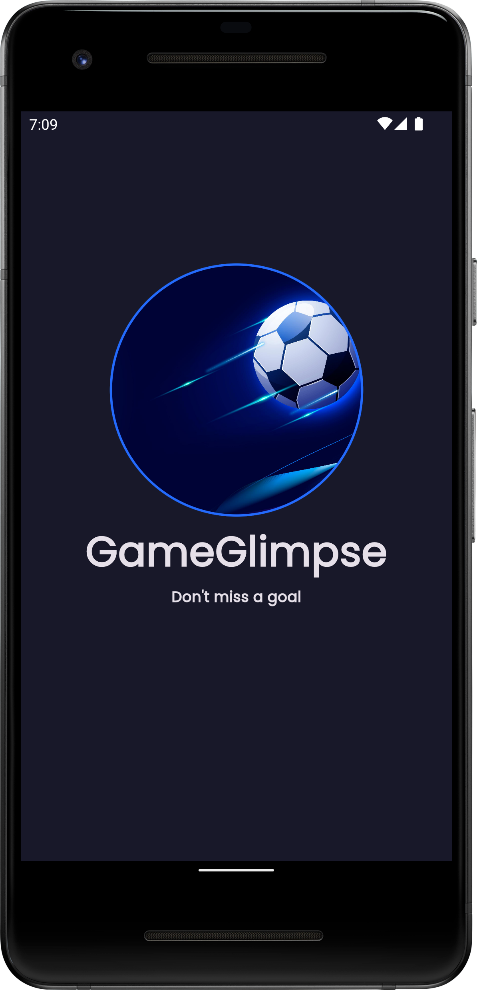


Figure ‎5‑1: Splash Screen

### Onboarding Screens

Onboarding screens play a crucial role in our application, providing new users with a seamless and engaging introduction. Specifically designed for Android applications, these screens are displayed only during the initial launch, ensuring a user-friendly experience from the outset.

These screens serve as an opportunity to acquaint users with the application's features effectively. For example, they can guide users on selecting or discovering images of statues while considering spatial constraints. Furthermore, onboarding screens highlight the app's advantages and provide a comprehensive overview of its purpose.

Moreover, these screens demonstrate how to utilize various functionalities, such as interactive chat, ensuring users grasp both how to use them and the benefits they offer. Overall, onboarding screens are instrumental in ensuring users comprehend the app's capabilities, encouraging them to maximize its potential.

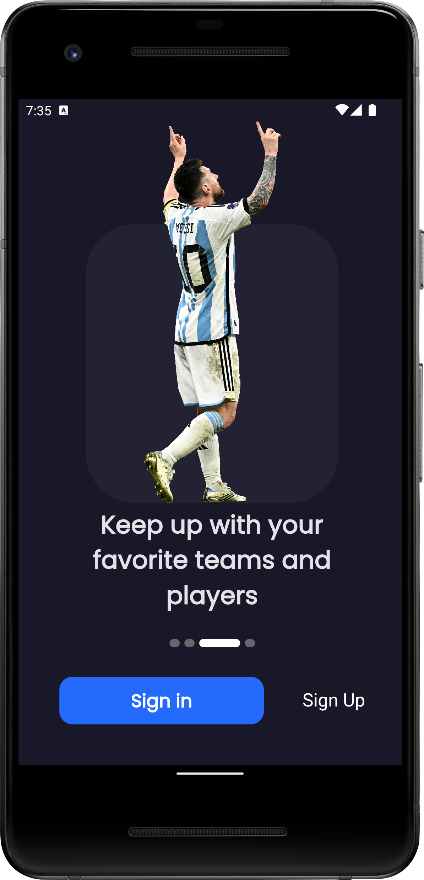
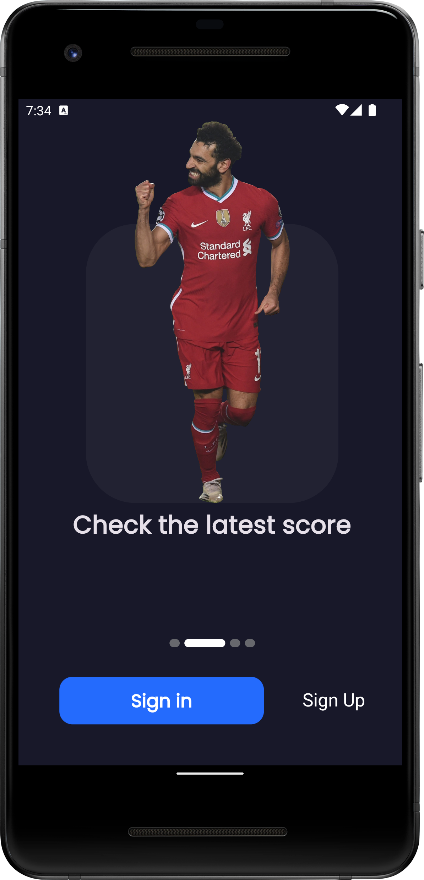
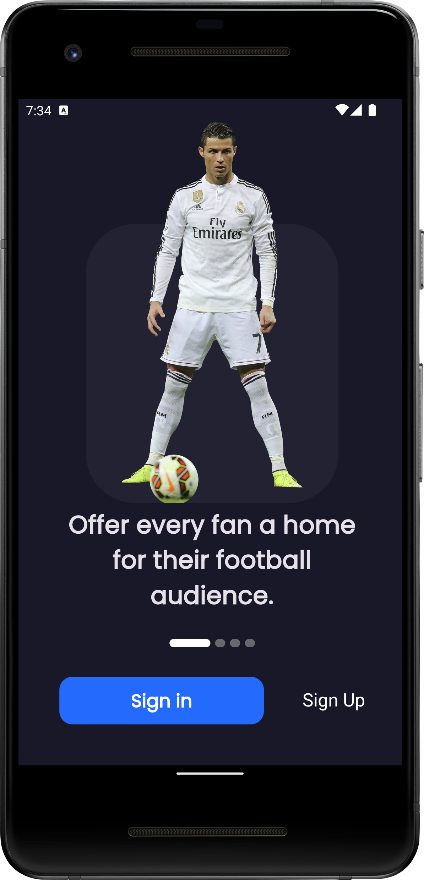


Figure ‎5‑2: Onboarding Screens

### Authentication Screen

The Authentication Screen is pivotal in our application, offering users streamlined access through both Sign In and Sign Up options. Whether opting for traditional email and password authentication or the convenience of Google sign-in, users can seamlessly enter the app.

For those signing up, the process is equally straightforward, with options to create an account using email and password or to swiftly register via Google. Additionally, users have the flexibility to join anonymously as an incognito user, ensuring privacy and convenience.

Furthermore, the Authentication Screen includes a Forgot Password feature, allowing users to securely reset their credentials if needed, enhancing user accessibility and security.

With these functionalities seamlessly integrated, our Authentication Screen ensures a user-friendly experience, prioritizing convenience, security, and user choice. security flutter

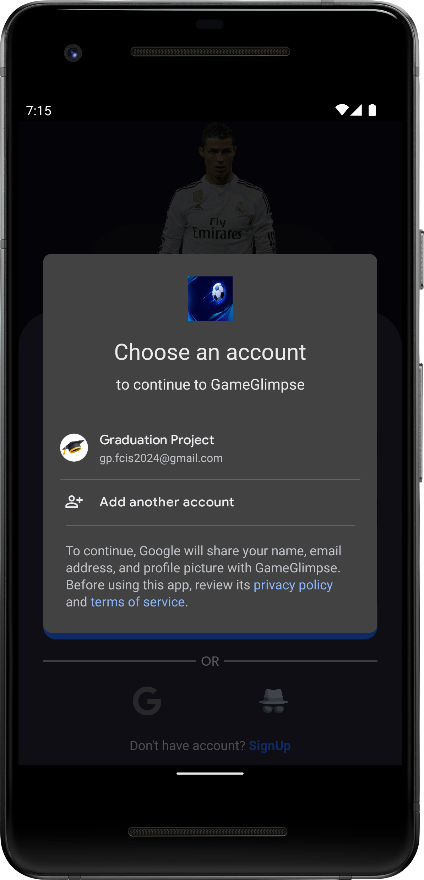
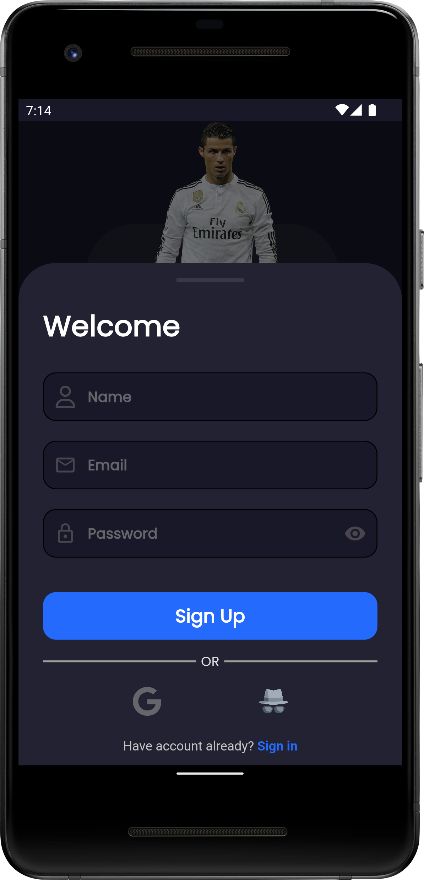
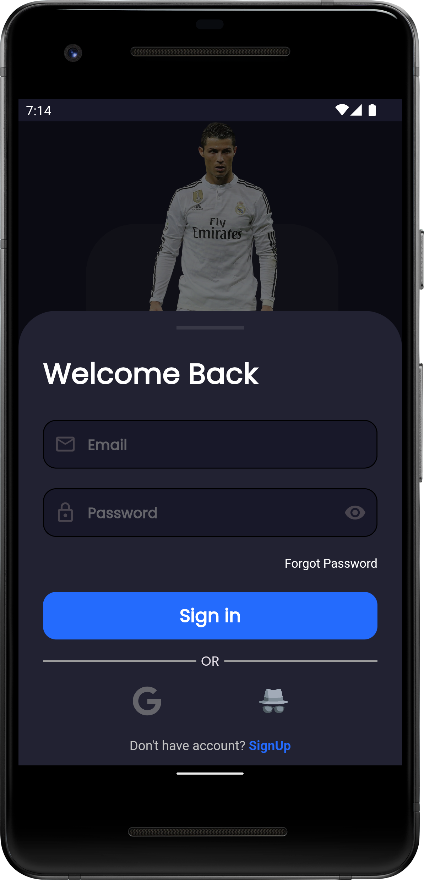


Figure ‎5‑3: Authentication Screen

### Home Layout

The Home Layout of our application features a dynamic Bottom Navigation Bar, meticulously designed to enhance user navigation across four distinct pages: Fixtures, Leagues Standing, Video Summary, and Profile.

This intuitive interface ensures effortless access to vital soccer information. The Fixtures page keeps fans updated on upcoming matches, ensuring they never miss a game. The Leagues Standing page provides comprehensive standings, allowing users to track their favorite teams' progress throughout the season.

For those seeking visual updates, the Video Summary page offers concise recaps and highlights of recent matches, delivering engaging content at a glance. Lastly, the Profile page allows users to personalize their experience, manage preferences, and stay connected with their favorite teams and leagues.

With seamless navigation and informative content, our Bottom Navigation Bar transforms the soccer viewing experience, making our app a must-have companion for every enthusiast.

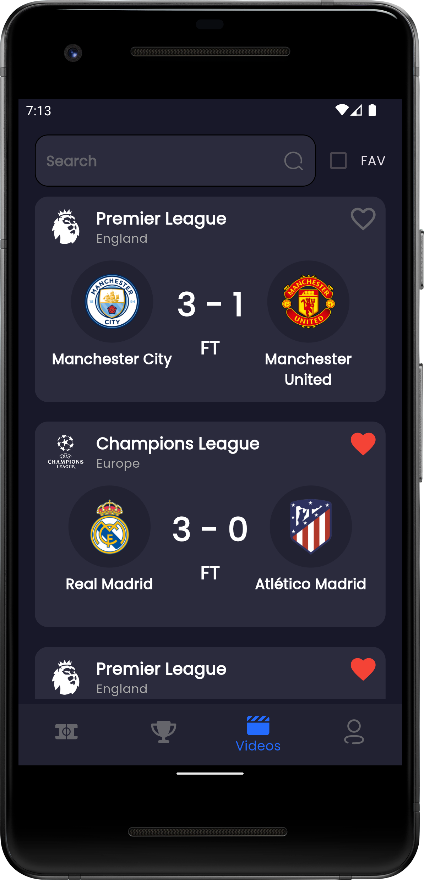
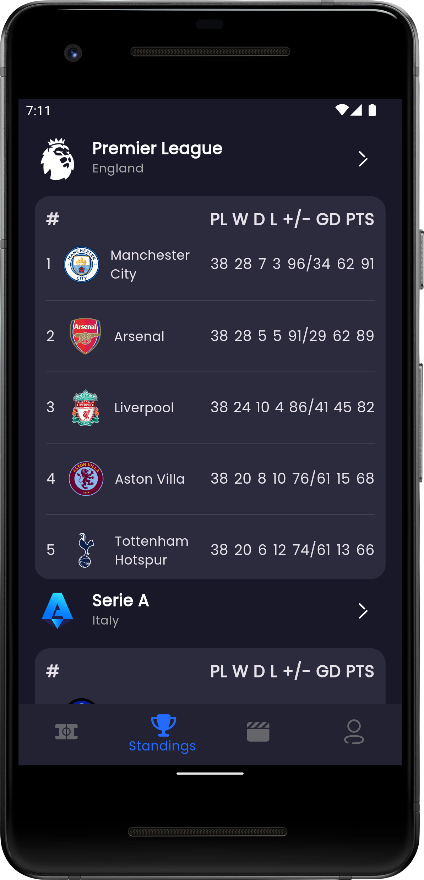
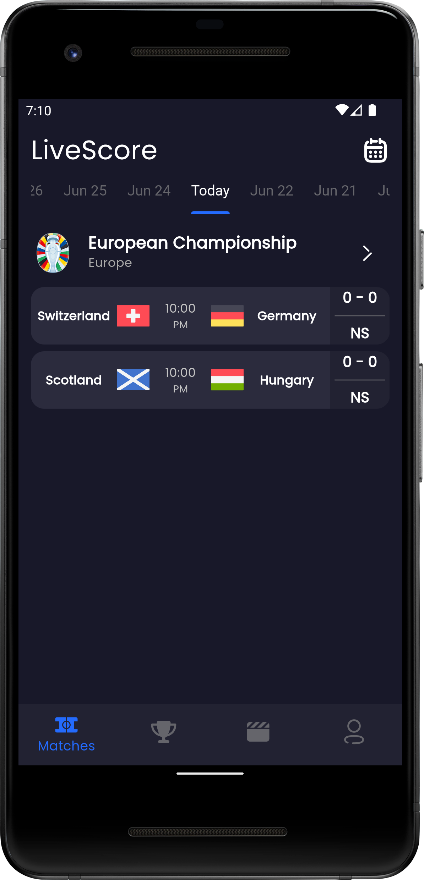


Figure ‎5‑4: Home Layout

### Fixtures Screen

The Day Fixtures Screen in our application is designed for easy access and navigation, featuring a Tab Bar that allows users to effortlessly select the specific day they wish to view fixtures for. Alternatively, users can opt to choose a day directly from a calendar interface to explore the day's scheduled matches.

This intuitive design ensures that soccer enthusiasts can quickly find the fixtures they're interested in, whether they prefer browsing through tabs for immediate access or using the calendar for precise date selection. By providing these options, the Day Fixtures Screen enhances user convenience and flexibility, catering to various preferences and needs when following their favorite teams' schedules.

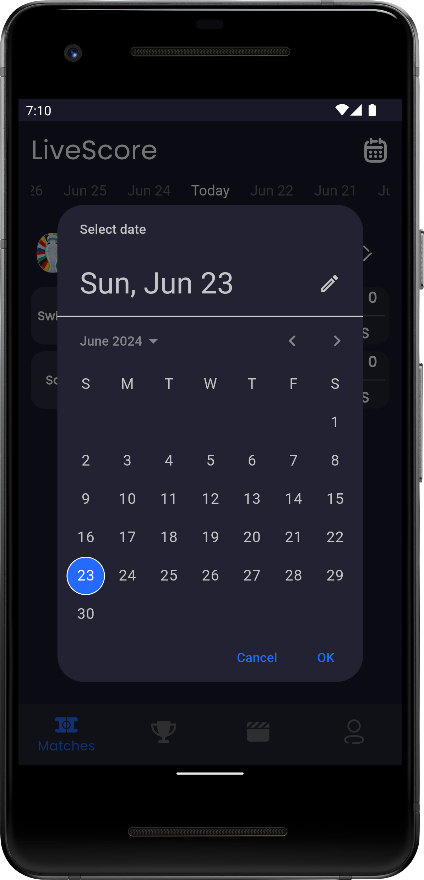
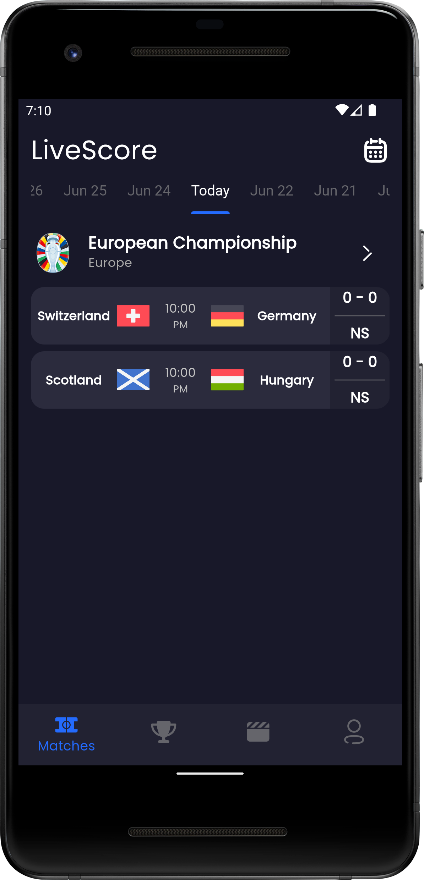


Figure ‎5‑5: Fixtures Screen

### Match Details

The Match Details Screen in our application offers a detailed breakdown of each match, providing users with comprehensive information on scores, statistics, and starting lineups for both teams.

This screen serves as a central hub where users can delve into key aspects of the game, including goals scored, assists, possession percentages, and shots on target. Additionally, it displays the starting lineups for each team, highlighting key players and formations.

With its user-friendly interface and real-time updates, the Match Details Screen enhances the soccer viewing experience, ensuring fans have access to all pertinent information to follow and analyze their favorite matches with depth and insight.

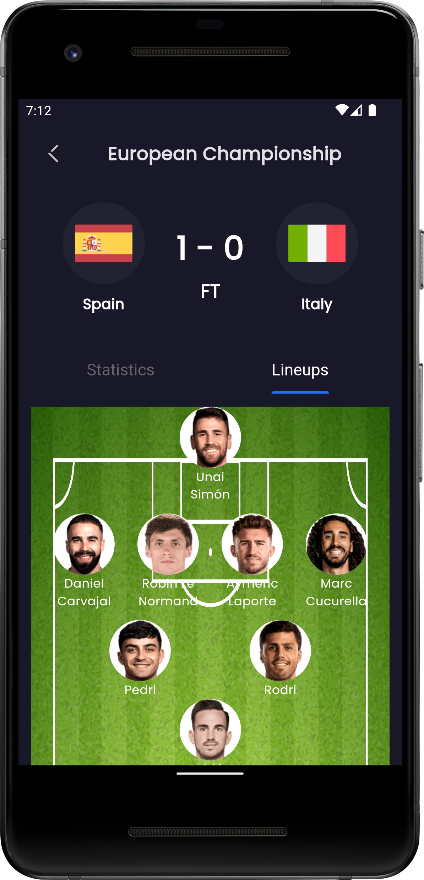


Figure ‎5‑6: Match Details Screens

### Leagues Standings

The Leagues Standings Screen in our application provides a comprehensive view of team rankings across various leagues. Users can easily navigate through different leagues to see the standings of each team displayed in an organized order.

This screen offers soccer enthusiasts a detailed perspective on team performances, allowing them to track their favorite clubs' positions throughout the season. With intuitive design and up-to-date information, the Leagues Standings Screen ensures users stay informed about current standings and league dynamics, making it an essential tool for passionate followers of the sport.

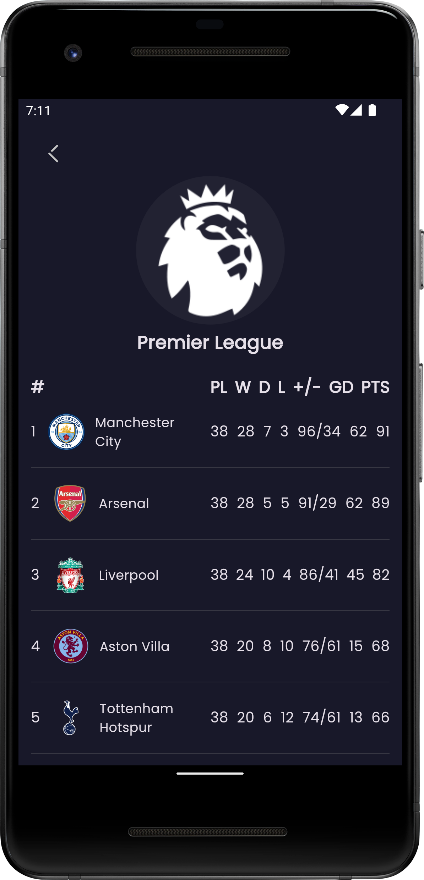
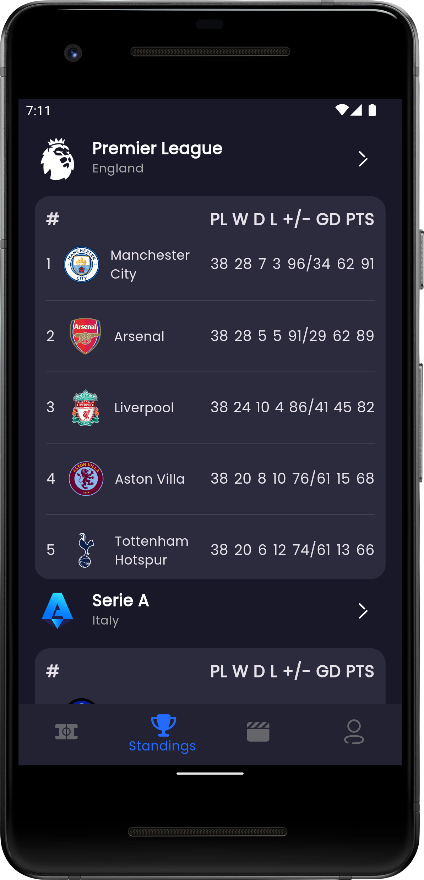


Figure ‎5‑7*:* Leagues Standing

### Video Summary

The Video Summary Screen in our application offers users a curated list of matches, each categorized into four classes: Full Summary, Goals, Shots, and Red Cards. Users can select any match category to view specific highlights and key moments.

Additionally, the screen features a functionality allowing users to mark matches as favorites, enabling easy access for future viewing. This personalized feature ensures users can quickly revisit their preferred matches without searching through the entire list.

Furthermore, the Video Summary Screen includes search and filter options, enabling users to efficiently navigate through matches. Whether searching for a specific match or filtering by favorites, these tools enhance user experience by providing quick access to desired content.

With its intuitive design and robust features, the Video Summary Screen enriches the soccer viewing experience, offering comprehensive match highlights and convenient navigation options for enthusiasts.

### Profile Screen

The Profile Screen in our application provides users with a personalized space to manage their identity and preferences. It prominently displays the user's name, bio, and profile image, offering a glimpse into their profile details.

Users have the option to edit their profile information directly from this screen. They can easily update their name, modify their bio to reflect current interests or statuses, and change their profile image to personalize their account further.

This screen ensures a seamless user experience by allowing quick and straightforward profile management within the app. Whether users wish to update their details or personalize their profile image, the Profile Screen offers intuitive functionality to meet their needs effectively.

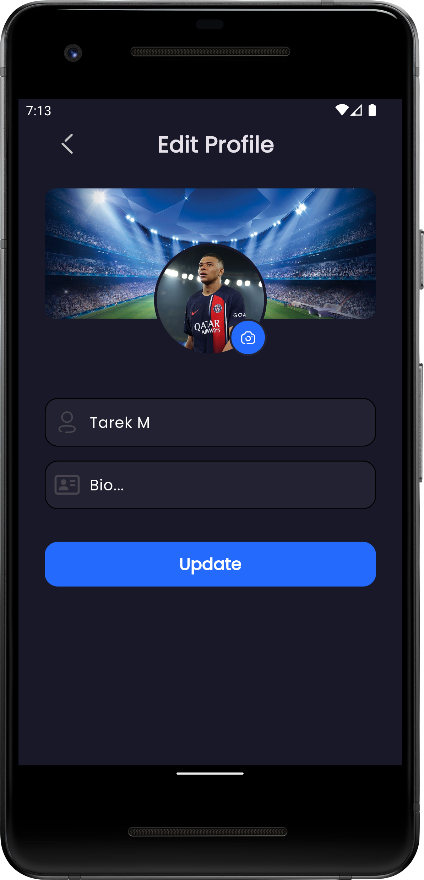
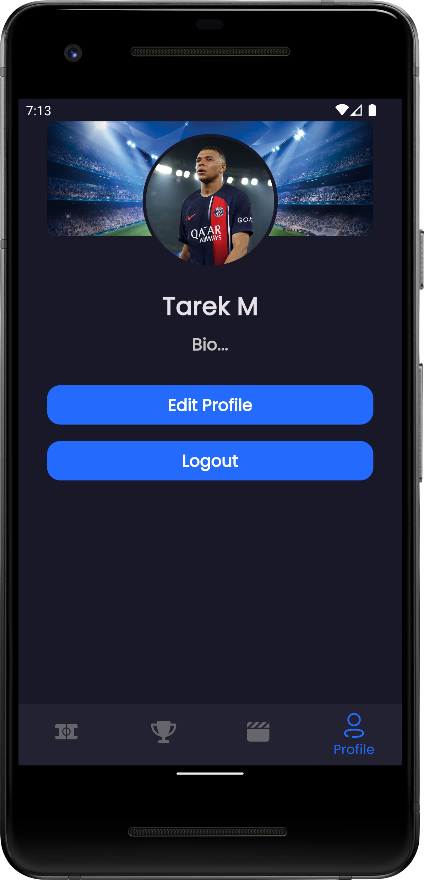


Figure ‎5‑8: Profile Screen

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