

**SPL-2 Software Requirement Specification and Analysis Report, 2024**

**ShotMaster**

**SE 505: Software Project Lab II**

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# Elicitation of ShotMaster

The main task of the elicitation phase is to combine the elements of problem solving, elaboration, negotiation and specification. The collaborative working approach of the stakeholders is required to elicit the requirements. The following tasks have been finished for eliciting requirements of ShotMaster:

- Collaborative Requirements Gathering
- Quality Function Deployment
- Usage Scenarios

## Collaborative Requirements Gathering

We have met with the stakeholders in the inception phase such as the players and coaches. These meetings created an indecisive state for us to elicit the requirements. To solve this problem, we have met with the stakeholders (who are playing a vital role in the whole process) a few times to elicit the requirements.

## Quality Function Deployment

Quality Function Deployment (QFD) is a technique that translates the needs of the customers into technical requirements for software. Ultimately the goal of QFD is to translate subjective quality criteria into objective ones that can be quantified and measured, and can then be used to design and manufacture the product. It is a methodology that concentrates on maximizing customer satisfaction from the software engineering process. So, we have followed this methodology to identify

the requirements for the project. The requirements which are given below, are identified successfully by the QFD.

## Normal Requirements

Normal Requirements are generally the objectives and goals that are stated for a product or system during meetings with the customer. The presence of these requirements fulfills customers' satisfaction. The normal requirements are given below:

1. **User-friendly interface:** The app should have an intuitive and easy-to-use interface, suitable for cricketers of all skill levels.
2. **Data recording and storage:** The app should accurately record and store data from practice sessions, including shot type, bat speed, impact, etc.
3. **Session summarization:** Provide users with summaries of their practice sessions, including metrics like number of shots, shot accuracy, and power.
4. **Periodic summarization:** Allow users to view data summaries on a daily, weekly, monthly, and yearly basis to track progress over time.
5. **Personalized notes and feedback:** Enable users to add personal notes to their practice sessions and receive feedback from coaches.
6. **Shot-based analysis:** Provide analysis and feedback on specific shots such as cut, pull, straight drive, cover drive, and slog.

## Expected Requirements

These requirements are intrinsic to the product or system and may be so elementary that the customer does not explicitly state them. Their absence will be a cause for significant dissatisfaction. Below are the expected requirements for this software:

1. **Sensor integration:** Support integration with gyroscopic sensors attached to bats for accurate data collection.
2. **Improvement graphs:** Display visual graphs illustrating improvements over time in key metrics like bat speed, impact speed, etc.

3. **Connect with coach:** Enable users to connect with coaches for personalized guidance and feedback.
4. **Multi-platform support:** Ensure the app is accessible on both iOS and Android platforms for widespread use.
5. **Social sharing:** Allow users to share their practice sessions, achievements, and improvement graphs on social media platforms i.e. Facebook, X, LinkedIn.

## Exciting Requirements

These requirements are for features that go beyond the customer's expectations and prove to be very satisfying. These are the exciting features of our project:

1. **AI-driven guidance:** Integrate a GPT chatbot to interact with and provide cricket tactics related assistance.
2. **3D shot visualization:** Generate a 3D animation that demonstrates the entire shot trajectory visual representation.

## Usage Scenario

ShotMaster will be a mobile application that will be a helping tool for an aspiring cricketer to improve their batting. It will be like a virtual assistant of the cricketer where s/he will need to attach a sensor with their bat. The sensor will read the data of the shots played by the player during their practice session and send it to the database and the database will store the data. Finally it will compare the shots with the standard shots which were stored in the database earlier and provide feedback on how perfectly the shots were played.

**Target Audience:** Cricketers of beginner and intermediate skill levels looking to improve their batting techniques and gain insights into their performance.

The software will contain the following features:

## Register and Login

### Registration

1. User accesses the registration page and system presents the registration form.
2. User enters their first name, last name, email address, and date of birth.
3. User selects their role: Player or Coach.
4. User creates a password adhering to the specified criteria (i.e., minimum length should be 8 characters including alphanumeric characters).
5. User re-enters the password for confirmation.
6. User clicks on the "Register" button.
7. System validates the entered information:
  - Checks if all mandatory fields are filled.
  - Verifies the email address format.
  - Ensures the date of birth is in the past
  - Validates password criteria.
8. If validation fails, the system displays appropriate error messages and prompts the user to correct the information.
9. If validation succeeds, the system creates a new user account with the provided details.
10. The system sends a verification email to the provided email address for account activation.
11. User receives the verification email and clicks on the provided link to activate the account.
12. System confirms successful activation and redirects the user to the dashboard.

## Login

The steps are:

1. User navigates to the login page.
2. System presents the login form.
3. User enters their registered email address and password.
4. User clicks on the "Login" button.
5. System validates the entered credentials:
  - Checks if the email address exists in the database.
  - Verifies if the password matches the corresponding email address.
6. If validation succeeds, the system grants access to the user's account.
7. If not, show "Wrong email address or password."
8. Users are redirected to the dashboard for their role (Player or Coach).

## Account recovery

The steps are:

1. User navigates to the login page.
2. System presents the login form.
3. User clicks on the "Forgot password" option.
4. System asks for the email address.
5. User enters her/his email address.
6. System verifies:
  - The email address is valid.
  - The email address exists in the database.
7. If verification fails, the system again asks for the email address.
8. System sends a verification email with an URL.
9. User clicks on the URL sent via email.
10. User creates a password adhering to the specified criteria (i.e., minimum length should be 8 characters including alphanumeric characters).
11. User re-enters the password for confirmation.
12. User clicks on the "Reset password" button.

13. System verifies the password criterias.
14. If any of the criterias is not fulfilled, the system again asks to type and retype a password again.
15. System shows a message "Password has been changed successfully."
16. User is directed to the dashboard.

Connect your coach

1. **Request coach:** Player sends request to the coach to connect as coach.  
Player cannot send a request to a coach if s/he is already connected to a coach.
2. **Respond to request:** Coach gets access to the player's data if s/he accepts the request.
3. **View Player Progress:** The coach navigates to the "Player Progress" section of the app, where they can view insights and analytics regarding the performance of their players.
4. **Select Player:** The coach selects the specific player s/he wants to view progress for from a list of their assigned players.
5. **Review Progress Insights:** The coach reviews the progress insights of the selected player, including performance metrics, improvement graphs, and any notes or comments from previous sessions.
6. **Send Feedback:** Based on the player's performance, the coach can provide feedback and recommendations for improvement. They can:
  - Select a specific session to provide feedback on.
  - Write comments or suggestions regarding the player's performance in that session.
7. **Submit Feedback:** After composing the feedback message, the coach submits it through the app.
8. **Player Receives Feedback:** The player receives a notification indicating that they have received feedback from their coach.
9. **Review Feedback:** The player navigates to the "Feedback" section of the app to review the feedback provided by their coach.
10. **Acknowledge Feedback:** The player acknowledges the feedback by reading it and considering the coach's recommendations for improvement.

Record practice session(ball by ball)

**1. Player Initiates Practice Session:** Player accesses the system and navigates to the “Practice session” module.

**2. Start Session:** Player selects the option to start a new practice session.

**3. Record Shots:**

- Player begins hitting shots, and for each shot:
  - a. Records the type of shot played (cut, pull, straight drive, cover drive, slog).
  - b. Records additional details if necessary (shot placement, speed, accuracy, connection point).
- Submits the data to the system.

**4. End Session:**

- Player concludes the practice session and confirms to end it.
- System saves the recorded data to the database.

**5. Retrieve Session Data:**

- Player or coach accesses the system at any time.
- Navigates to the practice session history section.

**6. Select Session:** Player or coach selects the desired practice session from the recorded sessions list.

**7. View Session Details:**

- System retrieves and displays the details of the selected practice session.
- Details may include:
  - a. Date, time and duration of the session.
  - b. Type and number of shots played.
  - c. Performance metrics if available (accuracy, consistency, variation, power).
  - d. Any additional notes or observations logged during the session.

Session summarizing

**1. Access Session Summary:** Player or coach accesses the system and navigates to the “Session summary” section.

**2. Select Session:** Player or coach chooses the practice session they want to summarize from the list of recorded sessions.

- 3. Retrieve Session Data:** System retrieves the detailed data of the selected practice session from the database.
- 4. Categorize Shot Quality:** For each shot played in the session:
  - System evaluates the shot based on predefined criteria (i.e. accuracy, consistency, variation, power).
  - Categorizes each shot as perfect, good, normal, or bad.
- 5. Calculate Statistics:** System computes statistics for the session, including:
  - Total number of perfect, good, normal, and bad shots.
  - Maximum and minimum values for bat speed, impact, and power recorded during the session.
- 6. Display Session Summary:**
  - System presents the summarized data in a clear and organized format.
  - Summary includes:
    - a. Distribution of shots by type.
    - b. Breakdown of shot quality categories.
    - c. Maximum and minimum values of bat speed, impact, and power.
- 7. Analyze Summary:**
  - Player or coach reviews the session summary to gain insights into performance trends and areas for improvement.
  - Identifies patterns or discrepancies in shot quality and performance metrics.
- 8. Adjust Training Plan:**
  - Based on the analysis, player or coach modifies the training plan or technique emphasis for future sessions.
  - Focuses on addressing weaknesses or building on strengths identified in the summary.

Comparing multiple players based on batting parameters

- 1. Navigate to Comparison Feature:** The user navigates to the "Comparison" section of the app where they can analyze their performance and compare it with other players.

2. **Select Players:** The user selects the players they want to compare. They can choose from their own performance data stored in the app or select other players from their network or leaderboards.
3. **Select Comparison Criteria:** The user chooses the criteria for comparison, such as:
  - Number of sessions attended
  - Total number of shots played
  - Shot accuracy percentage
  - Average strength and impact of shots
  - Maximum improvement over a period
4. **Generate Comparison Report:** After selecting the comparison criteria and players, the app generates a comprehensive comparison report displaying:
  - Total number of sessions attended by each player.
  - Total number of shots played by each player.
  - Shot accuracy percentage for each player.
  - Average strength and impact of shots for each player.
  - Maximum improvement achieved by each player over a period.
5. **Analyze Comparison:** The user analyzes the comparison report to understand the strengths and weaknesses of each player in various aspects of their cricket performance.

Periodic summarization

1. **Navigate to Data Visualization Section:** The user navigates to the "Performance Metrics" section of the app where they can visualize and analyze cricket performance data.
2. **Select Timeframe:** The user selects the desired timeframe for data visualization and analysis. They can choose from options such as day, week, month, or year.
3. **Select Data Parameters:** The user selects the specific parameters they want to analyze within the chosen timeframe. These parameters may include:
  - Accuracy
  - Impact
  - Variations
  - Number of shots played

- Number of practice sessions
4. **Generate Data Visualization:** After selecting the timeframe and parameters, the app generates visual representations (graphs, charts) of the performance data. Each parameter may be represented over time according to the selected timeframe.
  5. **View Data Insights:** The user views the generated data visualization to gain insights into their cricket performance. They observe trends, patterns, and fluctuations in performance metrics over the selected timeframe.

### Improvement graphs

1. **Navigate to Improvement Tracking:** The user navigates to the "Improvement Visualizer" section of the app where they can visualize their progress in various cricket skills.
2. **Select Metrics:** The user chooses the specific metrics they want to track for improvement. They select from options such as:
  - Bat speed
  - Impact speed
  - Backlift angle
  - Downswing angle
  - Bat face angle
  - Backlift direction
3. **Generate Improvement Graphs:** After selecting the metrics, the app generates graphical representations (graphs) showcasing the user's improvement over time for each selected metric. These graphs may display trends, progress, and fluctuations in performance.
4. **View Graphs:** The user views the generated improvement graphs, which provide insights into their development in different aspects of cricket skills. Each graph may have axes representing time and the chosen metric (e.g., bat speed over time).
5. **Social media sharing:** Players or coaches can share the player's improvement graph on social media.

## Personalized note and feedback

- 1. Navigate to Session Data:** The user navigates to the section of the app where they can access session data, such as performance metrics, shots played, and practice details.
- 2. Select Session:** The user selects the specific session for which they want to add notes. They may choose from a list of past sessions.
- 3. Add Notes:** The user clicks on the "Add Notes" button associated with the selected session.
- 4. Player's Section:**
  - The player enters notes in their section, reflecting on their performance, experiences, and any observations during the session.
  - The player may include details such as strengths displayed, areas for improvement, challenges faced, or specific techniques practiced.
- 5. Coach's Section:**
  - If applicable, the coach enters notes in their section, providing feedback, insights, and recommendations based on the player's performance during the session.
  - The coach may comment on the player's progress, offer technical advice, highlight areas of improvement, or suggest drills for future sessions.
- 6. Save Notes:** After adding notes in both sections (if applicable), the user saves the notes by clicking on the "Submit" button.

# Scenario based modeling

Although the success of a computer based system or product is measured in many ways, user satisfaction resides at the top of the list. If we understand how end users and other actors want to interact with a system, the software team will be better able to properly characterize requirements and build meaningful analysis and design models. Hence, requirements modeling with UML begins with the creation of scenarios in the form of use cases, activity diagrams, and swimlane diagrams.

## Use Case Diagram

A use case is a list of actions or event steps typically defining the interactions between a role (actor) and a system to achieve a goal. The actor can be a human or other external system. In this modeling, use case diagram is a graphical depiction of a user's possible interactions with a system. A use case diagram shows various use cases and different types of users the system has and will often be accompanied by other types of diagrams as well. Use case diagrams are a blueprint for the system. Due to their simplistic nature, use case diagrams can be a good communication tool for stakeholders. The drawings attempt to mimic the real world and provide a view for the stakeholder to understand how the system is going to be designed. Use case diagrams consist of actors, use cases and their relationships. The diagram is used to model the system/subsystem of an application. A single use case diagram captures a particular functionality of a system.

### **Actors :**

Actors are the users who communicate with a system. They may be a person, group, or external system that communicates with your system or application. They must be external data-producing or data-consuming objects. In the use case diagram, stick figures denote the actors employing the use cases. Actors are also divided into two parts:

- **Primary Actor :**

Primary actors collaborate to accomplish necessary system functions and produce the system's desired requirements. They often and directly collaborate with the software.

- **Secondary Actor:**

A secondary actor is a person, business procedure, or application that gives a use case a certain outcome or information in order to accomplish the use case's ultimate objective. Secondary actors support the whole system for fluent execution of primary actors. And they accomplish this task by producing or consuming information.

### **Associations :**

Associations are depicted through a line between actors and use cases. It's quite important because when the diagram becomes complex, associations help to understand the association between actors and use cases.

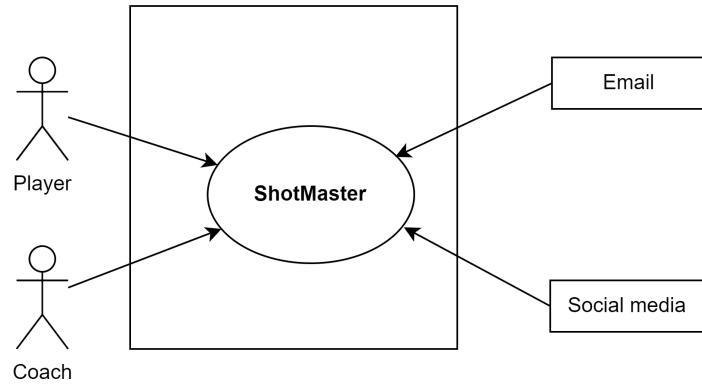
### **System:**

System means a certain pattern of actors' behaviors and interactions. The system is also titled Scenario. In the diagram, a box is used to represent the system scope to use cases. The use case outside the box is considered out of the system's scope.

### **Module :**

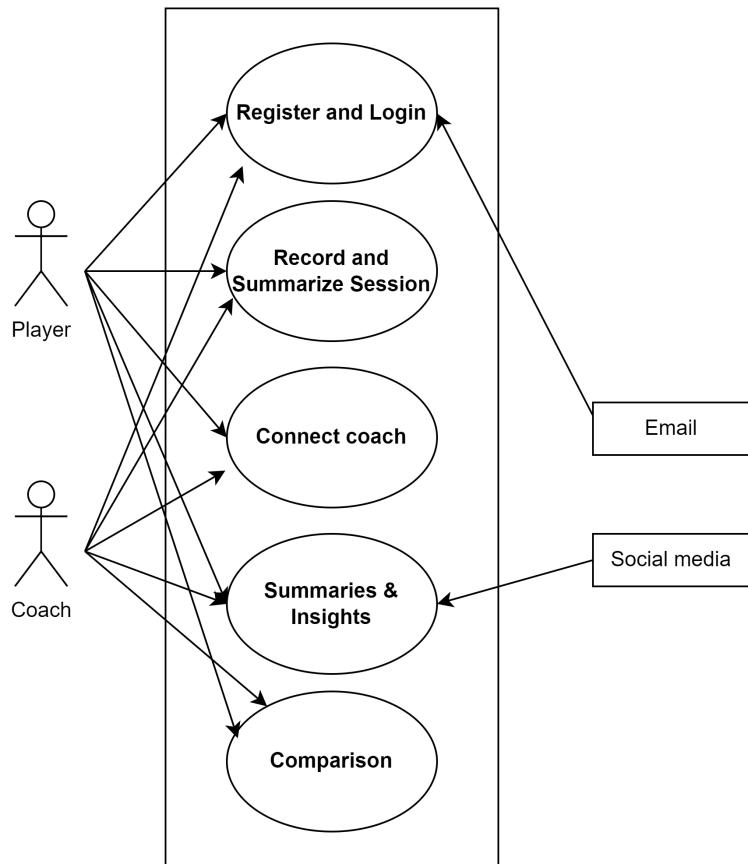
All of the use case components are gathered within a single UML shape. This module is also signified as a file or folder.

## Level 0: ShotMaster



**Fig:** ShotMaster

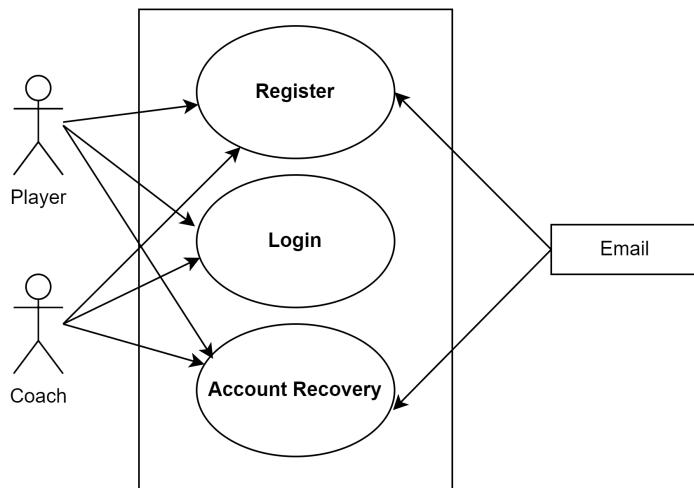
## Level 1: ShotMaster



**Fig:** ShotMaster

**Description:** ShotMaster is a mobile app designed for aspiring cricketers to enhance their batting skills. It utilizes sensors attached to the bat to analyze shots played during practice sessions. Key features include registration/login, account recovery, coach connectivity, recording practice sessions, session summarization, player comparison, periodic summarization, improvement tracking, social media sharing, and personalized note/feedback addition. Users can track their performance metrics, receive feedback from coaches, compare their progress with others, visualize improvement over time, and share achievements on social media.

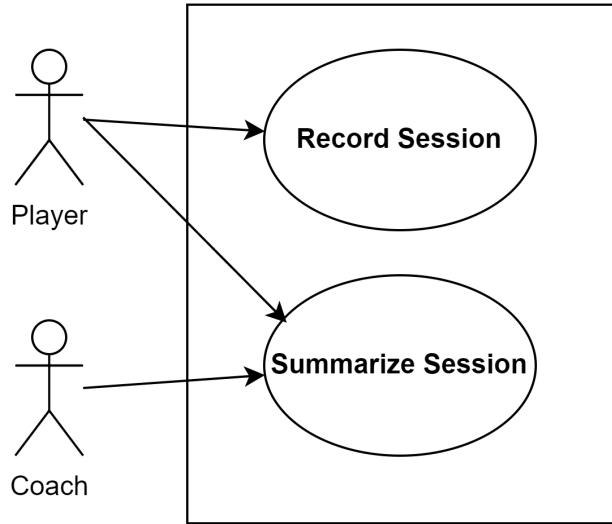
### Level 1.1: Register and Login



**Fig:** Register & Login

**Description:** The registration process involves users filling out a form with their details, including name, email, date of birth, role (Player or Coach), and a password meeting specific criteria. Validation ensures all fields are filled, email format is correct, date of birth is in the past, and password criteria are met. Upon successful validation, a verification email is sent for account activation. Login requires users to enter their email and password, with validation ensuring correct credentials for access to the dashboard. Account recovery involves users providing their email, receiving a verification email, setting a new password, and upon successful validation, gaining access to the dashboard.

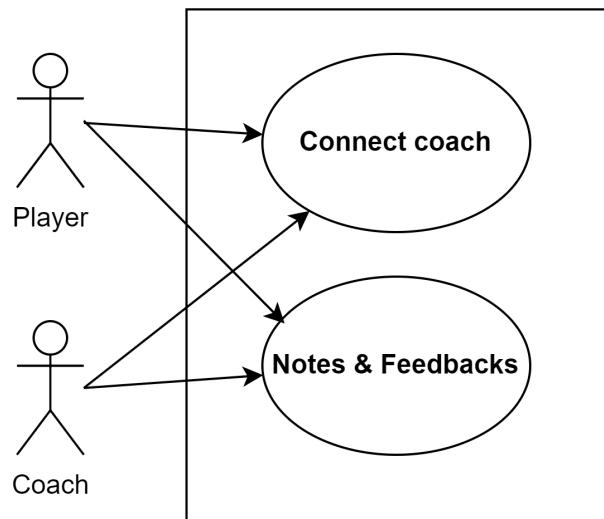
### Level 1.2: Record and Summarize Session



**Fig: Record and Summarize Session**

**Description:** The practice session module allows players to record their shots ball by ball, including shot type and additional details. Sessions can be started, ended, and saved to the database. Users can retrieve session data, view details, and access session summaries. Shot quality is categorized and statistics are calculated, such as shot distribution and performance metrics. The session summary provides insights for players and coaches to adjust training plans based on performance trends and areas for improvement.

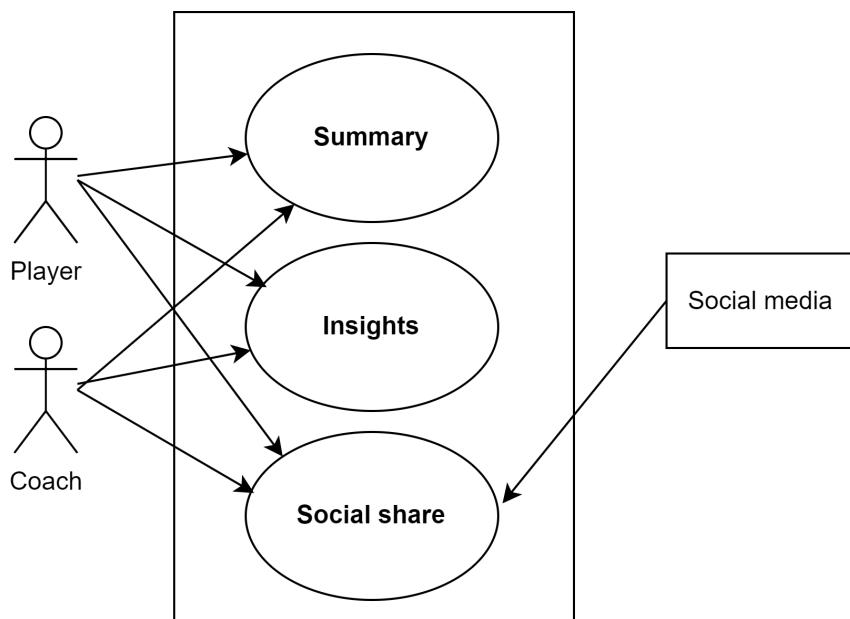
### Level 1.3: Connect your coach



**Fig: Connect your coach**

**Description:** The application facilitates the connection between players and coaches, enabling players to request coach connections. Once a coach accepts a player's request, they gain access to the player's data for progress monitoring. Coaches can view player progress insights, select specific players, review performance metrics, and provide feedback on individual sessions. Feedback includes session-specific comments and suggestions for improvement, which players receive notifications for and can acknowledge within the app. Additionally, users can personalize session notes, reflecting on performance and experiences, with both players and coaches able to contribute their insights. These notes are saved for future reference, providing a comprehensive overview of each session's development and areas for focus.

#### Level 1.4: Summaries and Insights



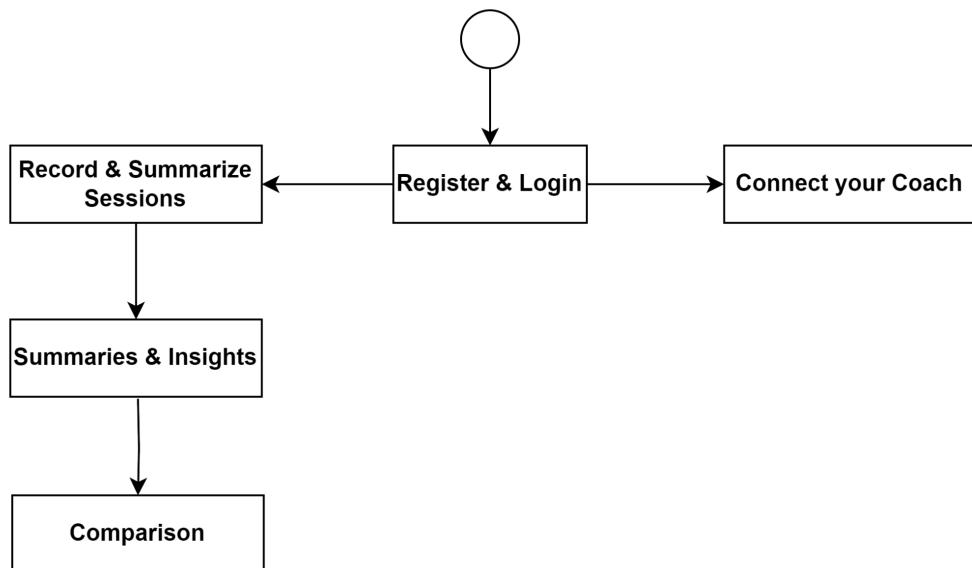
**Fig: Summaries and Insights**

**Description:** The app offers cricket enthusiasts two core features: data visualization and improvement tracking. Through the data visualization section, users can analyze their cricket performance metrics by selecting desired timeframes and parameters, generating visual representations like graphs and charts to observe trends and fluctuations in their performance over time. Meanwhile, the improvement tracking feature allows users to monitor their progress in various cricket skills by selecting specific metrics such as bat speed or impact speed. The app generates improvement graphs illustrating users' development over time, which can be shared on social media platforms for broader recognition.

# Activity Diagram

Activity diagram is an important behavioral diagram in UML diagram to describe dynamic aspects of the system. Activity diagram is essentially an advanced version of flowchart that models the flow from one activity to another activity.

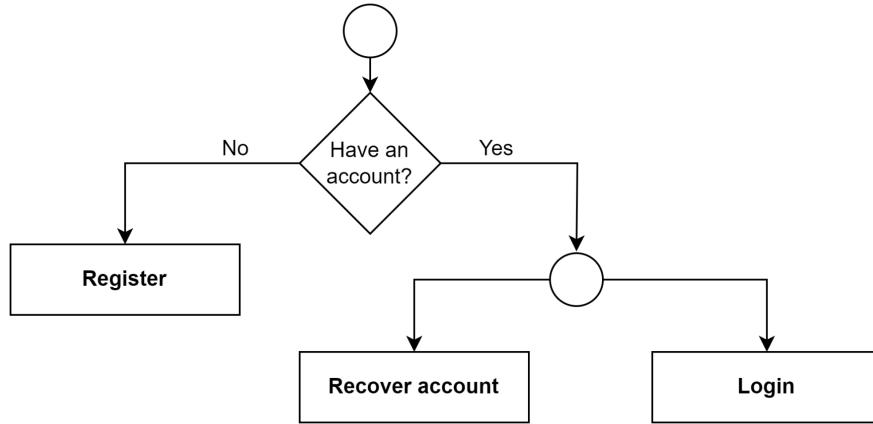
Level 1: ShotMaster



**Fig: ShotMaster**

**Description:** ShotMaster is a mobile app designed for aspiring cricketers to enhance their batting skills. It utilizes sensors attached to the bat to analyze shots played during practice sessions. Key features include registration/login, account recovery, coach connectivity, recording practice sessions, session summarization, player comparison, periodic summarization, improvement tracking, social media sharing, and personalized note/feedback addition. Users can track their performance metrics, receive feedback from coaches, compare their progress with others, visualize improvement over time, and share achievements on social media.

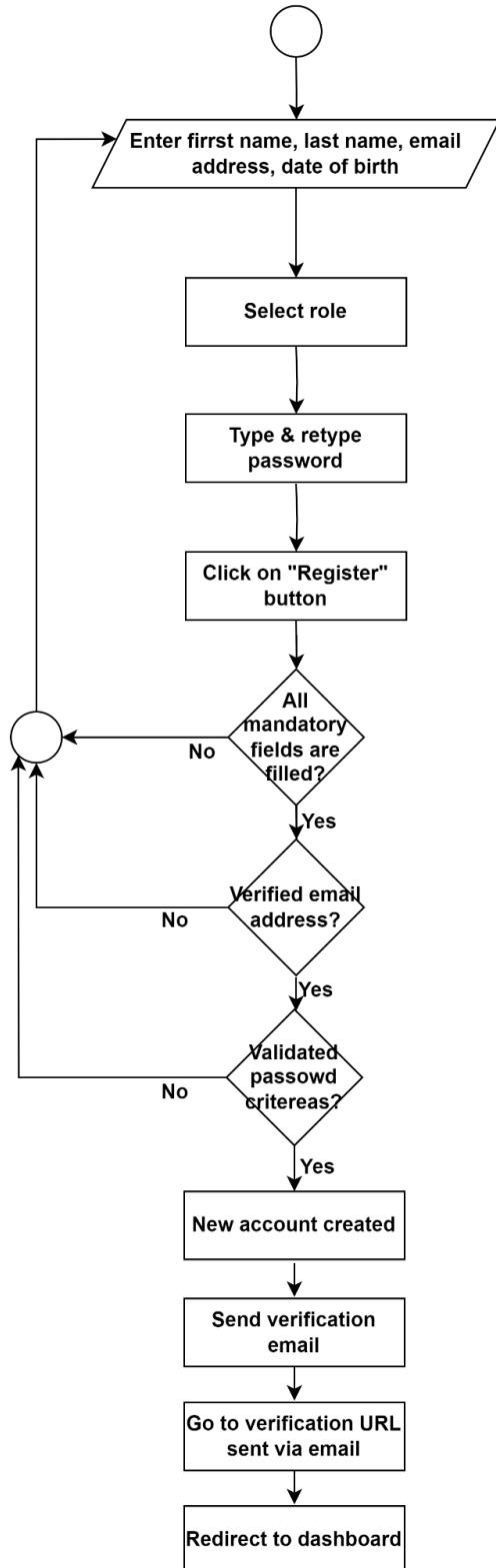
## Level 1.1: Register & Login



**Fig: Register & Login**

**Description:** The registration process involves users filling out a form with their details, including name, email, date of birth, role (Player or Coach), and a password meeting specific criteria. Validation ensures all fields are filled, email format is correct, date of birth is in the past, and password criteria are met. Upon successful validation, a verification email is sent for account activation. Login requires users to enter their email and password, with validation ensuring correct credentials for access to the dashboard. Account recovery involves users providing their email, receiving a verification email, setting a new password, and upon successful validation, gaining access to the dashboard.

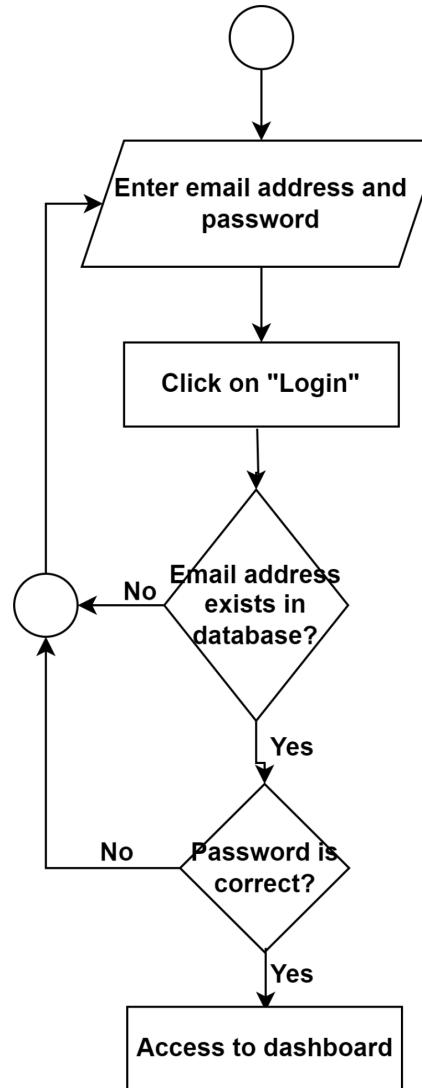
### Level 1.1.1: Register



**Fig: Register**

**Description:** For the registration process, the user first fills out a registration form with their first name, last name, email, date of birth, chosen role (either Player or Coach), and a password meeting specific criteria such as a minimum length of 8 characters including alphanumeric characters. Upon submission, the system validates the provided information, ensuring all mandatory fields are filled, the email address format is correct, the date of birth is in the past, and the password adheres to the criteria. If any validation fails, appropriate error messages are displayed, prompting the user to correct the information. If all validations succeed, the system creates a new user account and sends a verification email to the provided email address for account activation. Once the user activates the account by clicking on the verification link in the email, they are redirected to the dashboard.

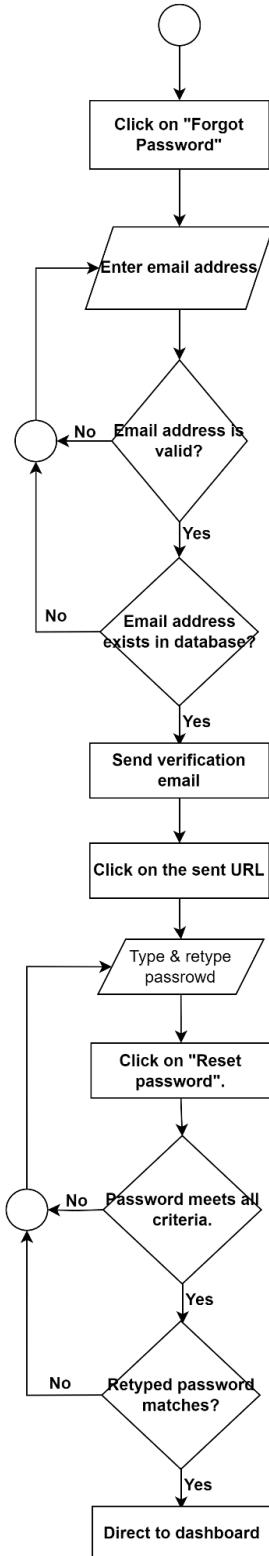
### Level 1.1.2: Login



**Fig: Login**

**Description:** In the login process, the user navigates to the login page and enters their registered email address and password. The system then validates the entered credentials by checking if the email address exists in the database and verifying if the provided password matches the corresponding email address. If the validation succeeds, the system grants access to the user's account and redirects them to the dashboard relevant to their role (Player or Coach). If the validation fails, an error message is displayed indicating "Wrong email address or password".

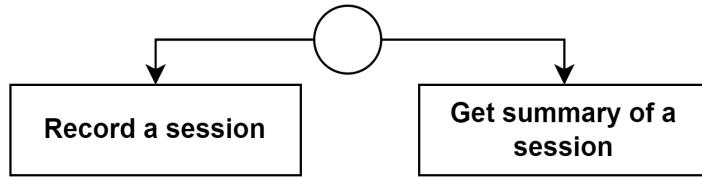
### Level 1.1.3: Recover account



**Fig: Recover account**

**Description:** In the account recovery process, the user initiates the process from the login page, selects the "Forgot password" option, and enters their email address. The system verifies the validity of the email address and checks if it exists in the database. If the verification is successful, the system sends a verification email containing a URL to the user's email address. Upon clicking the URL, the user is directed to a page where they can create a new password adhering to the specified criteria. After setting the new password and confirming it, the system verifies the password criteria again. If all criteria are met, a message stating "Password has been changed successfully" is displayed, and the user is directed to the dashboard.

#### Level 1.2: Record & summarize session



**Fig: Record & Summarize session**

**Description:** The practice session module allows players to record their shots ball by ball, including shot type and additional details. Sessions can be started, ended, and saved to the database. Users can retrieve session data, view details, and access session summaries. Shot quality is categorized and statistics are calculated, such as shot distribution and performance metrics. The session summary provides insights for players and coaches to adjust training plans based on performance trends and areas for improvement.

### Level 1.2.1: Record a session

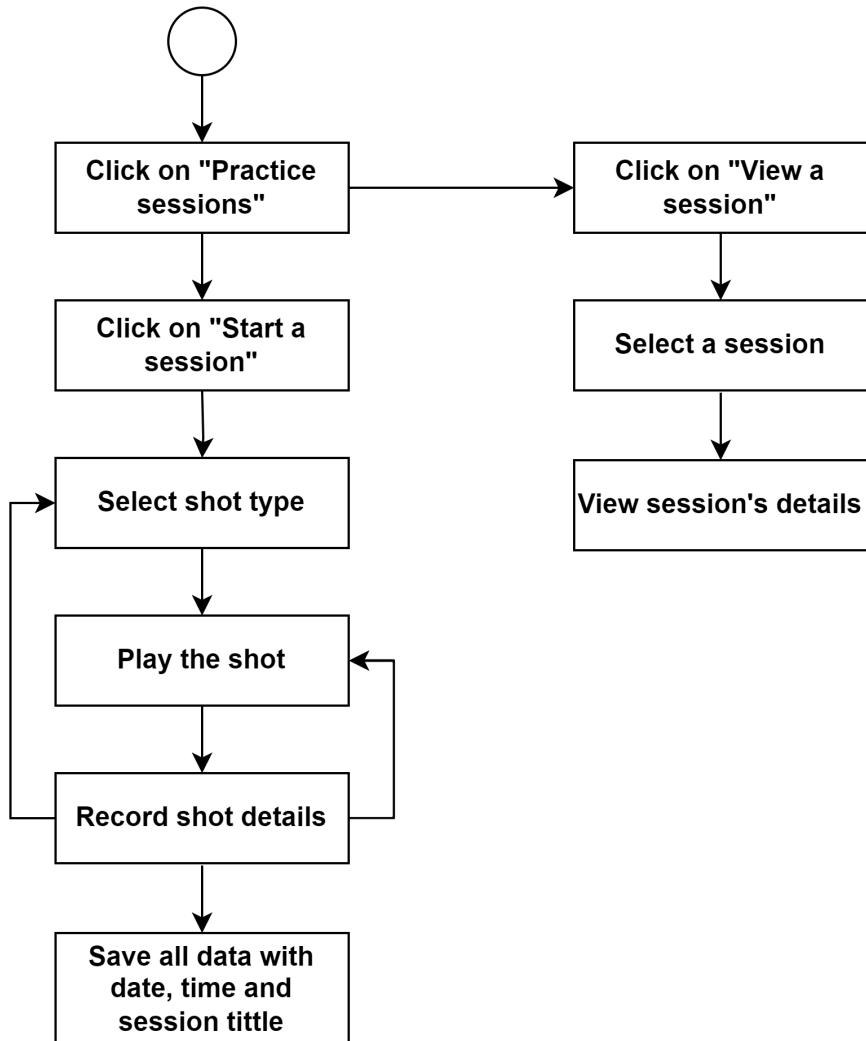
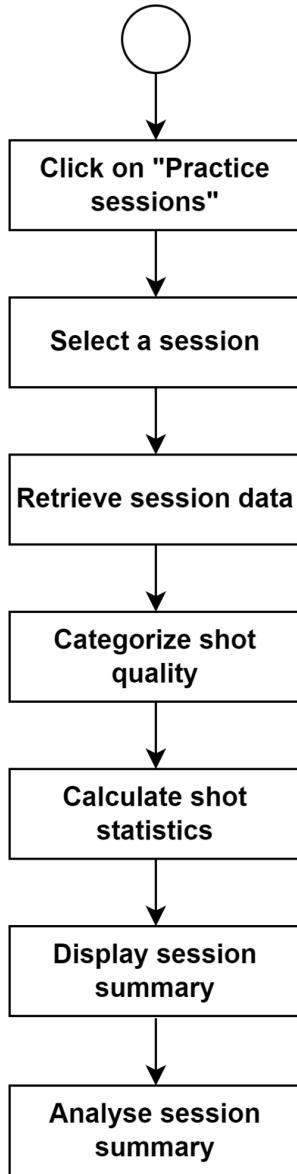


Fig: Record session

**Description:** The practice session module facilitates comprehensive shot recording, enabling players to meticulously document each shot's type, placement, and other relevant details. Users can initiate, manage, and conclude practice sessions seamlessly, with data automatically saved to the system's database. Retrieval of session data allows for detailed review, encompassing shot types, performance metrics, and any notes logged during the session. This structured approach to recording offers players and coaches a comprehensive overview of practice sessions, enhancing analysis and facilitating informed decision-making.

### Level 1.2.2: Summarize a session

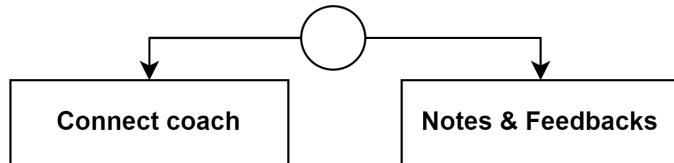


**Fig: Summarize session**

**Description:** The system's session summary functionality provides a condensed yet insightful perspective on performance. By categorizing shot quality and computing relevant statistics, the summary presents a clear breakdown of session outcomes. Players and coaches can then delve into this summarized data to identify trends, pinpoint areas for improvement, and adjust training plans accordingly. This iterative process of analysis and adjustment empowers individuals to refine

techniques, address weaknesses, and optimize training strategies for enhanced skill development.

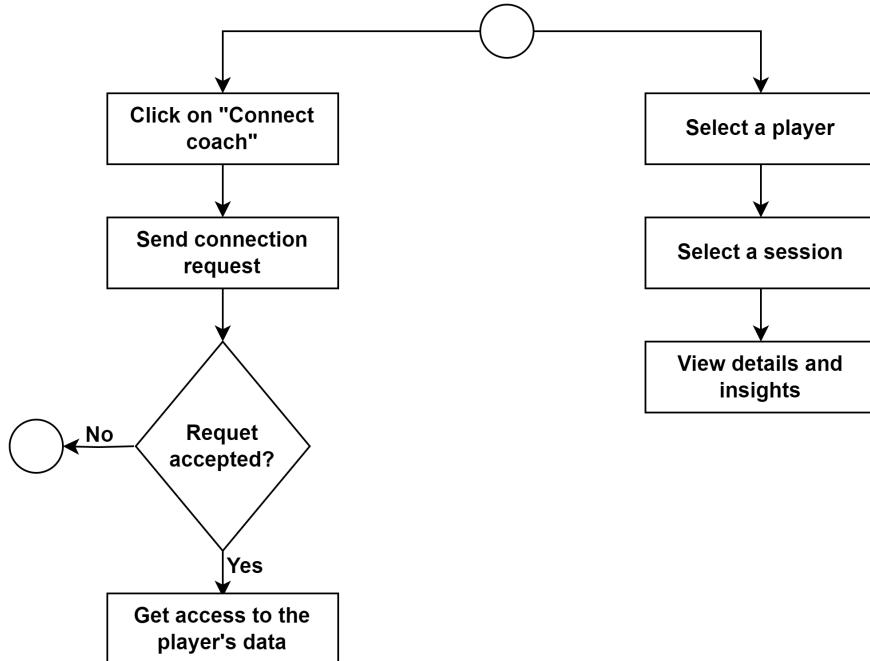
### Level 1.3: Connect your coach



**Fig: Connect your coach**

**Description:** The application facilitates the connection between players and coaches, enabling players to request coach connections. Once a coach accepts a player's request, they gain access to the player's data for progress monitoring. Coaches can view player progress insights, select specific players, review performance metrics, and provide feedback on individual sessions. Feedback includes session-specific comments and suggestions for improvement, which players receive notifications for and can acknowledge within the app. Additionally, users can personalize session notes, reflecting on performance and experiences, with both players and coaches able to contribute their insights. These notes are saved for future reference, providing a comprehensive overview of each session's development and areas for focus.

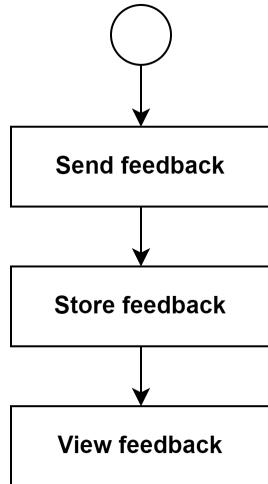
### Level 1.3.1: Connect coach



**Fig: Connect coach**

**Description:** The application streamlines the connection process between players and coaches, allowing players to send connection requests that coaches can accept. Once connected, coaches gain access to players' data for comprehensive progress tracking. Within the app, coaches navigate to the "Player Progress" section, where they can select individual players from their roster and review insights and analytics pertaining to their performance. This includes metrics, improvement graphs, and any notes or comments from previous sessions. Coaches can then provide personalized feedback and recommendations for improvement based on the player's performance in specific sessions, submitting feedback through the app. Players receive notifications of feedback, which they can review in the "Feedback" section, acknowledging and considering the coach's suggestions for development.

### Level 1.3.2: Feedback

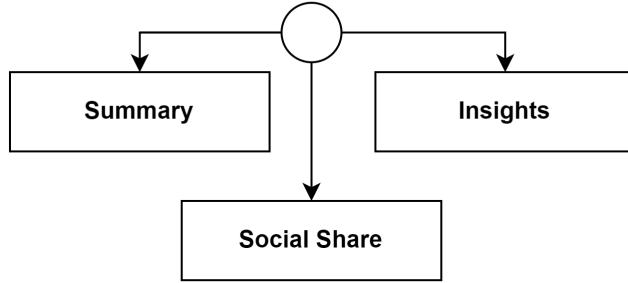


**Fig: Feedback**

#### Description:

The application streamlines the connection process between players and coaches, allowing players to send connection requests that coaches can accept. Once connected, coaches gain access to players' data for comprehensive progress tracking. Within the app, coaches navigate to the "Player Progress" section, where they can select individual players from their roster and review insights and analytics pertaining to their performance. This includes metrics, improvement graphs, and any notes or comments from previous sessions. Coaches can then provide personalized feedback and recommendations for improvement based on the player's performance in specific sessions, submitting feedback through the app. Players receive notifications of feedback, which they can review in the "Feedback" section, acknowledging and considering the coach's suggestions for development.

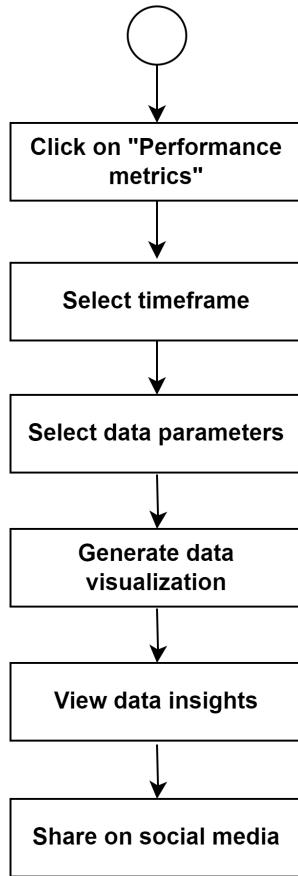
#### Level 1.4: Summaries and Insights



**Fig: Summaries & Insights**

**Description:** The app offers cricket enthusiasts two core features: data visualization and improvement tracking. Through the data visualization section, users can analyze their cricket performance metrics by selecting desired timeframes and parameters, generating visual representations like graphs and charts to observe trends and fluctuations in their performance over time. Meanwhile, the improvement tracking feature allows users to monitor their progress in various cricket skills by selecting specific metrics such as bat speed or impact speed. The app generates improvement graphs illustrating users' development over time, which can be shared on social media platforms for broader recognition.

#### Level 1.4.1: Period Wise Summary

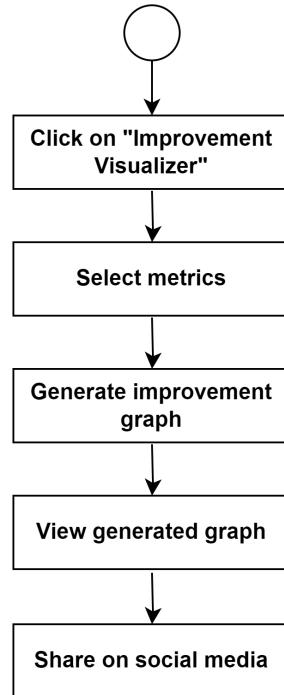


**Fig: Period Wise Summary**

#### Description:

Users can analyze cricket performance data by selecting a timeframe and specific parameters. The app generates visual representations like graphs and charts, allowing users to observe trends and fluctuations in their performance metrics.

### Level 1.4.2: Data Insights

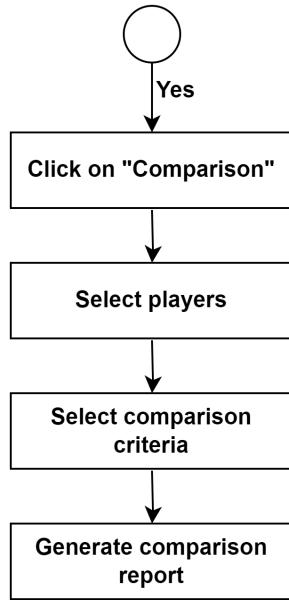


**Fig: Data Insights**

#### Description:

Users can track their progress in cricket skills by selecting metrics such as bat speed or impact speed. The app generates improvement graphs over time, showcasing users' development in different aspects of their cricket skills. Additionally, users can share these graphs on social media platforms for wider visibility.

### Level 1.5: Comparison



**Fig: Comparison**

#### Description:

The "Comparison" feature of the app enables users to analyze cricket performance by selecting and comparing multiple players based on various batting parameters. Users can choose players from their own data or from their network/leaderboards and specify comparison criteria such as sessions attended, shots played, shot accuracy, average strength, impact of shots, and maximum improvement over a period. Once criteria and players are selected, the app generates a comprehensive report detailing the total number of sessions attended, shots played, shot accuracy percentage, average strength and impact of shots, and maximum improvement achieved for each player. This report empowers users to gain insights into the strengths and weaknesses of each player's batting performance, facilitating informed decision-making regarding training and strategy.

## Swimlane Diagram

### Level 1.1: Register & Login

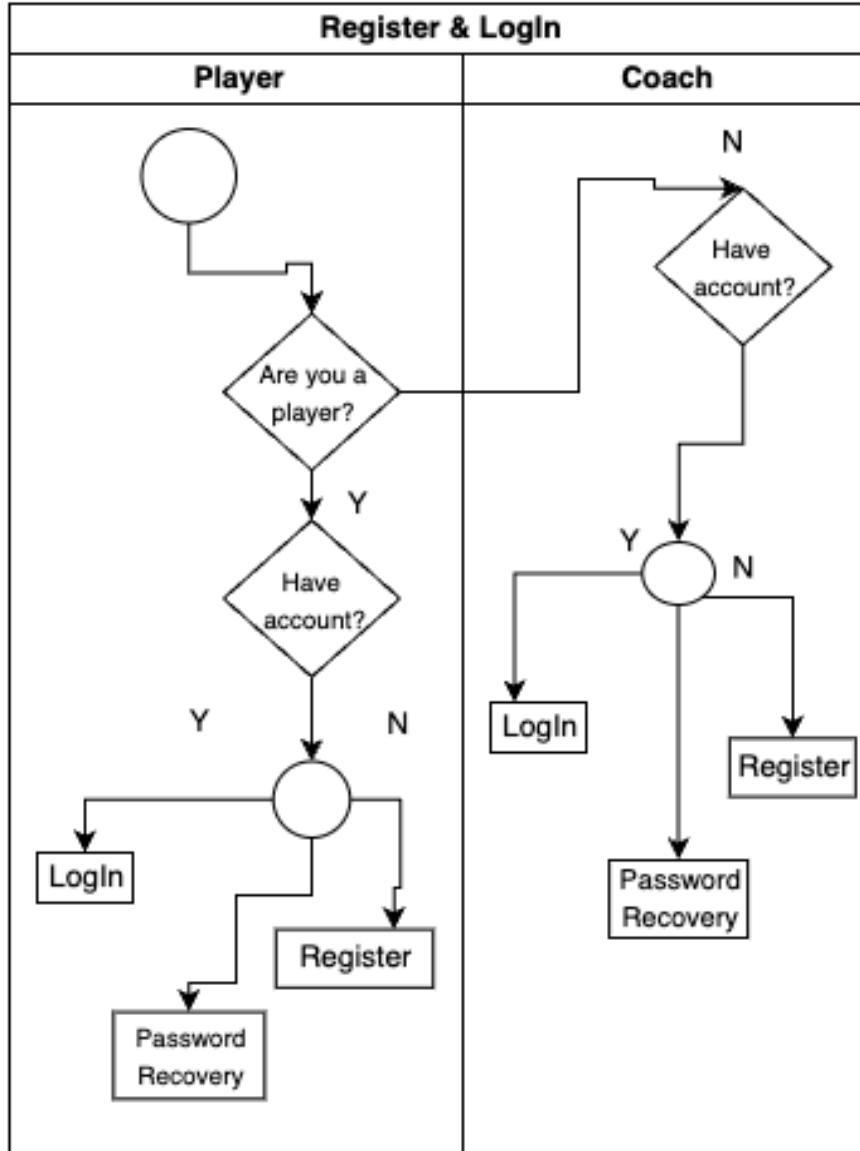


Fig: Register & LogIn

### Level 1.1.1: Register

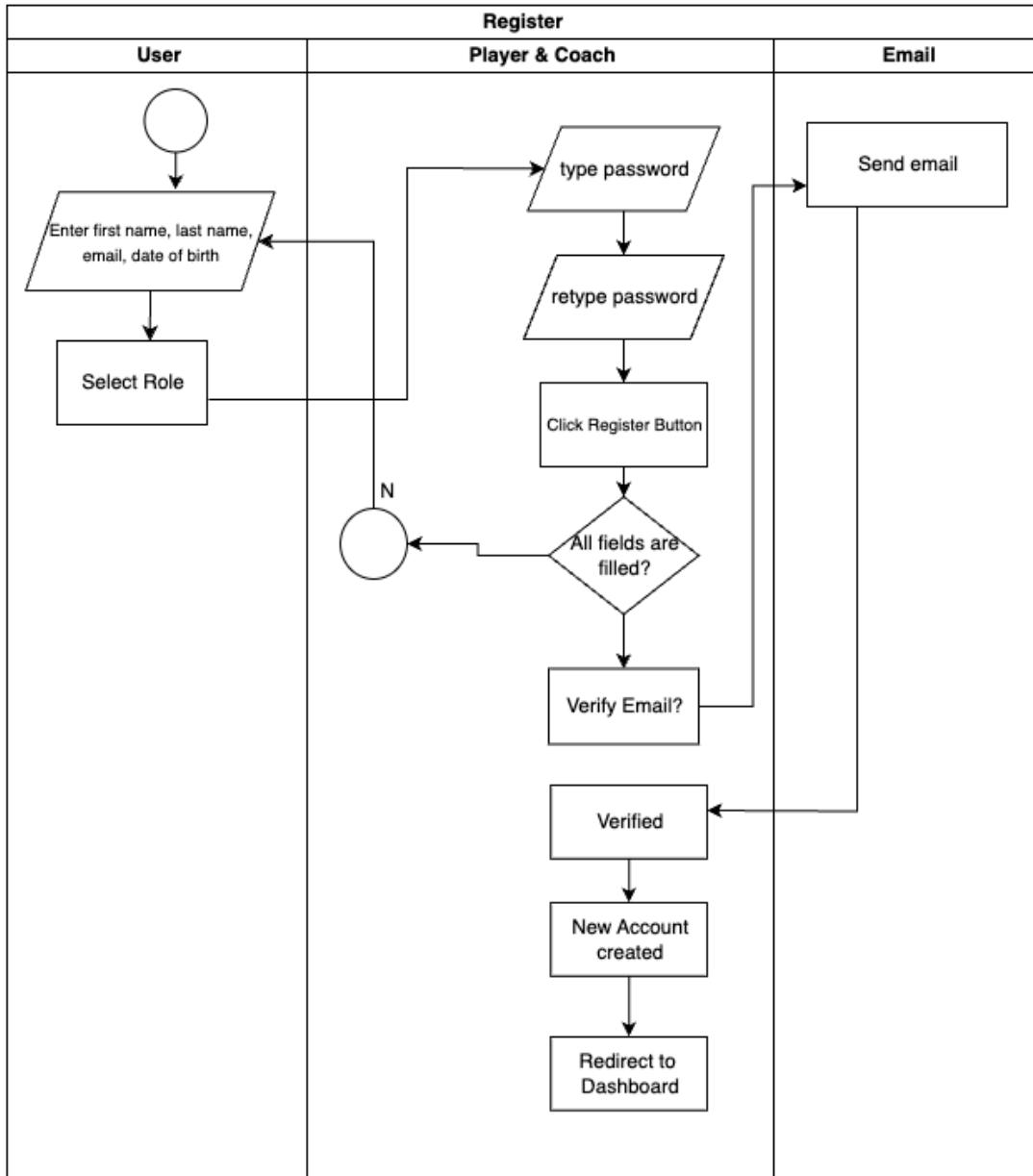


Fig: Register

## Level 1.1.2: Login

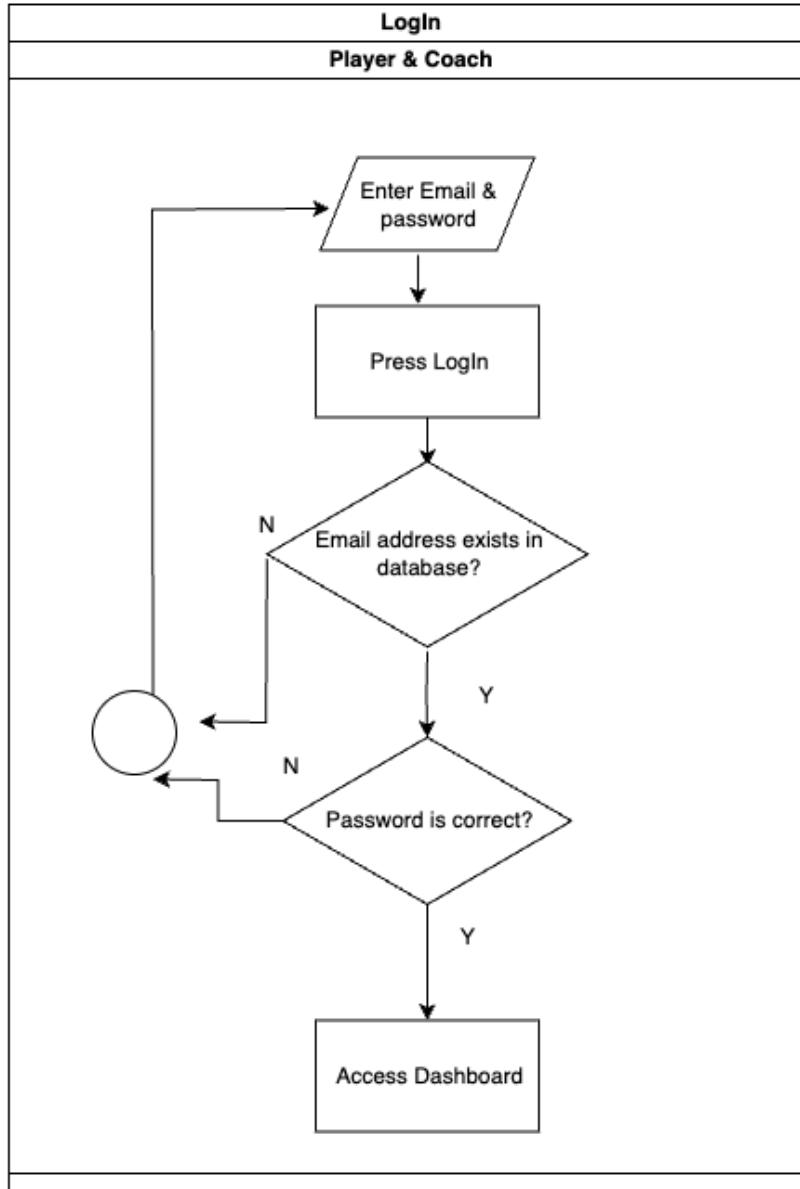


Fig: Login

### Level 1.1.3: Recover account

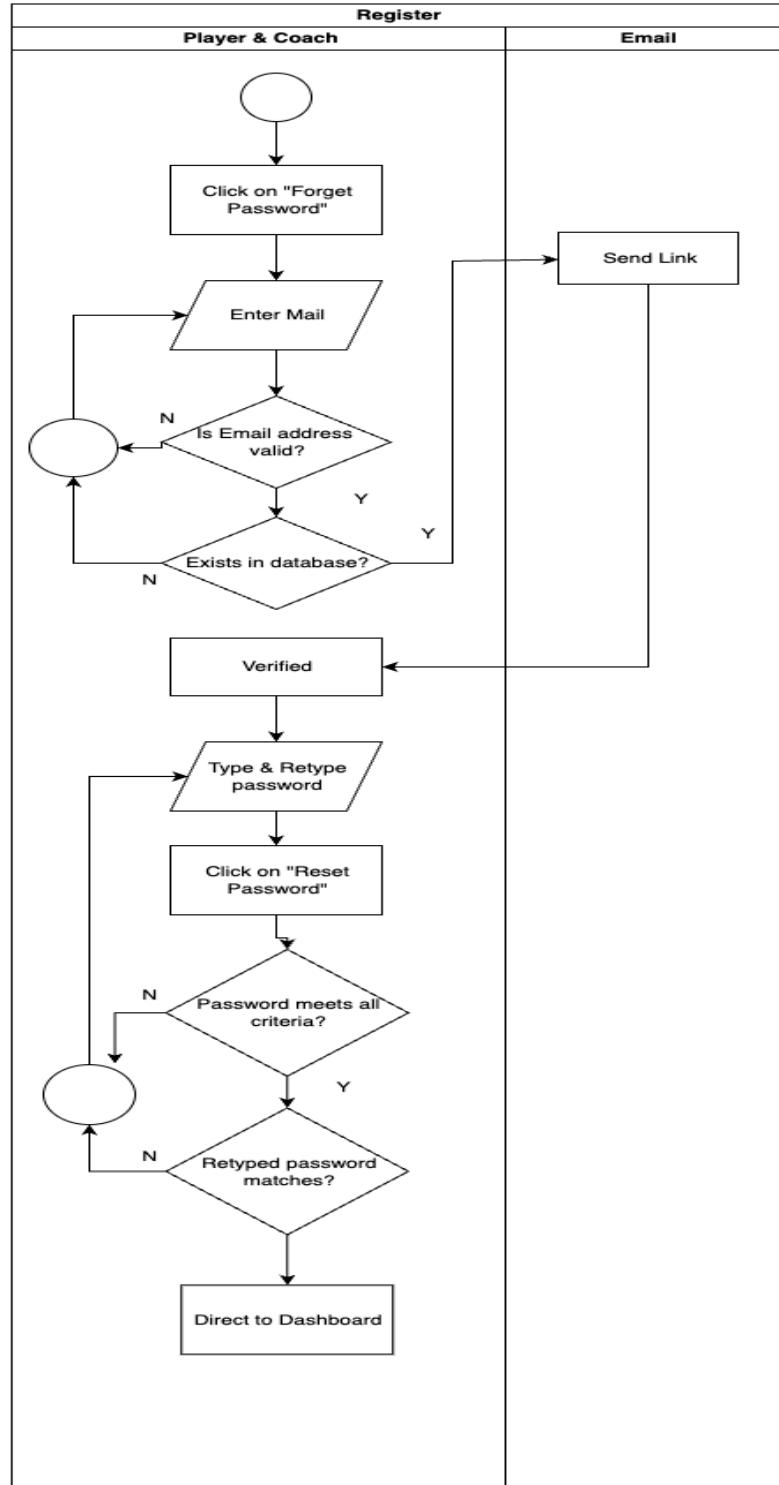


Fig: Recover Account

### Level 1.2: Record & summarize session

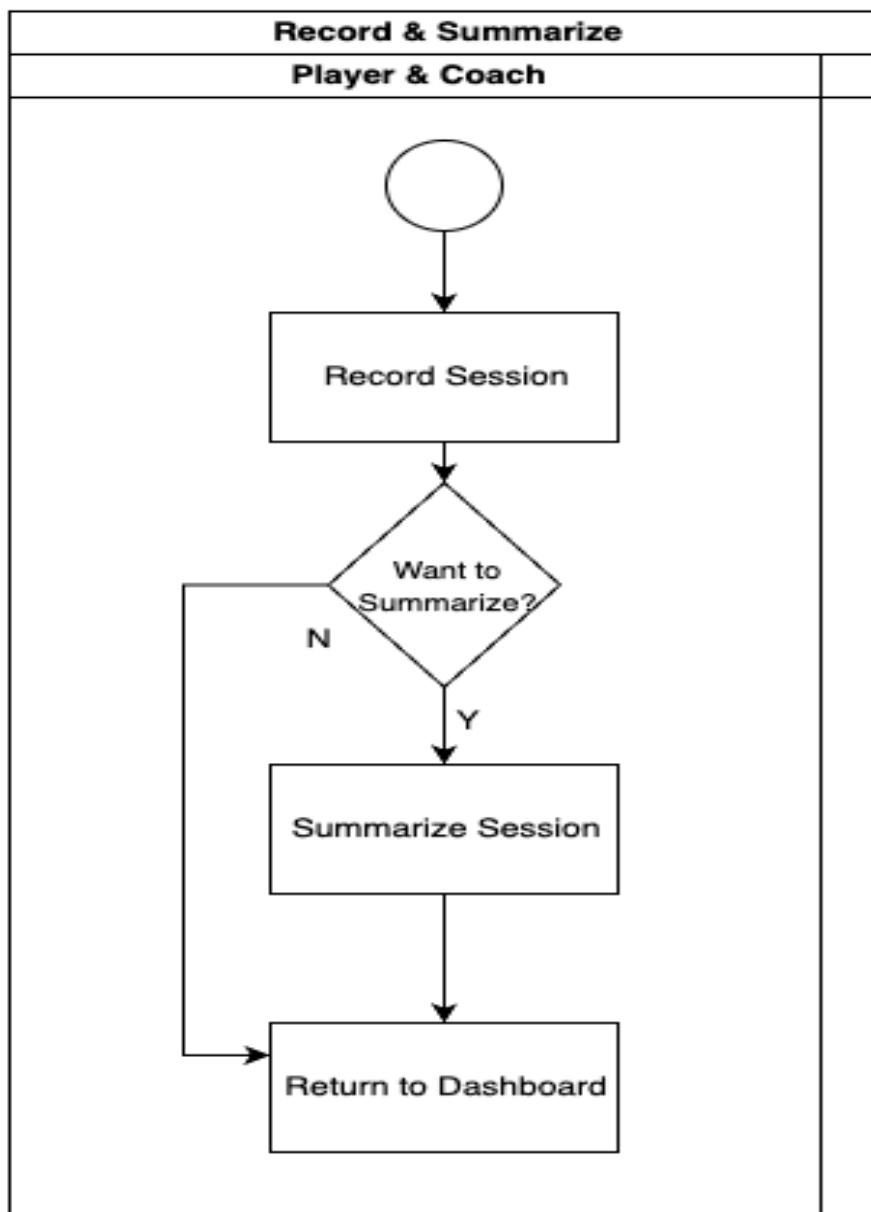


Fig: Record and Summarize session

### Level 1.2.1: Record a session

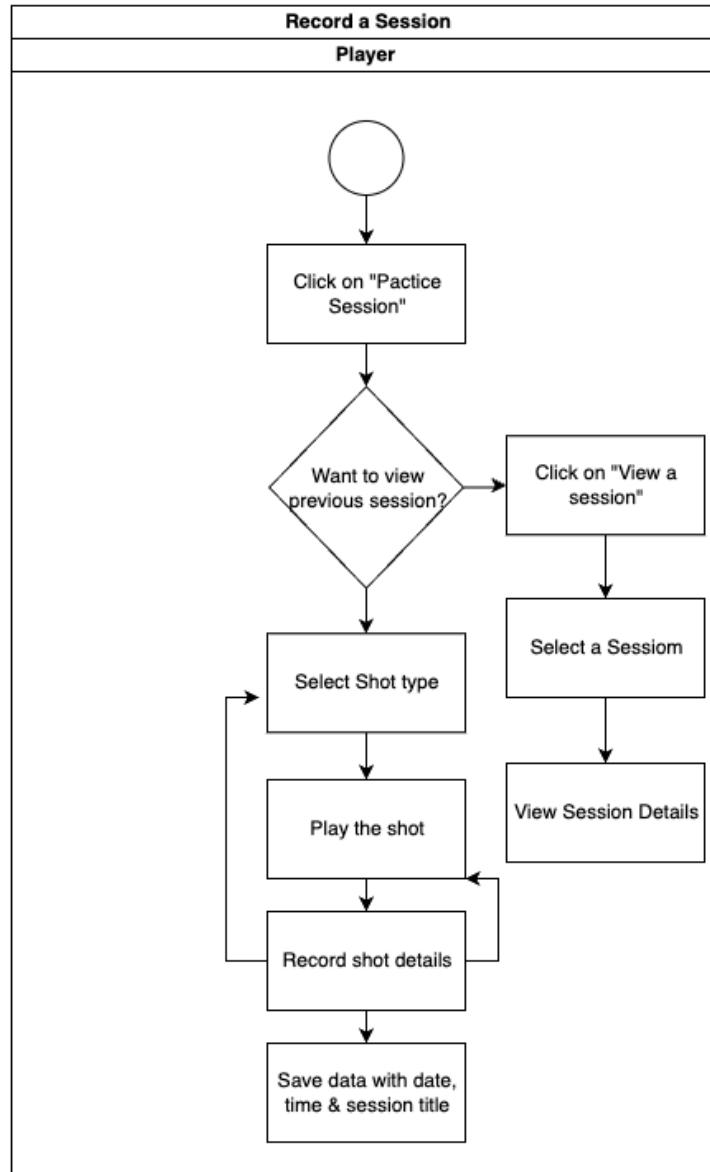


Fig: Record a session

### Level 1.2.2: Summarize a session

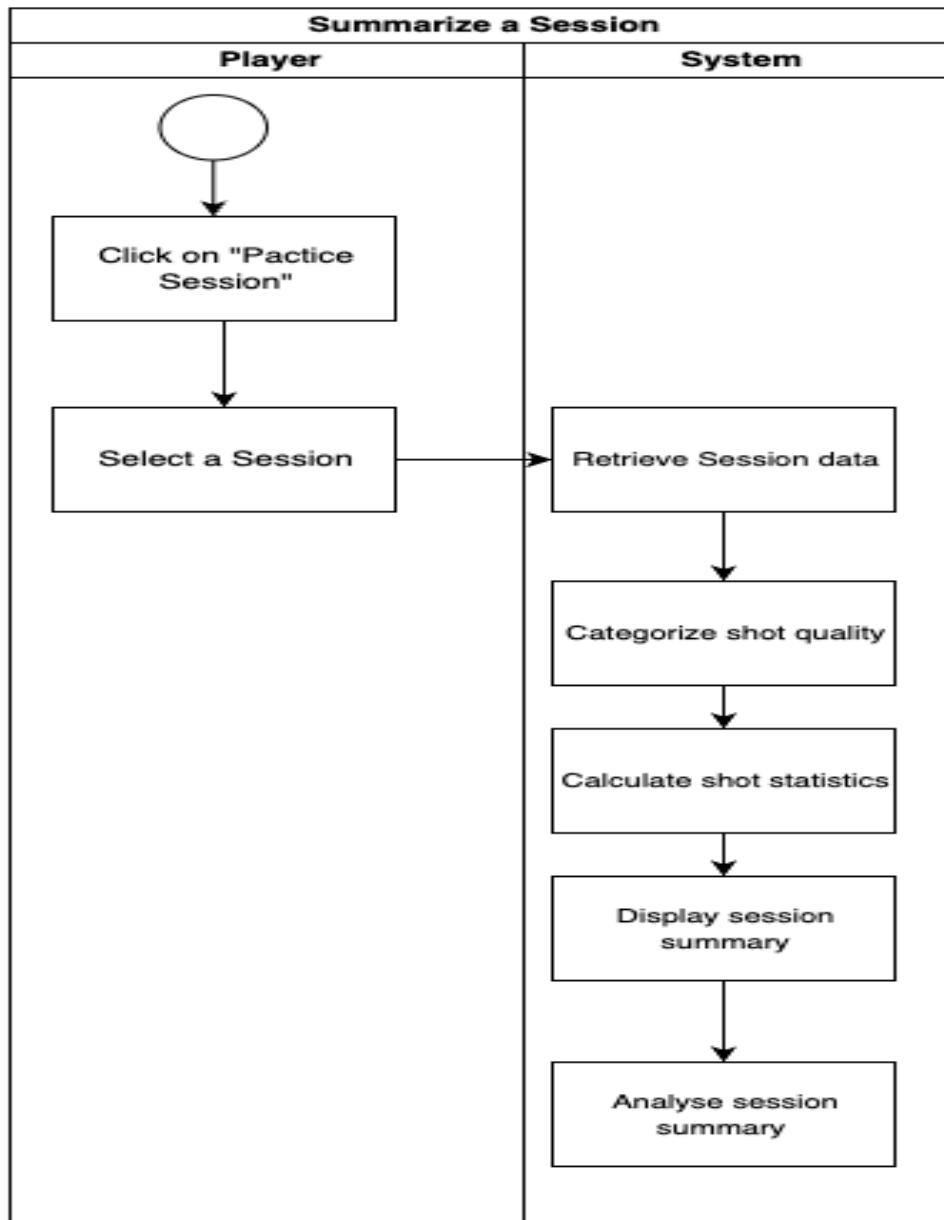


Fig: Summarize a session

### Level 1.3: Connect your coach

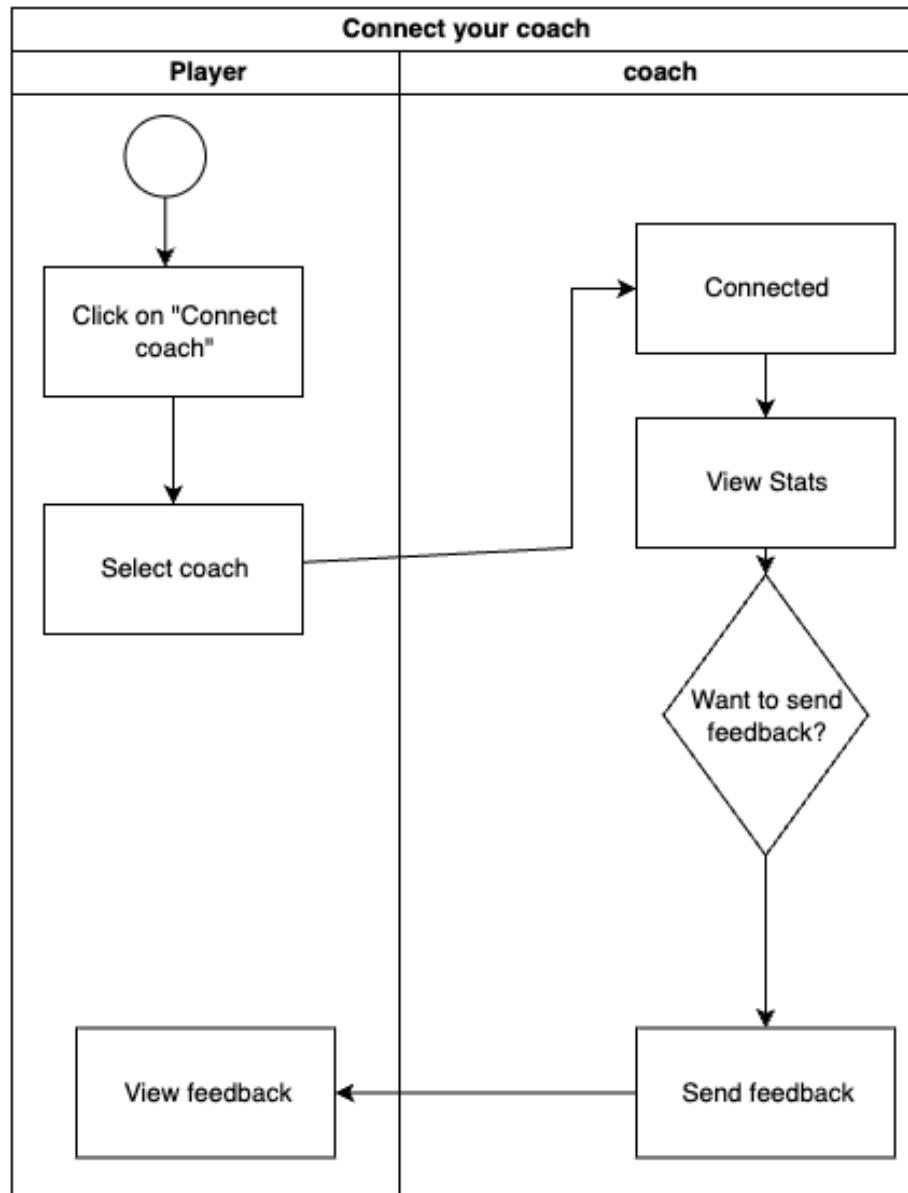


Fig: Connect your coach

## Level 1.3.1: Connect coach

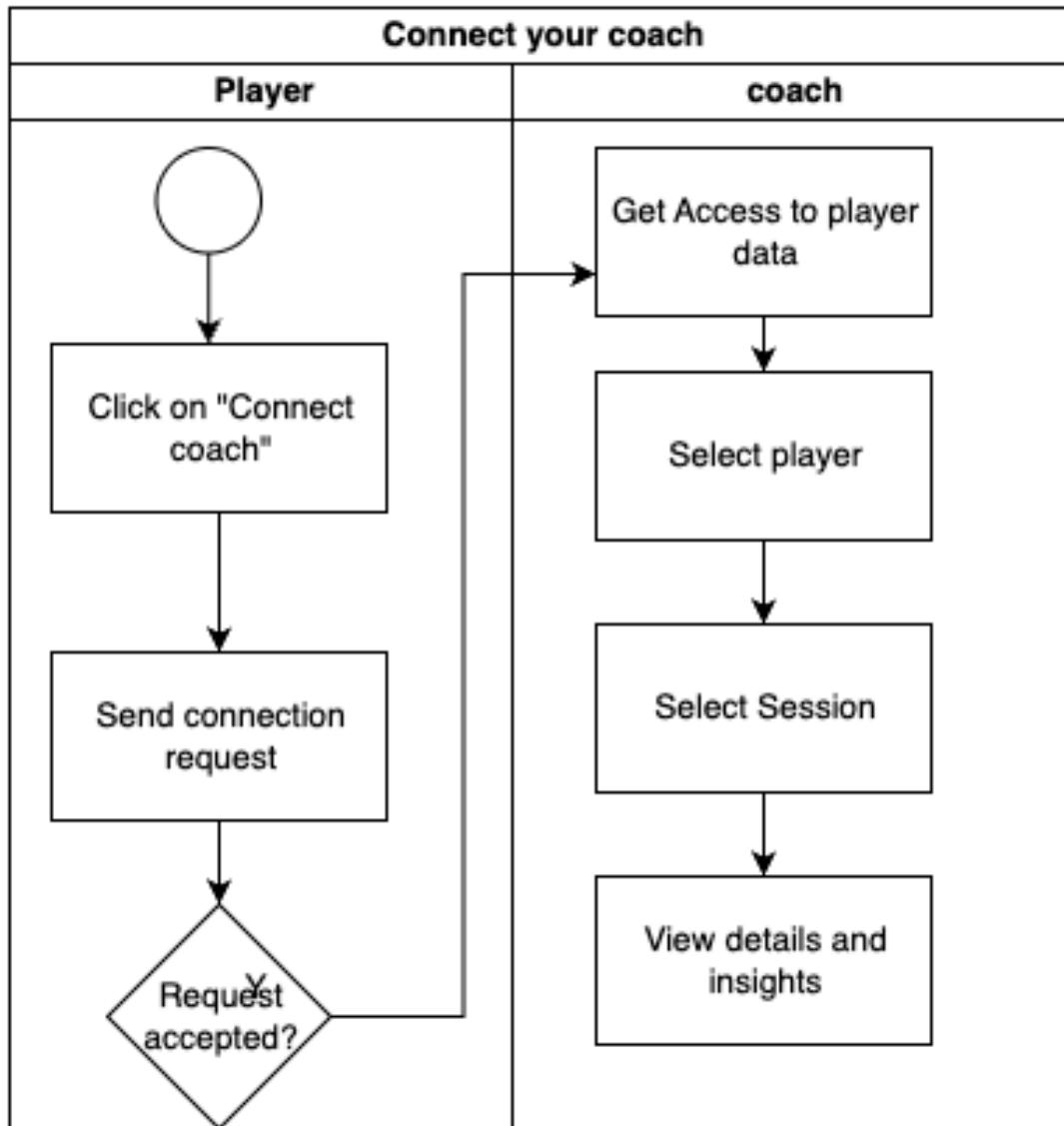


Fig: Connect coach

### Level 1.3.2: Feedback

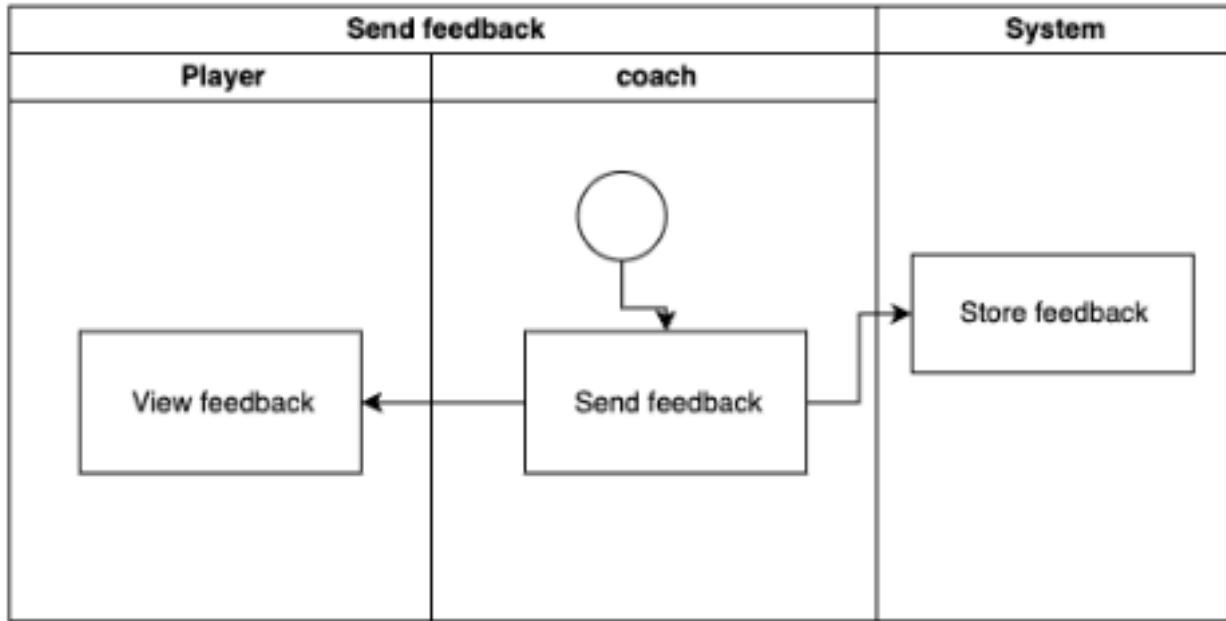


Fig: Feedback

### Level 1.4: Summaries and Insights

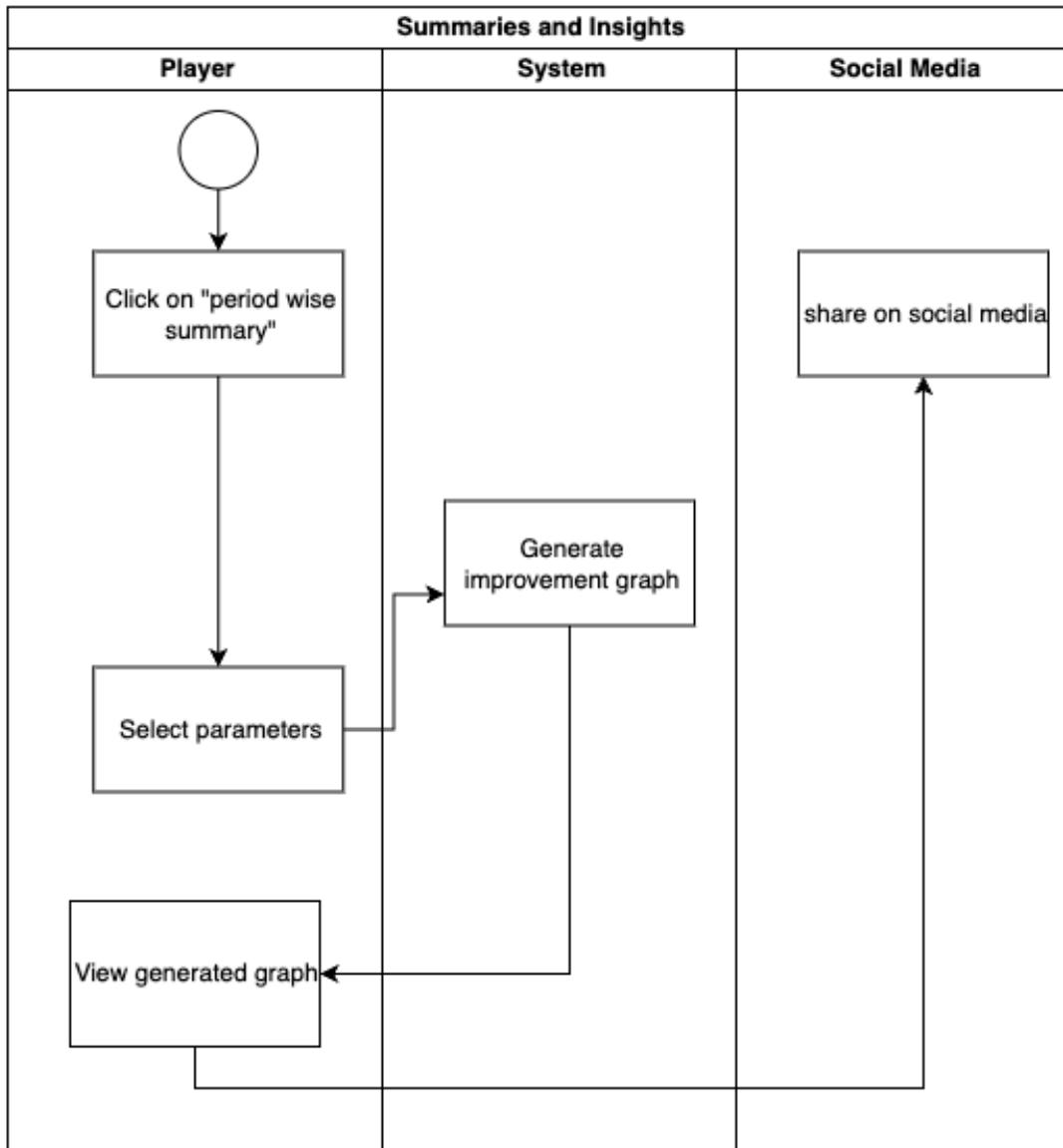


Fig: Summaries & Insights

### Level 1.4.1: Period Wise Summary

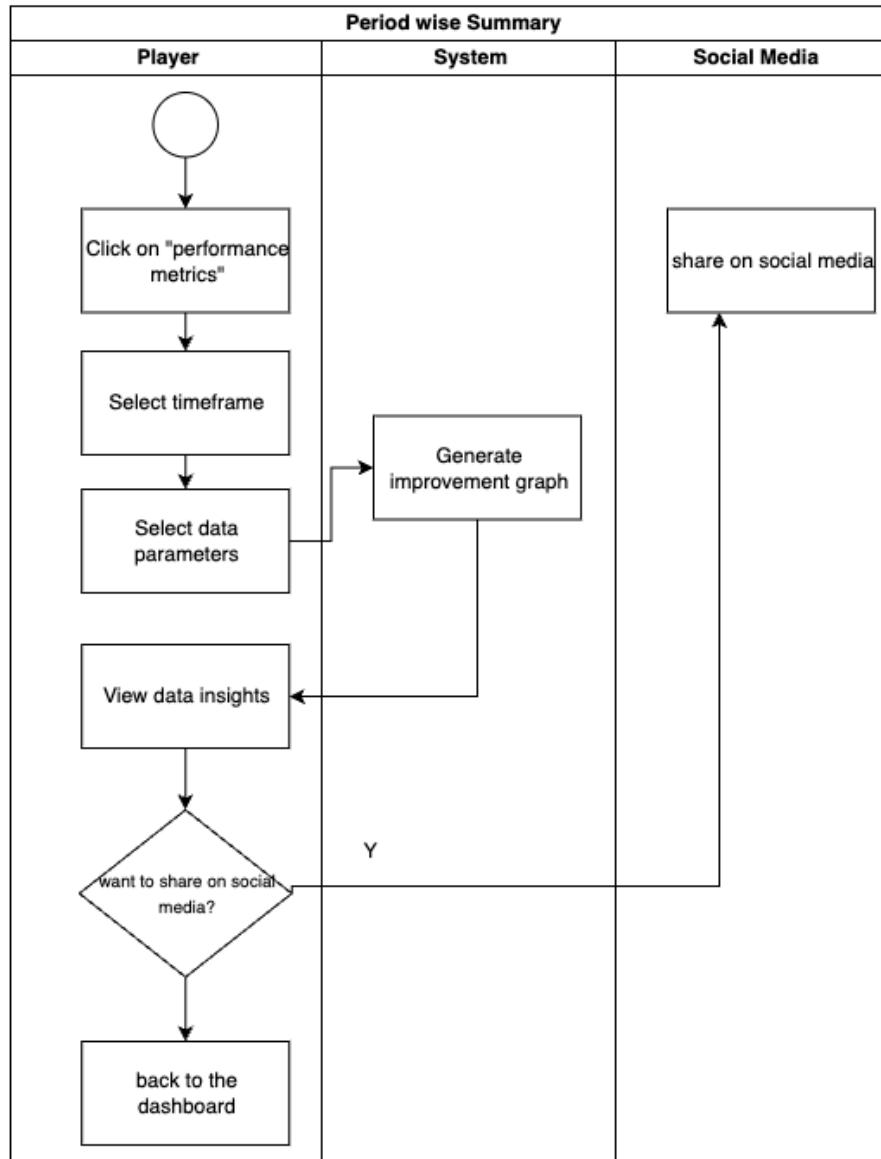


Fig: Period Wise Summary

### Level 1.4.2: Data Insights

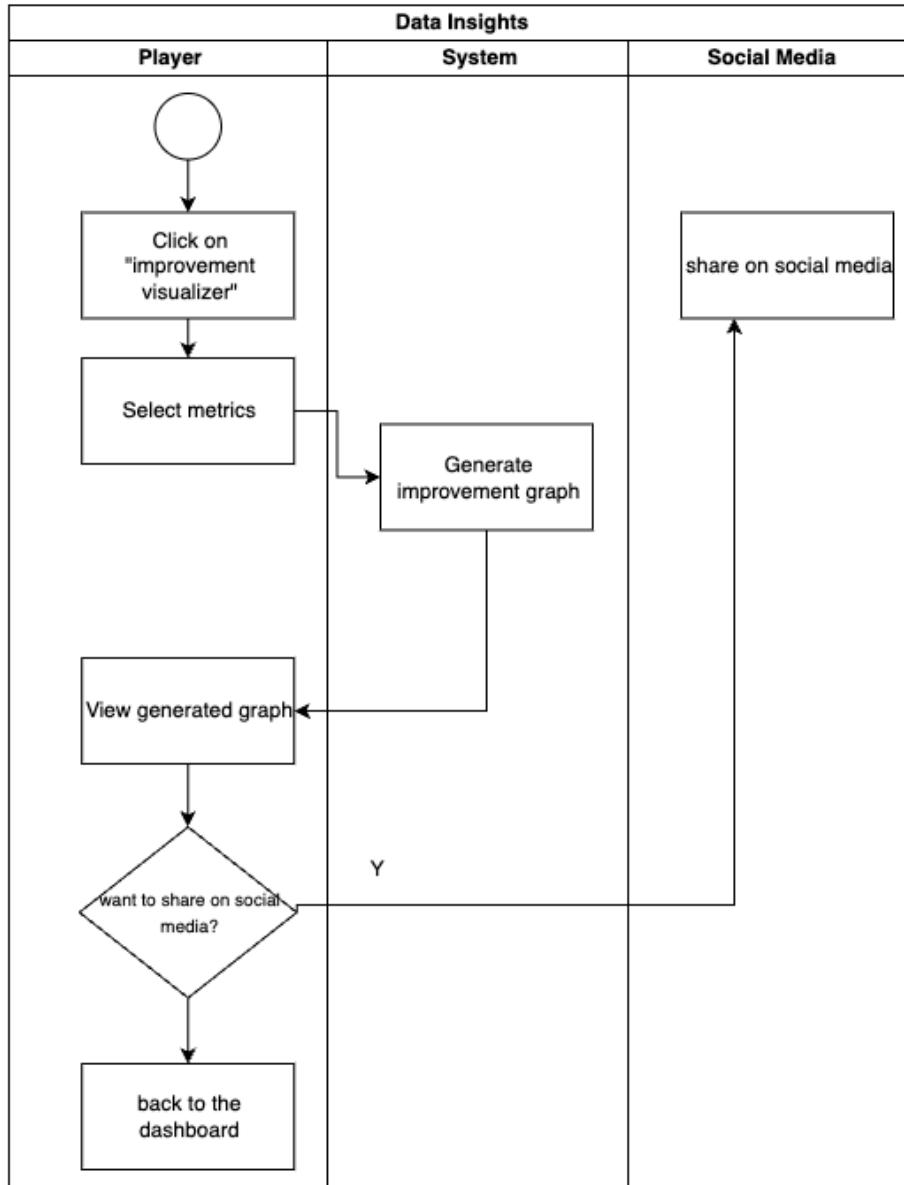


Fig: Data Insights

## Level 1.5: Comparison

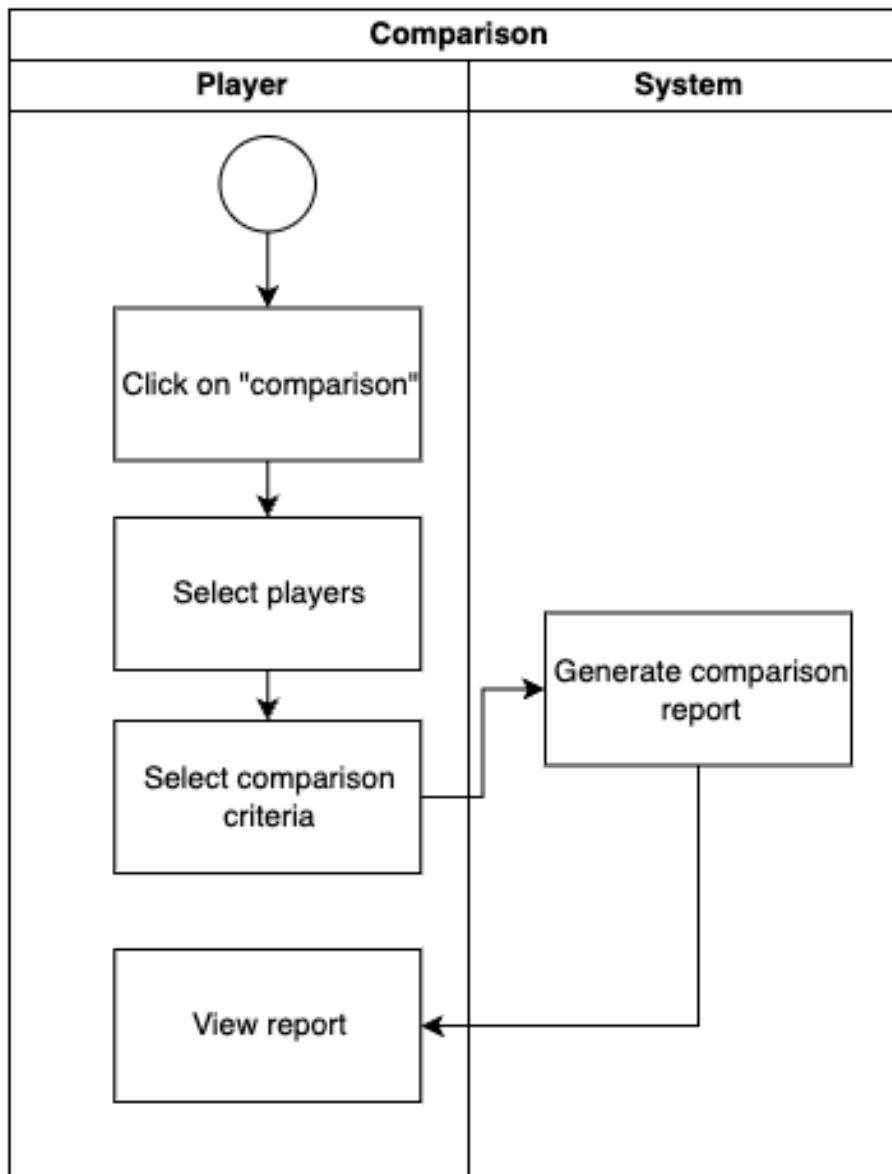


Fig: Comparison

# Data-based Modeling

## Introduction

A Data Model is an organized view of database concepts and their relationships. The purpose of creating a conceptual data model is to establish entities, their attributes, and relationships. In this data modeling level, there is hardly any detail available on the actual database structure.

The 3 basic elements of Data Modeling are-

1. Entity: A real-world thing
2. Attribute: Characteristics or properties of an entity
3. Relationship: Dependency or association between two entities

The entity relationship diagram (ERD) defines all data objects that are processed within the system, the relationships between the data objects and the information about how the data objects are entered, stored, transformed and produced within the system.

## Data Objects

A data object is a collection of one or more data points that create meaning as a whole. In other words, it's a storage or container to store data values. More specifically, data objects are usable, functional, and meaningful artifacts whose form and function is to encode data. It can be used in type checking operations. A data object can be an external entity, a thing, an occurrence, a role, an organizational unit, a place or a structure.

## List of nouns

Sl	Noun	P/S	Attributes
1	ShotMaster	S	
2	Sensor	S	
3	Data	S	
4	Shot	S	57, 68, 69, 70, 71, 75, 77, 78, 107, 108, 109, 110, 111
5	Practice session	S	4, 8, 9, 48, 64, 65, 66, 67, 79
6	Database	S	
7	Standard shots	S	
8	Feedback	S	
9	Insights	S	
10	Performance	S	46
11	Register	S	
12	User	S	15, 16, 17, 18, 21, 29, 33
13	Registration page	S	25
14	System	S	6
15	First name	S	
16	Last name	S	
17	Email address	S	
18	Date of birth	S	
19	Player	S	47, 49, 50, 84, 85, 88, 89, 90, 91, 92, 106
20	Coach	S	45
21	Password	S	22, 23

22	Characters	S	
23	Alphanumeric characters	S	
24	“Register” button	S	
25	Mandatory fields	S	
26	Age requirements	S	
27	Password criteria	S	
28	Error	S	
29	New user account	S	
30	Verification email	S	32
31	Account activation	S	
32	Provided link	S	
33	Dashboard	S	
34	Login	S	
35	Login page	S	36
36	Login form	S	37
37	“Login” button	S	
38	Access	S	
39	Account recovery	S	
40	“Forgot password” option	S	
41	“Reset password” button	S	
42	Request	S	
43	“Player Progress” section	S	44
44	Analytics	S	
45	List of assigned players	S	
46	Performance metrics	S	
47	Improvement graph	S	
48	Notes and comments	S	

49	Area of strength	S	
50	Area of improvement	S	
51	Training tip	S	
52	Feedback message	S	51, 52
53	Notification of feedback	S	
54	“Feedback” section	S	52
55	Recommendation for improvement	S	
56	“Practice session” module	S	
57	Type of shot	S	
58	Cut shot	S	
59	Pull shot	S	
60	Strait drive	S	
61	Cover drive	S	
62	Slog shot	S	
63	Recorded data	S	
64	Practice session history	S	
65	Date, time and duration of the session.	S	
66	Type and number of shots played	S	
67	Performance metrics	S	
68	Accuracy	S	
69	Consistency	S	
70	Variation	S	
71	Power	S	
72	“Session summary” section	S	73
73	Detailed data of the selected session	S	
74	Predefined criteria	S	
75	Category of a shot	S	

	Total number of perfect, good, normal, and bad shots	S	
76	Bat speed	S	
77	Impact	S	
78	Summarized data	S	80, 81, 82, 83
79	Distribution of shots by type	S	
80	Maximum and minimum values of bat speed, impact, and power	S	
81	Insights into performance trends	S	
82	Training plan or technique emphasis for future sessions	S	
83	Strength	S	
84	Weakness	S	
85	Comparison	S	87
86	"Comparison" section	S	
87	Number of sessions attended	S	
88	Number of shots played	S	
89	Shot accuracy percentage	S	
90	Average strength and impact of shots	S	
91	Maximum improvement over a period	S	
92	"Performance Metrics" section	S	94
93	Desired timeframe	S	
94	Data visualization and analysis	S	103, 104
95	Day	S	
96	Week	S	
97	Month	S	
98	Year	S	
99			

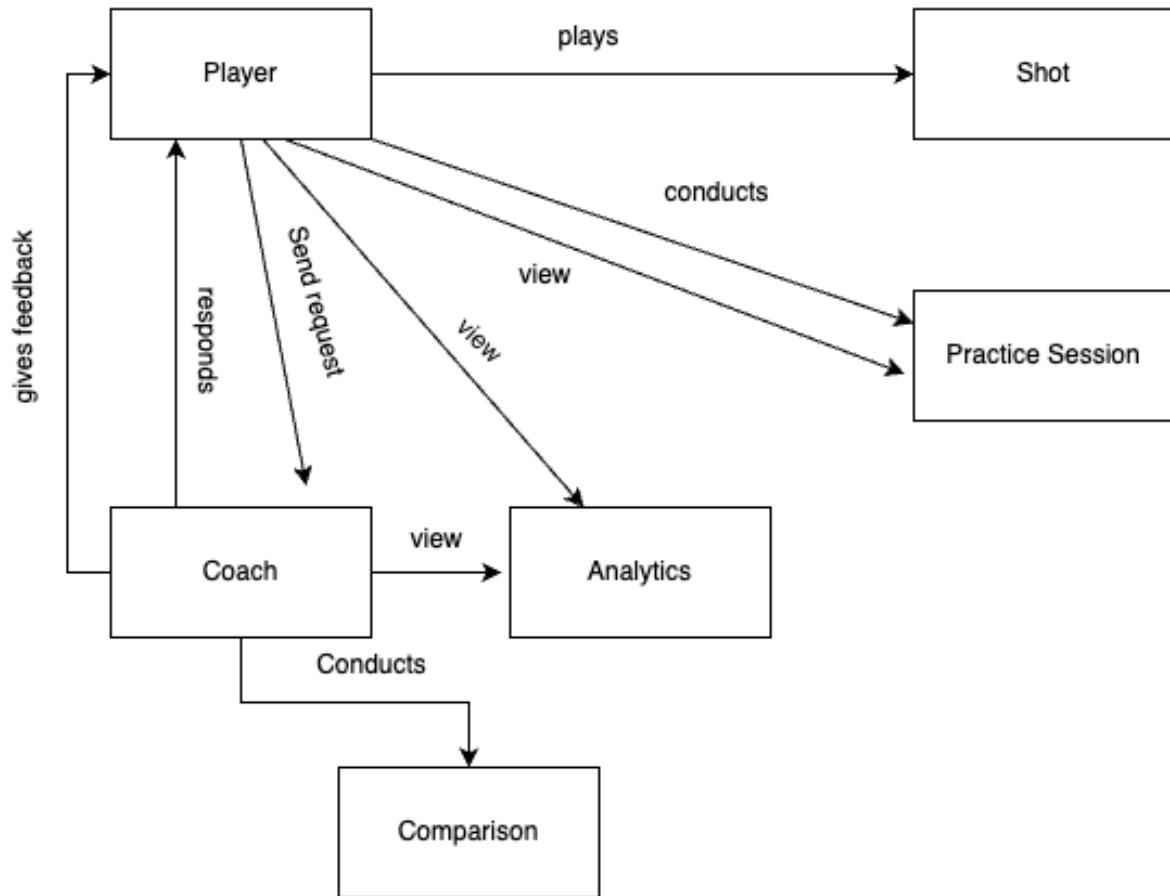
100	Visual representations	S	101, 102
101	Graphs	S	
102	Charts	S	
103	Patterns	S	
104	Fluctuations	S	
105	"Improvement Visualizer" section	S	
106	Skill	S	
107	Impact speed	S	
108	Backlift angle	S	
109	Downswing angle	S	
110	Bat face angle	S	
111	Backlift direction	S	
112	Social media	S	
113	"Add notes" button	S	
114	"Submit" button	S	
115	Email	S	
116	Mobile Application	P	
117	Cricketer	P	
118	Helping tool	P	
119	Virtual Assistant	P	
120	Drill	P	
121	Observation	P	
122	Experience	P	
123	Challenges faced	P	
124	Cricketers of beginner and intermediate skill levels	P	

125	Batting Techniques	P	
126	Clear and organized format	P	
127	Breakdown of shot quality categories	P	

## Preliminary object list

Data objects	Attributes
Shot	Category of a shot, batspeed, impact speed, backlift angle, downswing angle, bat face angle, backlift direction.
Practice Session	Notes, feedback, types of shot, recorded data, practice session history, Date time duration of the session, types and number of shots played
Player	First Name, Last Name, Email address, Date of Birth, hashed password, Average Strength, Average Impact, number of sessions attended, number of shots played, shot accuracy percentage, average strength and impact of shots,
Coach	firstName, Last Name, Email, Date of Birth, hashed password, list of players
Analytics	Improvement graph, Notes and feedback

## Relationship between Data Objects

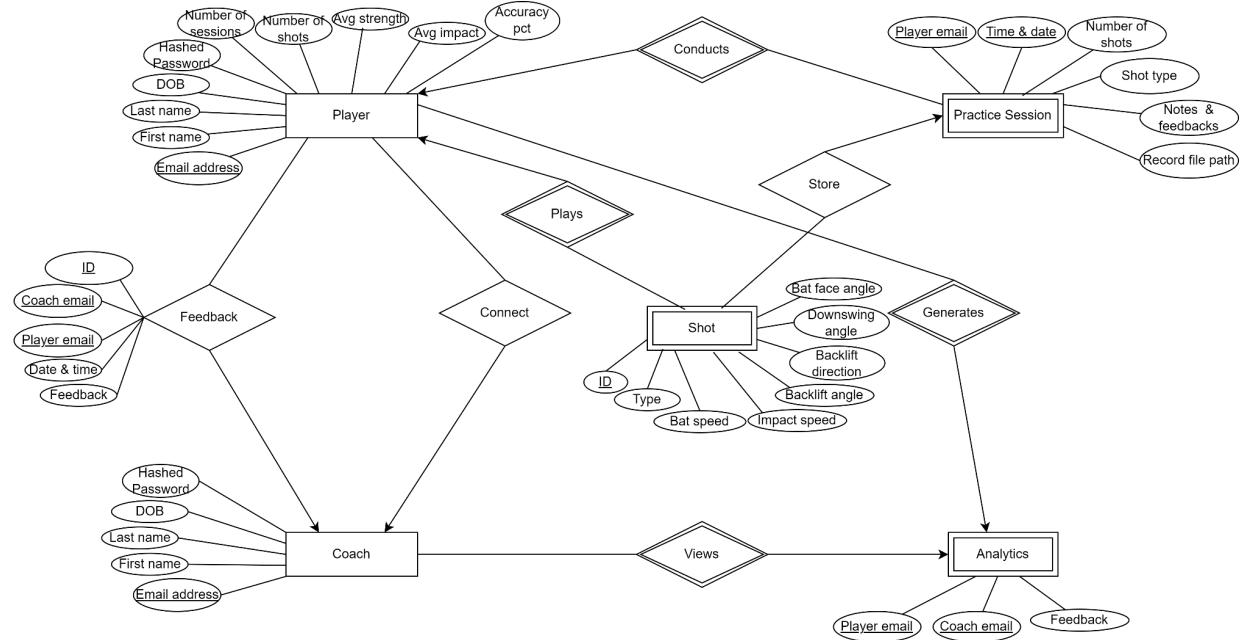


**Figure:** Relationship between data objects

## ER Diagram

ER Diagram stands for Entity Relationship Diagram, also known as ERD is a diagram that displays the relationship of entity sets stored in a database. In other words, ER diagrams help to explain the logical structure of databases. ER diagrams are created based on three basic concepts: entities, attributes and relationships. ER Diagrams contain different symbols that use rectangles to represent entities, ovals

to define attributes, triangles to define inheritance and diamond shapes to represent relationships.



**Figure: ER Diagram of Data Objects**

## Schema Diagram

**PK**-Primary Key

**CK**-Composite key

**FK**-Foreign Key

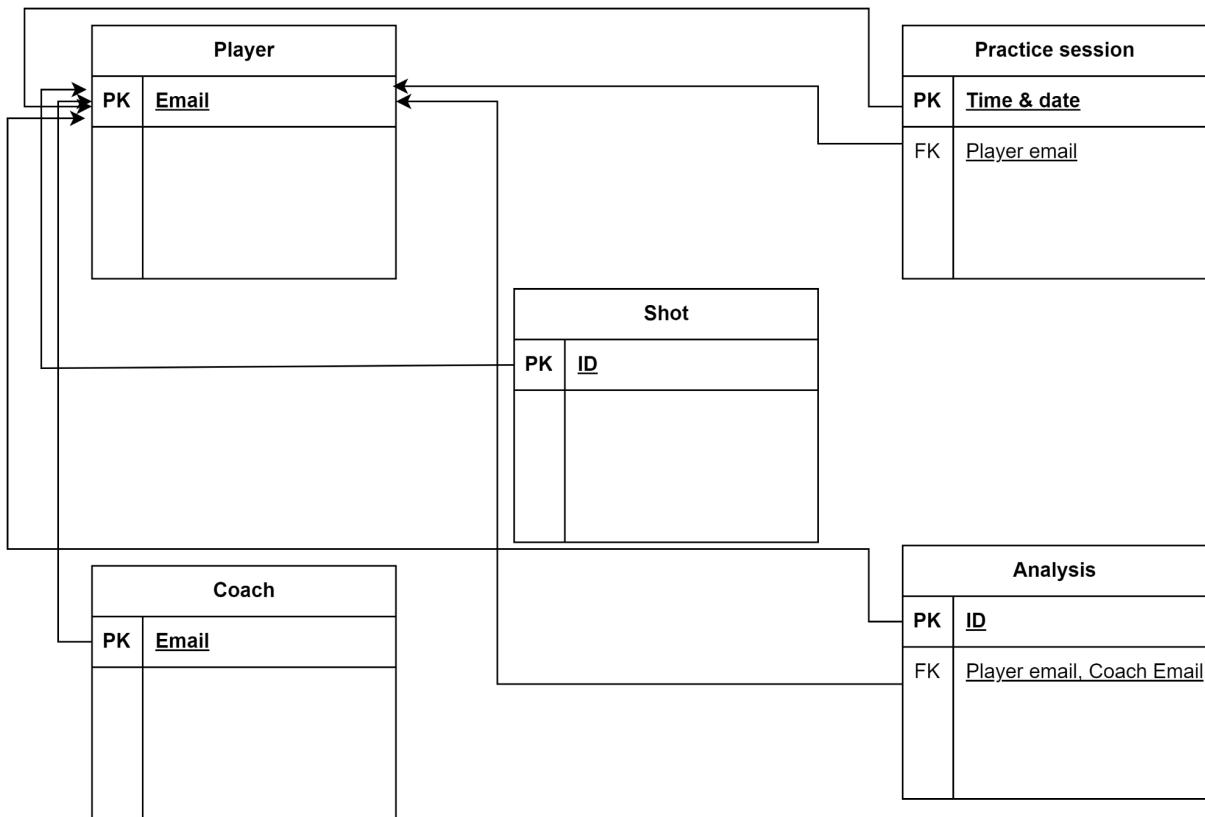


Fig: Schema diagram

# Class-based Modeling

## List of nouns

1. ShotMaster
2. Mobile application
3. Helping tool
4. Cricketer
5. Virtual assistant
6. Sensor
7. Data
8. Shot
9. Practice session
10. Database
11. Standard shots
12. Feedback
13. Cricketers of beginner and intermediate skill levels
14. Batting techniques
15. Insights
16. Performance
17. Register
18. User
19. Registration page
20. System
21. First name
22. Last name
23. Email address
24. Date of birth
25. Player
26. Coach
27. Password
28. Characters
29. Alphanumeric characters
30. “Register” button

- 31.Mandatory fields
- 32.Age requirements
- 33.Password criteria
- 34.Error
- 35.New user account
- 36.Email
- 37.Verification email
- 38.Account activation
- 39.Provided link
- 40.Dashboard
- 41.Login
- 42.Login page
- 43.Login form
- 44.“Login” button
- 45.Access
- 46.Account recovery
- 47.“Forgot password” option
- 48."Reset password" button
- 49.Request
- 50."Player Progress" section
- 51.Analytics
- 52.List of assigned players
- 53.Performance metrics
- 54.Improvement graph
- 55.Notes and comments
- 56.Area of strength
- 57.Area of improvement
- 58.Training tip
- 59.Feedback message
- 60.Notification of feedback
- 61.“Feedback” section
- 62.Recommendation for improvement
- 63.“Practice session” module
- 64.Type of shot
- 65.Cut shot

- 66. Pull shot
- 67. Straight drive
- 68. Cover drive
- 69. Slog shot
- 70. Recorded data
- 71. Practice session history
- 72. Date, time and duration of the session.
- 73. Type and number of shots played
- 74. Performance metrics
- 75. Accuracy
- 76. Consistency
- 77. Variation
- 78. Power
- 79. "Session summary" section
- 80. Detailed data of the selected session
- 81. Predefined criteria
- 82. Category of a shot
- 83. Total number of perfect, good, normal, and bad shots
- 84. Bat speed
- 85. Impact
- 86. Summarized data
- 87. Clear and organized format
- 88. Distribution of shots by type
- 89. Breakdown of shot quality categories
- 90. Maximum and minimum values of bat speed, impact, and power
- 91. Insights into performance trends
- 92. Training plan or technique emphasis for future sessions
- 93. Strength
- 94. Weakness
- 95. Comparison
- 96. "Comparison" section
- 97. Number of sessions attended
- 98. Number of shots played
- 99. Shot accuracy percentage
- 100. Average strength and impact of shots

101. Maximum improvement over a period
102. "Performance Metrics" section
103. Desired timeframe
104. Data visualization and analysis
105. Day
106. Week
107. Month
108. Year
109. Specific parameters
110. Visual representations
111. Graphs
112. Charts
113. Patterns
114. Fluctuations
115. "Improvement Visualizer" section
116. Skill
117. Bat speed
118. Impact speed
119. Backlift angle
120. Downswing angle
121. Bat face angle
122. Backlift direction
123. Social media
124. "Add notes" button
125. Experience
126. Observation
127. Challenges faced
128. Technical advice
129. Drill
130. "Submit" button

## List of nouns in solution space

Sl	Noun	Attributes
1	ShotMaster	
2	Sensor	
3	Data	
4	Shot	57, 68, 69, 70, 71, 75, 77, 78, 107, 108, 109, 110, 111
5	Practice session	4, 8, 9, 48, 64, 65, 66, 67, 79
6	Database	
7	Standard shots	
8	Feedback	
9	Insights	
10	Performance	46
11	Register	
12	User	15, 16, 17, 18, 21, 29, 33
13	Registration page	25
14	System	6
15	First name	
16	Last name	
17	Email address	
18	Date of birth	
19	Player	47, 49, 50, 84, 85, 88, 89, 90, 91, 92, 106
20	Coach	45
21	Password	22, 23

22	Characters	
23	Alphanumeric characters	
24	“Register” button	
25	Mandatory fields	
26	Age requirements	
27	Password criteria	
28	Error	
29	New user account	
30	Verification email	32
31	Account activation	
32	Provided link	
33	Dashboard	
34	Login	
35	Login page	36
36	Login form	37
37	“Login” button	
38	Access	
39	Account recovery	
40	“Forgot password” option	
41	"Reset password" button	
42	Request	
43	"Player Progress" section	44
44	Analytics	
45	List of assigned players	
46	Performance metrics	
47	Improvement graph	
48	Notes and comments	

49	Area of strength	
50	Area of improvement	
51	Training tip	
52	Feedback message	51, 52
53	Notification of feedback	
54	“Feedback” section	52
55	Recommendation for improvement	
56	“Practice session” module	
57	Type of shot	
58	Cut shot	
59	Pull shot	
60	Strait drive	
61	Cover drive	
62	Slog shot	
63	Recorded data	
64	Practice session history	
65	Date, time and duration of the session.	
66	Type and number of shots played	
67	Performance metrics	
68	Accuracy	
69	Consistency	
70	Variation	
71	Power	
72	“Session summary” section	73

	Detailed data of the selected session	
73		
74	Predefined criteria	
75	Category of a shot	
76	Total number of perfect, good, normal, and bad shots	
77	Bat speed	
78	Impact	
79	Summarized data	80, 81, 82, 83
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81	Maximum and minimum values of bat speed, impact, and power	
82	Insights into performance trends	
83	Training plan or technique emphasis for future sessions	
84	Strength	
85	Weakness	
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87	"Comparison" section	
88	Number of sessions attended	
89	Number of shots played	
90	Shot accuracy percentage	
91	Average strength and impact of shots	
92	Maximum improvement over a period	
93	"Performance Metrics" section	94
94	Desired timeframe	

95	Data visualization and analysis	103, 104
96	Day	
97	Week	
98	Month	
99	Year	
100	Visual representations	101, 102
101	Graphs	
102	Charts	
103	Patterns	
104	Fluctuations	
105	"Improvement Visualizer" section	
106	Skill	
107	Impact speed	
108	Backlift angle	
109	Downswing angle	
110	Bat face angle	
111	Backlift direction	
112	Social media	
113	"Add notes" button	
114	"Submit" button	
115	Email	

## List of verbs

1. Improve batting
2. Attach sensor
3. Read shot data
4. Send to database
5. Store data
6. Compare shot with standard shot
7. Provide feedback
8. Get insight
9. Access registration page
10. Present registration form
11. Enter information
12. Select role
13. Type password
14. Retype password
15. Click on the “Register” button
16. Check if all mandatory fields are filled
17. Verify the email address format
18. Ensure the date of birth is in the past
19. Validate password criteria
20. Fail to validate
21. Show appropriate error message
22. Create new user account
23. Send verification email
24. Receive verification email
25. Click on verification URL
26. Confirm successful verification
27. Redirect to the dashboard
28. Navigate to login page
29. Present login form

- 30.Enter email and password
- 31.Click on the “Login” button
- 32.Check if email exists in the database
- 33.Verify that the password is correct
- 34.Grant access to user’s account
- 35.Show “Wrong email address or password.”
- 36.Click on the “Forgot password”
- 37.Ask for email address
- 38.Enter email address
- 39.Click on the “Reset password” button.
- 40.Ask to type and retype password
- 41.Show the message “Password has been changed successfully.”
- 42.Send request to coach
- 43.Access player’s data
- 44.Navigate to the “Player progress” section
- 45.View player’s progress insights and analysis
- 46.Select a player
- 47.Send feedback
- 48.Select a session
- 49.Write comment
- 50.Submit feedback
- 51.Receive notification about sent feedback
- 52.Navigates to the “Practice session” module
- 53.Start a new practice session
- 54.Record the type of shot
- 55.Record additional details
- 56.Submit data to the system
- 57.End the session
- 58.Save recorded data
- 59.Access system data
- 60.Navigates to the practice session history
- 61.Select desired session
- 62.Retrieve and display details of the selected practice session
- 63.Navigate to the “Session summary” section
- 64.Evaluate the shot based on predefined criteria

65. Categorize the shot
66. Compute statistics
67. Present summarized data
68. View session summary
69. Identify patterns or discrepancies in shot quality and performance metrics
70. Focus on addressing weaknesses or building on strengths identified in the summary
71. Navigate to the “Comparison” section
72. Choose comparison criteria
73. Generate a comprehensive comparison report
74. Analyze comparison report
75. Navigate performance metrics
76. Select timeframe
77. Select parameters
78. Generate visual representations
79. View generated data
80. Navigate to "Improvement Visualizer" section
81. Choose specific metrics
82. Display trends, progress, and fluctuations
83. Share on social media
84. Click on the “Add Notes” button
85. Enter notes
86. Include details
87. Comment on player’s improvement
88. Click on the “Submit” button

## General Classification

Candidate classes are categorized based on the seven general classification. The analysis classes manifest themselves in one of the following ways:

1. External entities
2. Things
3. Events

4. Roles
5. Organizational units
6. Places
7. Structures

A candidate class is selected for special classification if it fulfills three or more Characteristics.

<b>Noun</b>	<b>General characteristics</b>
ShotMaster	2
Sensor	1, 2, 7 (selected)
Data	2
Shot	2, 3, 7 (selected)
Practice session	2, 3, 7 (selected)
Database	2, 4, 7 (selected)
Standard shots	
Feedback	2
Insights	2
Performance	7
Register	2, 3, 4 (selected)
User	2, 4, 5 (selected)
Registration page	2
System	2, 7
First name	2
Last name	2
Email address	2
Date of birth	2
Player	2, 4, 5 (selected)
Coach	2, 4, 5 (selected)

Password	2
Characters	2
Alphanumeric characters	2
“Register” button	2
Mandatory fields	2
Age requirements	
Password criteria	
Error	
New user account	2
Verification email	2, 3
Email	1, 2, 7 (Selected)
Account activation	3
Provided link	2
Dashboard	2
Login	2, 3, 4 (selected)
Login page	2
Login form	2
“Login” button	2
Access	3
Account recovery	2, 3, 4 (selected)
“Forgot password” option	2
“Reset password” button	2
Request	3
“Player Progress” section	2
Analytics	4, 5, 7 (selected)
List of assigned players	2
Performance metrics	7

Improvement graph	2
Notes and comments	2
Area of strength	
Area of improvement	
Training tip	2
Feedback message	2, 3
Notification of feedback	2, 3, 4 (selected)
“Feedback” section	2
Recommendation for improvement	2
“Practice session” module	2
Type of shot	
Cut shot	
Pull shot	
Strait drive	
Cover drive	
Slog shot	
Recorded data	2, 7
Practice session history	2, 7
Date, time and duration of the session	7
Type and number of shots played	
Performance metrics	
Accuracy	
Consistency	
Variation	
Power	
“Session summary” section	2, 7
Detailed data of the selected session	2, 7

Predefined criteria	
Category of a shot	
Total number of perfect, good, normal, and bad shots	
Bat speed	
Impact	
Summarized data	
Distribution of shots by type	7
Maximum and minimum values of bat speed, impact, and power	2
Insights into performance trends	
Training plan or technique emphasis for future sessions	2
Strength	
Weakness	
Comparison	3, 4, 7 (selected)
"Comparison" section	2
Number of sessions attended	
Number of shots played	
Shot accuracy percentage	
Average strength and impact of shots	
Maximum improvement over a period	
"Performance Metrics" section	2
Desired timeframe	
Data visualization and analysis	
Day	3
Week	3

Month	3
Year	3
Visual representations	2
Graphs	2
Charts	2
Patterns	
Fluctuations	
"Improvement Visualizer" section	2
Skill	
Impact speed	
Backlift angle	
Downswing angle	
Bat face angle	
Backlift direction	
Social media	1, 2, 7 (selected)
"Add notes" button	2
"Submit" button	2

## Potential class list

1. Sensor
2. Shot
3. Practice session
4. Database
5. Register
6. User
7. Player
8. Coach
9. Email

- 10. Login
- 11. Account recovery
- 12. Analytics
- 13. Notification
- 14. Comparison
- 15. Social media

## **Selection criteria**

Candidate classes are categorized based on the seven general classification. The analysis classes manifest themselves in one of the following ways:

- 1. Retained Information
- 2. Needed Services
- 3. Multiple Attributes
- 4. Common Attributes
- 5. Common Operations
- 6. Essential Requirements

A final class list is made after reviewing the list and merging multiple candidate classes if needed.

<b>Noun</b>	<b>Selection criteria</b>
Sensor	1, 2, 6 (selected)
Shot	1, 2, 3, 6 (selected)
Practice session	1, 2, 3, 6 (selected)
Database	2
Register	2, 5, 6 (selected)
User	1, 3, 4, 5 (selected)
Player	1, 3, 4, 5 (selected)
Coach	1, 4, 5 (selected)
Email	1, 2, 6 (selected)
Login	2, 5, 6 (selected)
Account recovery	2, 5, 6 (selected)

Analytics	1, 2, 3, 6 (selected)
Notification	2, 6
Comparison	1, 2, 6 (selected)
Social media	1, 2, 6 (selected)

## Selected Classes

1. Sensor
2. Shot
3. Practice session
4. Register
5. User
6. Player
7. Coach
8. Email
9. Login
10. Account recovery
11. Analytics
12. Comparison
13. Social media

## Analysis

1. “Register”, “Login” and “Account recovery” classes have common functionalities. Moreover, they serve the same purpose. It will be an overload if we keep all the classes separately. So they can be merged in a single common class. We call it “Account” class.

## Finally selected classes

1. Sensor
2. Shot

3. Practice session
4. Account
5. User
6. Player
7. Coach
8. Email
9. Analytics
10. Comparison
11. Social media

## Attributes and Methods Identification

Class name	Attributes	Methods
Sensor		readShotData()
Shot	-type -accuracy -impactSpeed -backliftAngle -downswingAngle -batFaceAngle -backliftDirection	compareWithStandardShot() readShotType() recordShotDetails()
PracticeSession	-dateAndTime -player -shot <list> -feedbackMessages <list>	receiveShotData() storeSessionData() summarizeSessionData()
Account	-hashKey	register() login() recoverAccount() matchPasswordCriterial() validateEmailAddress() sendVerificationEmail() getVerificationResponse() hashPassword()

User	<ul style="list-style-type: none"> <li>-firstName</li> <li>-lastName</li> <li>-emailAddress</li> <li>-dateOfBirth</li> <li>-hashedPassword</li> </ul>	<ul style="list-style-type: none"> <li>viewPlayerProgress()</li> <li>writeCommentOnSession()</li> <li>accessPracticeSessionHistory()</li> <li>accessPracticeSessionData()</li> </ul>
Player	<ul style="list-style-type: none"> <li>-shotAccuracy</li> <li>-averageStrength</li> <li>-averageImpact</li> <li>-numberOfSessionsAttended</li> <li>-number of shots played</li> <li>-shotAccuracyPercentage</li> <li>-averageStrengthAndImpactOfShots</li> <li>-maximumImprovementOverAPeriod</li> <li>- improvementGraph</li> </ul>	<ul style="list-style-type: none"> <li>sendConnectionRequestToCoach()</li> <li>receiveFeedback()</li> <li>conductSession()</li> </ul>
Coach	<ul style="list-style-type: none"> <li>-players &lt;list&gt;</li> </ul>	<ul style="list-style-type: none"> <li>respondToConnectionRequest()</li> <li>sendFeedback()</li> <li>selectAPlayer()</li> <li>comparePlayers()</li> <li>viewPlayerComparison()</li> <li>selectPlayers()</li> </ul>
Email		sendEmail()
Analysis	<ul style="list-style-type: none"> <li>-timeframe</li> </ul>	<ul style="list-style-type: none"> <li>generateSummary()</li> <li>generateGraph()</li> <li>shareOnSocialMedia()</li> </ul>
Comparison	<ul style="list-style-type: none"> <li>-players &lt;list&gt;</li> </ul>	generateComparisonReport()
SocialMedia	<ul style="list-style-type: none"> <li>-profileURL</li> </ul>	<ul style="list-style-type: none"> <li>connectAccount()</li> <li>shareAsAPost()</li> </ul>

## Class cards

### Class-1: Sensor

Class: Sensor	
Attributes	Methods
	readShotData()
Responsibility	Collaborators
Read shot data and send for storing	PracticeSession

### Class-2: Shot

Class: Shot	
Attributes	Methods
-type -accuracy -impactSpeed -backliftAngle -downswingAngle -batFaceAngle -backliftDirection	compareWithStandardShot() readShotType() recordShotDetails()
Responsibility	Collaborators
Record shot type	Player
Record shot details	Sensor

### Class-3: PracticeSession

<b>Class: PracticeSession</b>	
<b>Attributes</b>	<b>Methods</b>
-dateAndTime -player -shot <list> -feedbackMessages <list>	receiveShotData() storeSessionData() summarizeSessionData()
<b>Responsibility</b>	<b>Collaborators</b>
Receive shot data	Shot

### Class-4: Account

<b>Class: Account</b>	
<b>Attributes</b>	<b>Methods</b>
-hashKey	register() login() recoverAccount() matchPasswordCriterial() validateEmailAddress() sendVerificationEmail() getVerificationResponse() hashPassword()
<b>Responsibility</b>	<b>Collaborators</b>
Register	User
Login	User
Recover account	User

Send validation email	Email
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## Class-5: User

<b>Class: User</b>	
<b>Attributes</b>	<b>Methods</b>
-firstName -lastName -emailAddress -dateOfBirth -hashedPassword	viewPlayerProgress() writeCommentOnSession() accessPracticeSessionHistory() accessPracticeSessionData()
<b>Responsibility</b>	<b>Collaborators</b>
View player progress	Analytics
Write comment on session	PracticeSession
Access a session's data	PracticeSession

## Class-6: Player

<b>Class: Player</b>	
<b>Attributes</b>	<b>Methods</b>
-shotAccuracy -averageStrength -averageImpact -numberOfSessionsAttended -number of shots played -shotAccuracyPercentage -averageStrengthAndImpactOfShots -maximumImprovementOverAPeriod	sendConnectionRequestToCoach() receiveFeedback() conductSession()

- improvementGraph	
<b>Responsibility</b>	<b>Collaborators</b>
Send connection request to coach	Coach
Receive feedback	Coach
Conduct a session	PracticeSession

## Class-7: Coach

<b>Class: Coach</b>	
<b>Attributes</b>	<b>Methods</b>
-players <list>	respondToConnectionRequest() sendFeedback() selectAPlayer() comparePlayers() viewPlayerComparison() selectPlayers()
<b>Responsibility</b>	<b>Collaborators</b>
Respond to connection request	Player
Send feedback on a session	PracticeSession
Compare players	Comparison

## Class-8: Email

<b>Class: Email</b>	
<b>Attributes</b>	<b>Methods</b>
	sendEmail()
<b>Responsibility</b>	<b>Collaborators</b>
Send verification email	Account

## Class-9: Analytics

<b>Class: Analytics</b>	
<b>Attributes</b>	<b>Methods</b>
-timeframe	generateSummary() generateGraph() shareOnSocialMedia()
<b>Responsibility</b>	<b>Collaborators</b>
Generate summary and graph	Player
Social media share	SocialMedia

## Class-10: Comparison

<b>Class: Comparison</b>	
<b>Attributes</b>	<b>Methods</b>
-players <list>	generateComparisonReport()
<b>Responsibility</b>	<b>Collaborators</b>

Generate comparison report	Player
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## Class-11: SocialMedia

Class: SocialMedia	
Attributes	Methods
-profileURL	connectAccount() shareAsAPost()
<b>Responsibility</b>	<b>Collaborators</b>
Social media sharing	User, Analytics

## Class Responsibility Collaboration Diagram

ID-1:

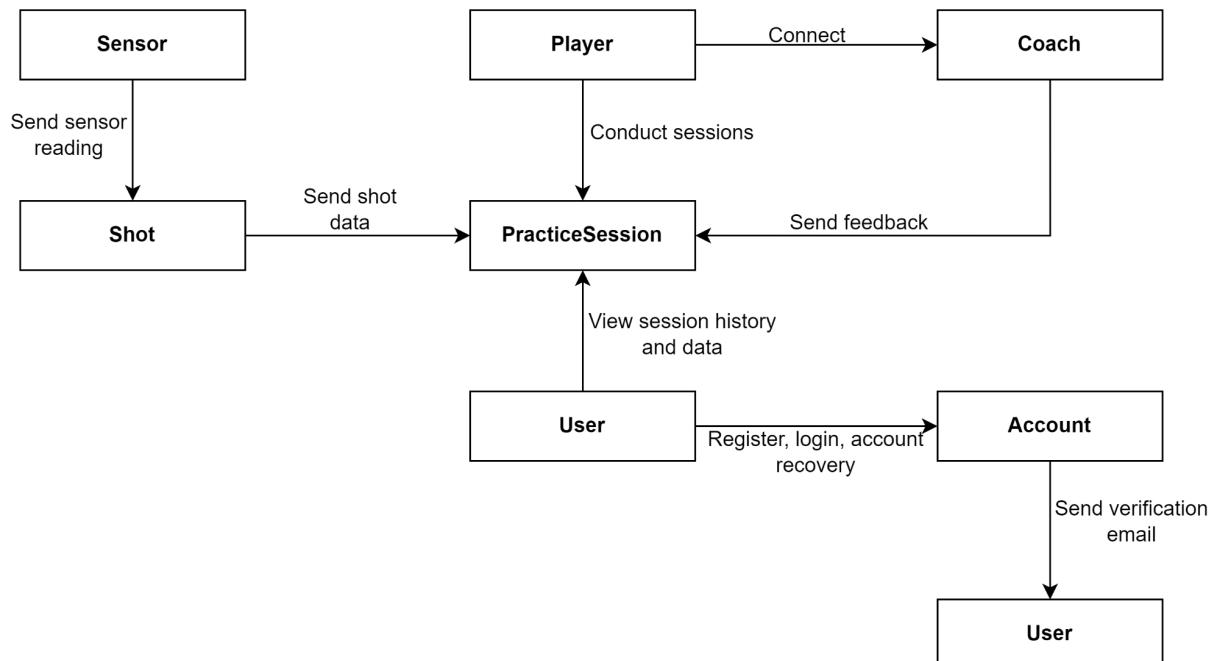


Fig: CRC Diagram - 1

ID-2:

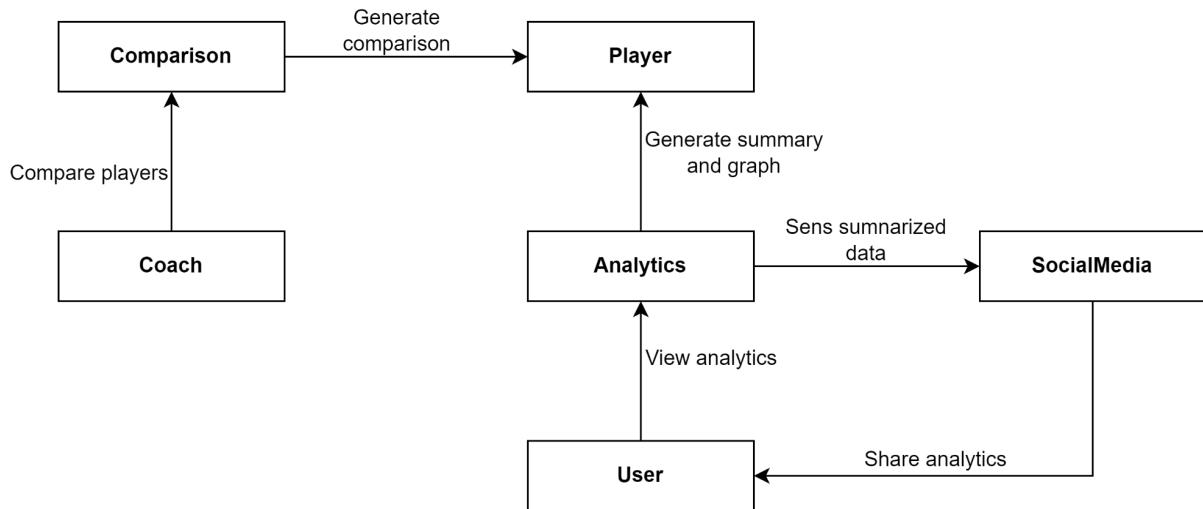


Fig: CRC Diagram - 2

# Behavior Modeling

The Behavior Modeling indicates how the system will behave to external events or stimuli. It is represented as a function of time and event,

It describes interactions between objects. It shows how individual objects collaborate to achieve the behavior of the system as a whole. In UML behavior of a system is shown with the help of use case diagram, sequence diagram and activity diagram.

To create behavioral model following things can be considered-

- ❖ Evaluation of all use-cases to fully understand the sequence of interaction within the system.
- ❖ Identification of events that drive the interaction sequence and understand how these events relate to specific classes.
- ❖ Creating sequence for each use case.
- ❖ Building a state diagram for the system.
- ❖ Reviewing the behavioral model to verify accuracy and consistency.

## Event Identification

<b>Sl.</b>	<b>Initial class</b>	<b>Event</b>	<b>Collaborator class</b>
1.	Sensor	Read shot data and send for storing	PracticeSession
2.	Shot	Record shot type and details	Player, Sensor
3.	PracticeSession	Receive shot data	Shot
4.	User	Register	Account
5.	User	Login	Account
6.	User	Recover account	Account
7.	Account	Validate email address	User, Email
8.	Account	Check email address is a valid one	User
9.	Account	Match password criteria	User
10.	User	View player progress	Analytics
11.	User	Write comment on session	PracticeSession
12.	User	Access a session's data	PracticeSession
13.	Player	Connect coach	Coach
14.	Player	Conduct a session	PracticeSession

15.	Coach	Send feedback	Player
16.	Coach	Compare players	Comparison, Player, Analytics
17.	Analytics	Generate summary and graph	Player
18.	SocialMedia	Social media sharing	User, Analytics

## State Transition Diagram

### State Transition Diagram of Class: Shot

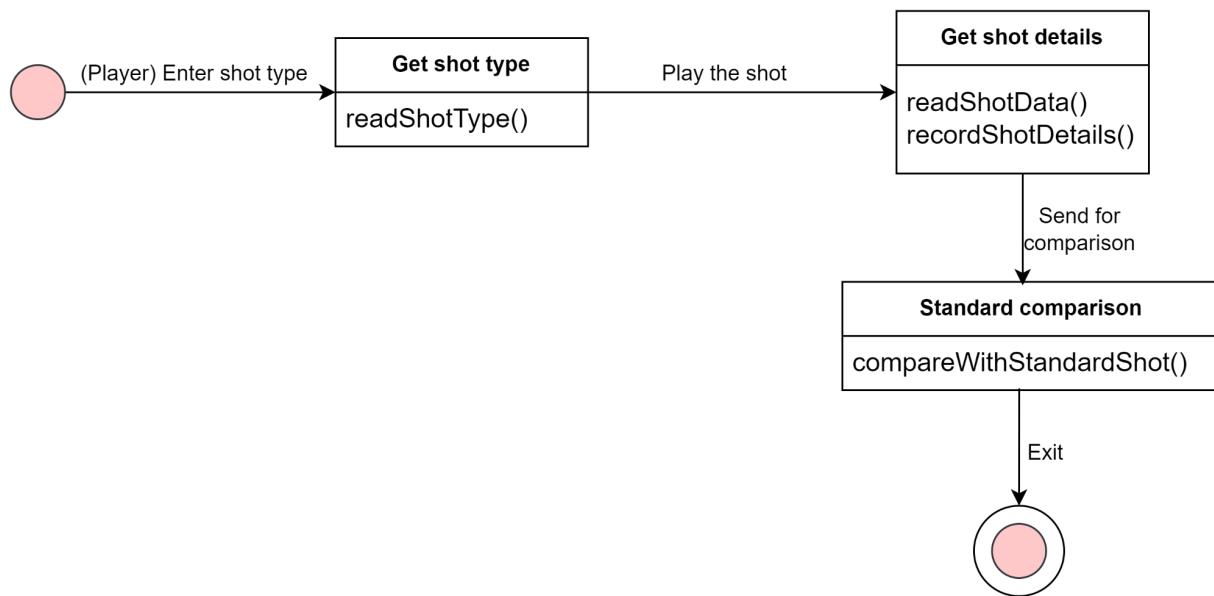


Fig: State transition diagram of **Shot**

## State Transition Diagram of Class: User

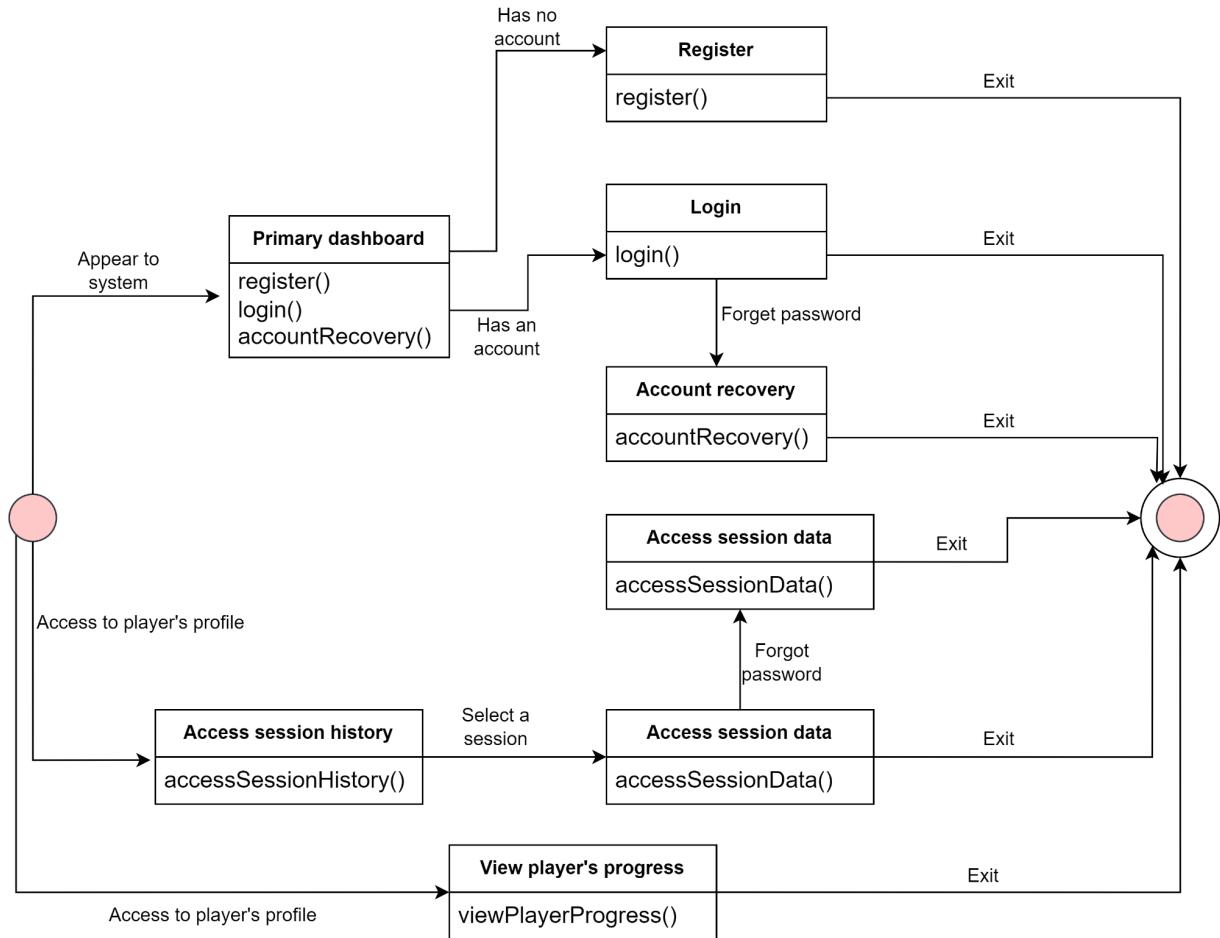


Fig: State transition diagram of **User**

## State Transition Diagram of Class: Account

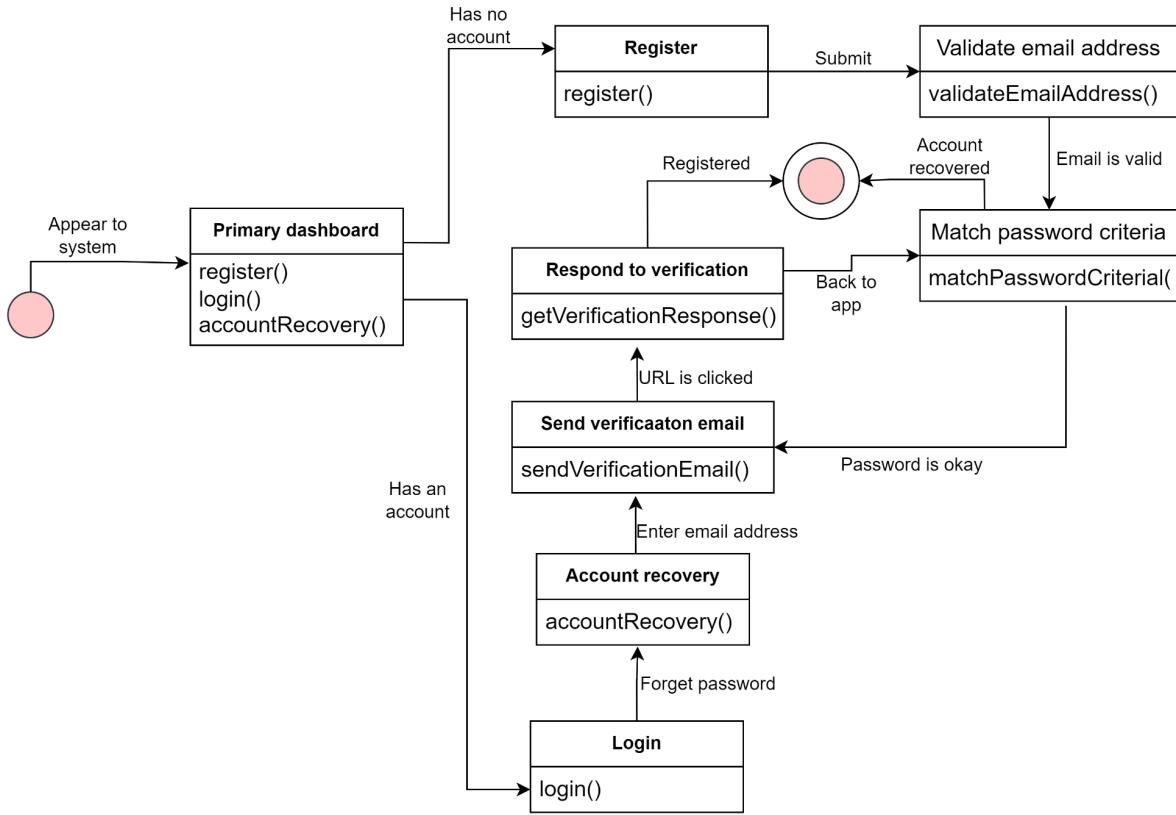


Fig: State transition diagram of Account

## State Transition Diagram of Class: Player

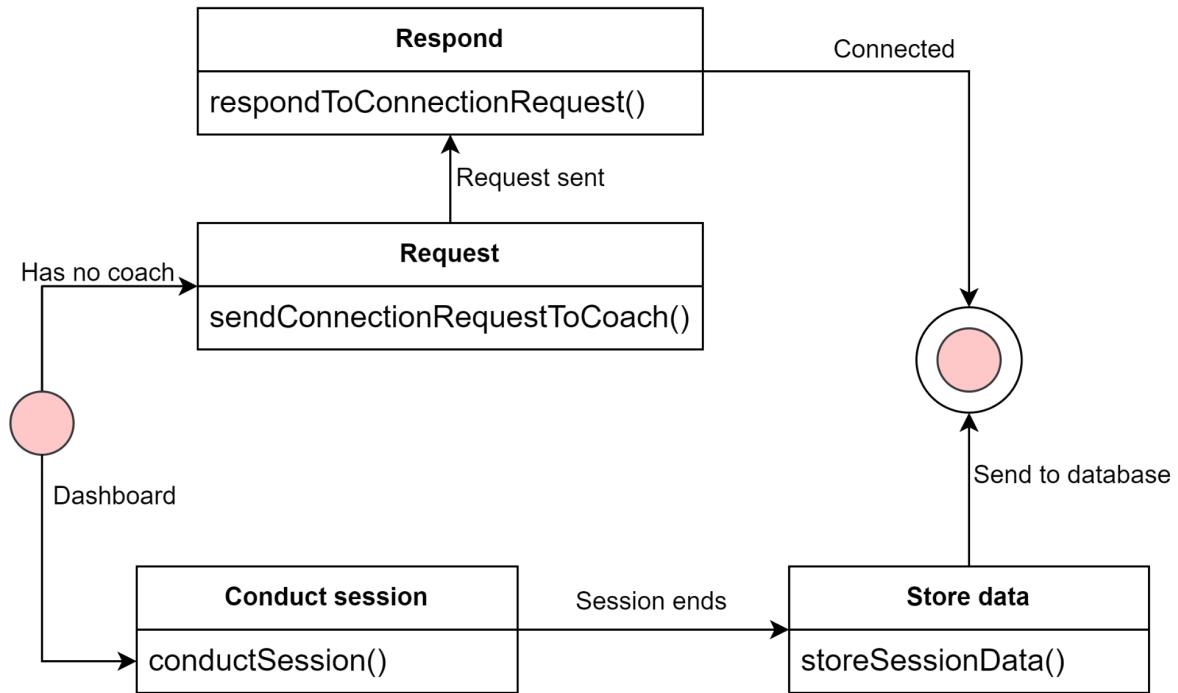


Fig: State transition diagram of **Player**

## State Transition Diagram of Class: Coach

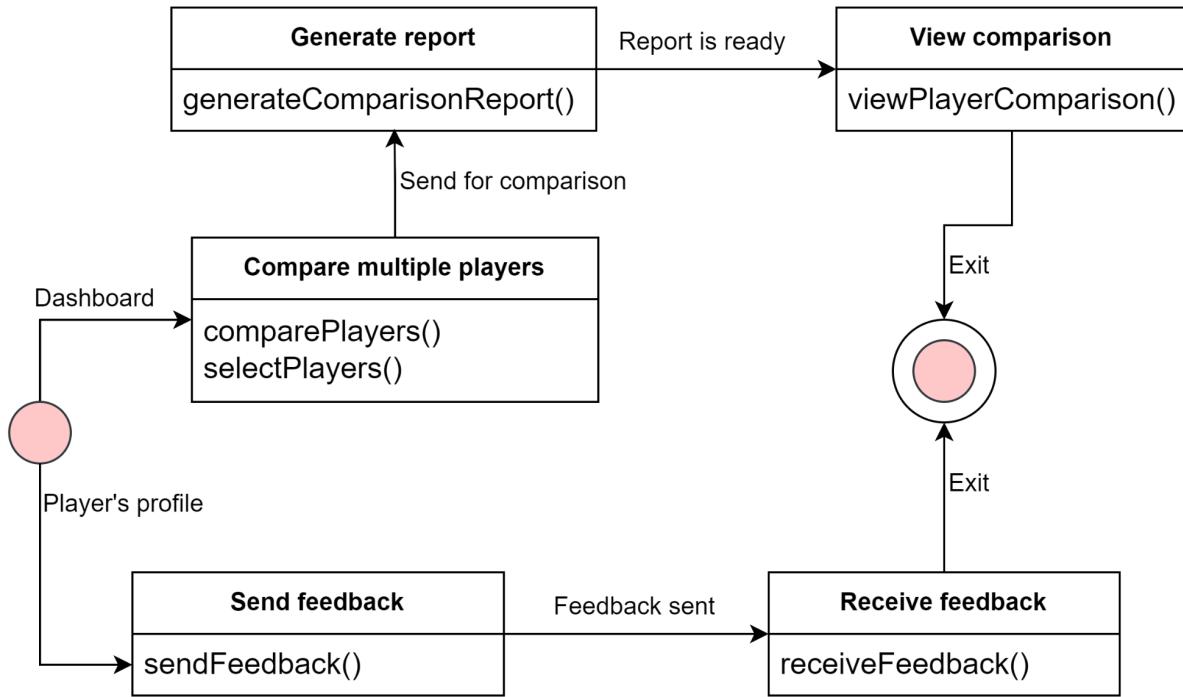


Fig: State transition diagram of **Coach**

## State Transition Diagram of Class: Analytics

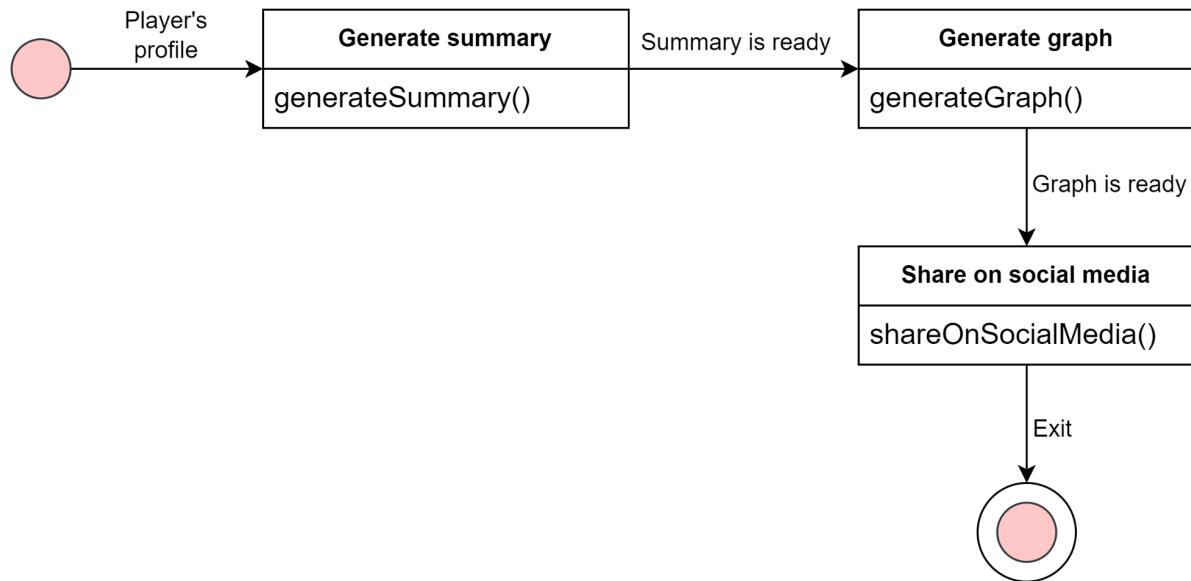


Fig: State transition diagram of **Analytics**

## Sequence Diagram

ID 1:

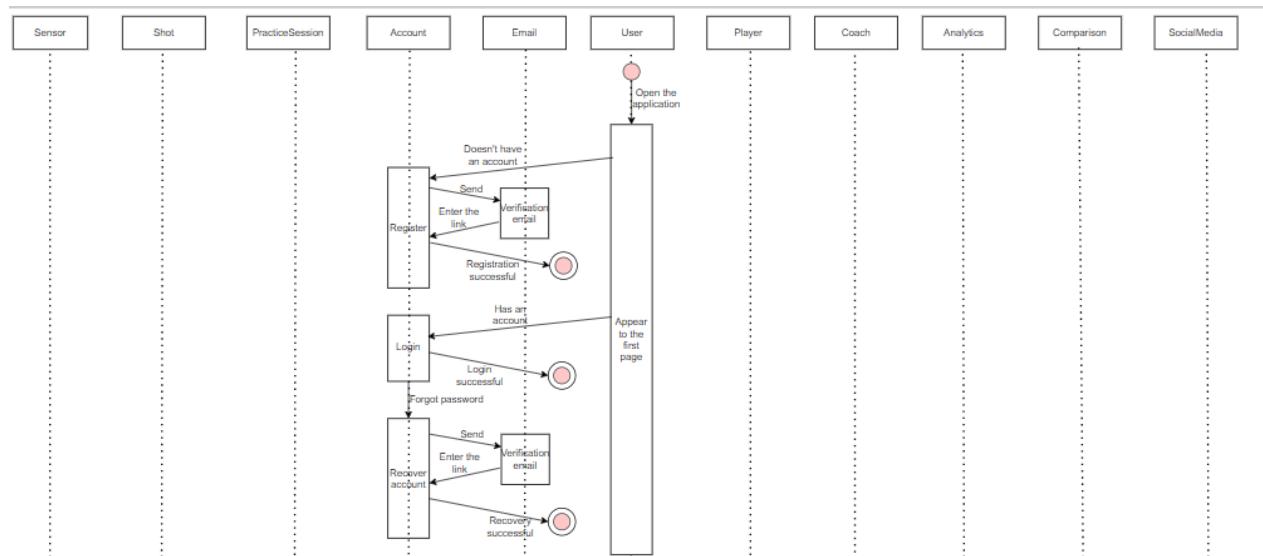


Fig: Sequence diagram of **Register & Login**

ID 2:

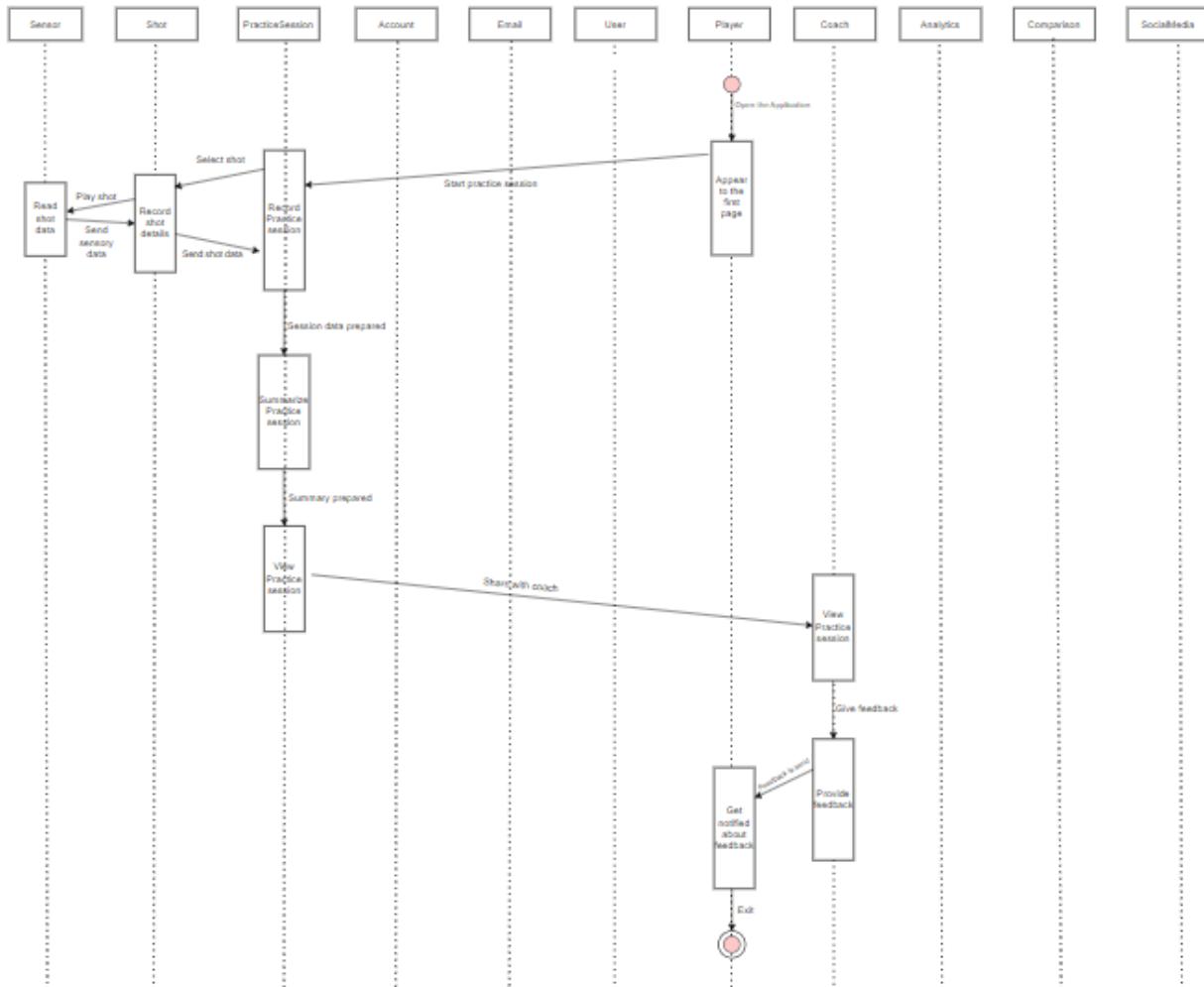


Fig: Sequence diagram of **Practice Session**

ID 3:

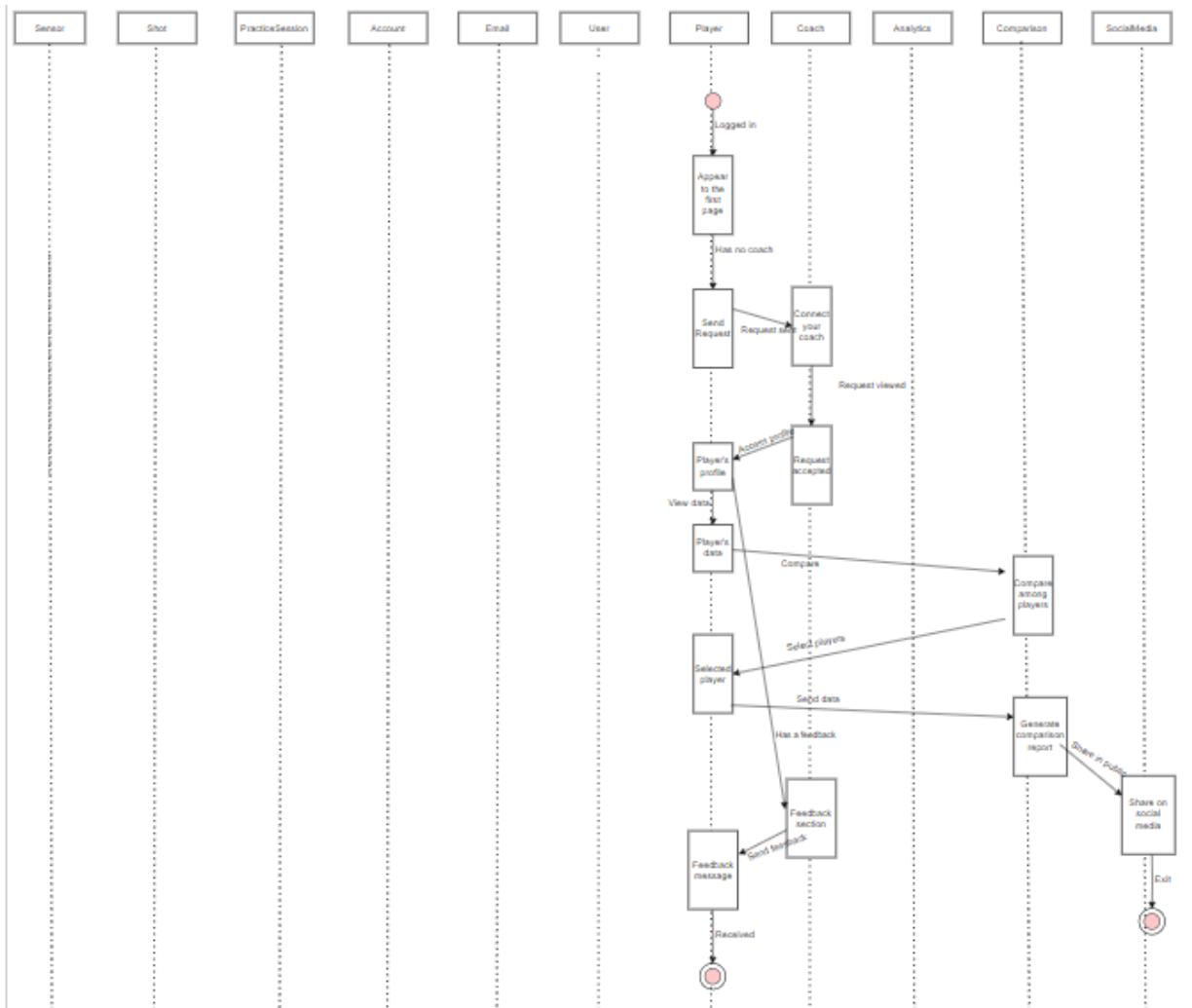


Fig: Sequence diagram of **Connecting coach**

ID 4:

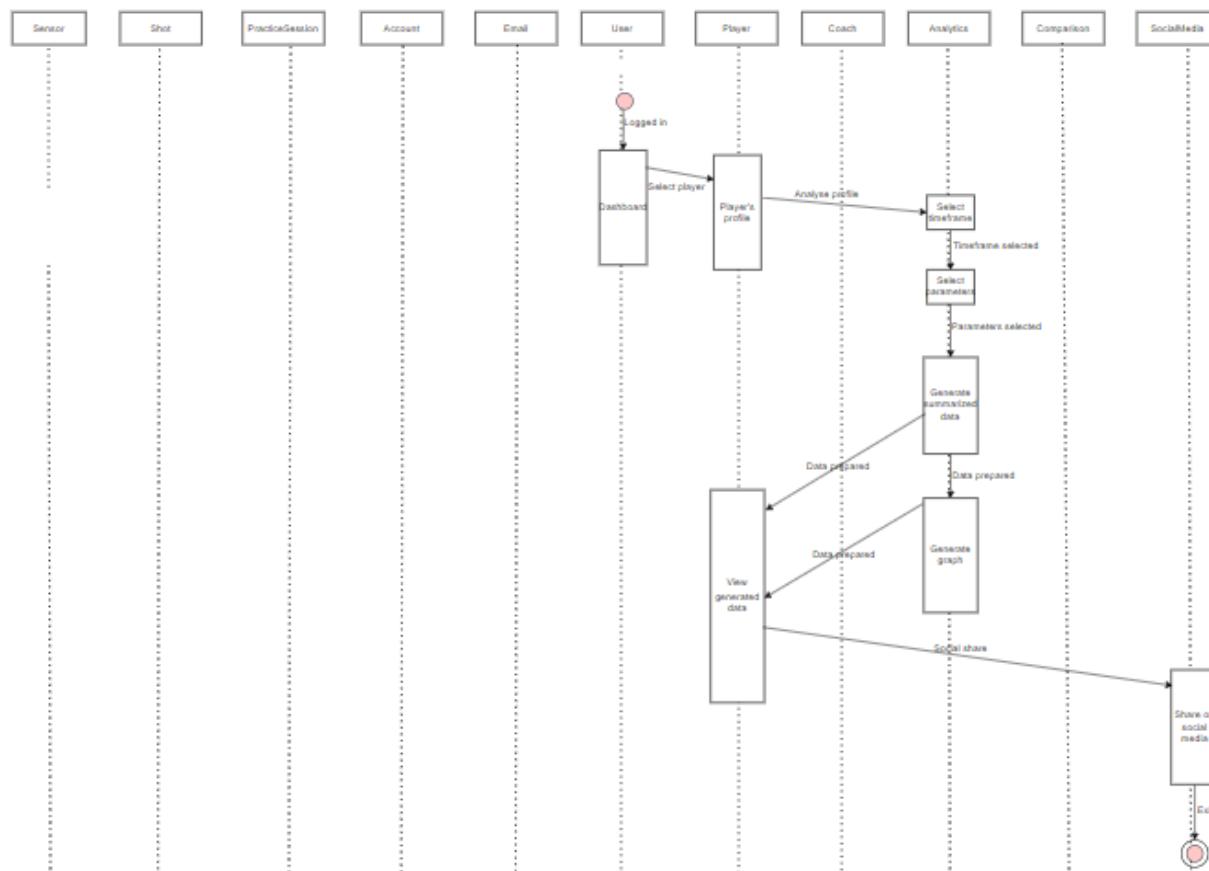


Fig: Sequence diagram of Analytics

# Flow-based Modeling.

## Data Flow Diagram

A data flow diagram is a graphical or visual representation using a standardized set of symbols and notations to describe different classes' operations through data movement. Superficially DFDs can resemble flow charts or UML, but they are not meant to represent details of software logic.

### Level 0: ShotMaster

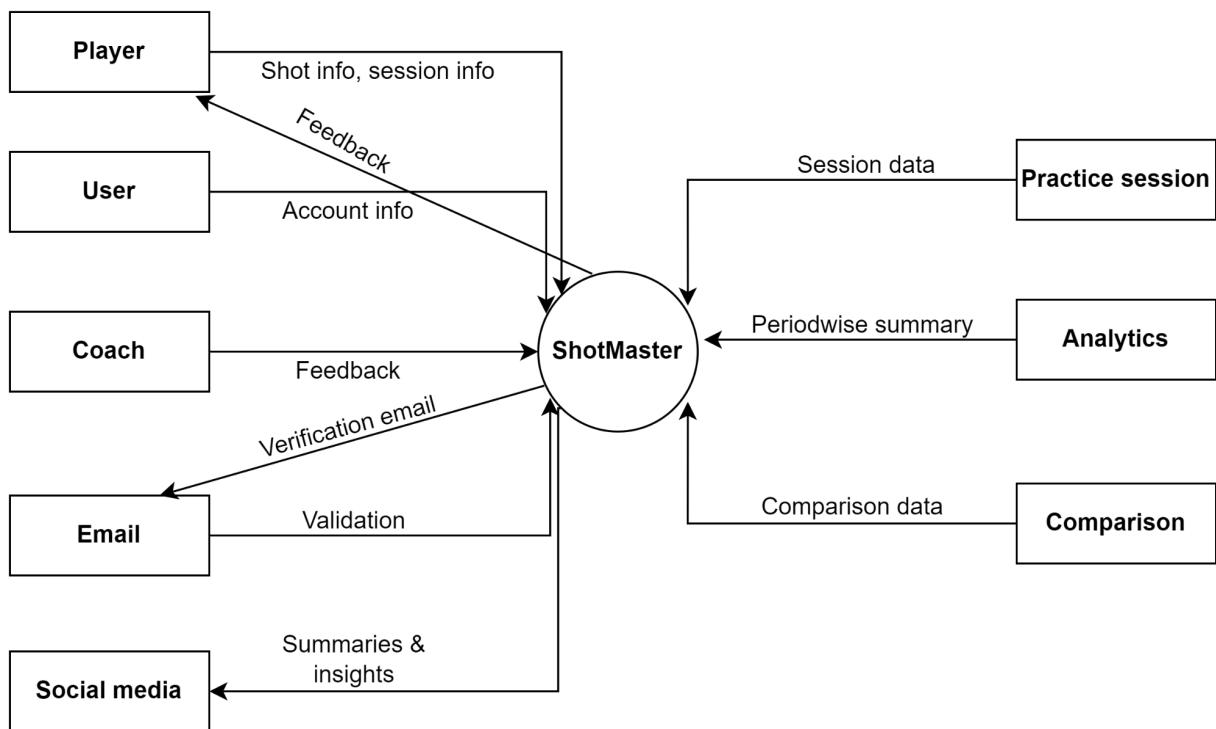


Fig: ShotMaster

## Level 1: ShotMaster

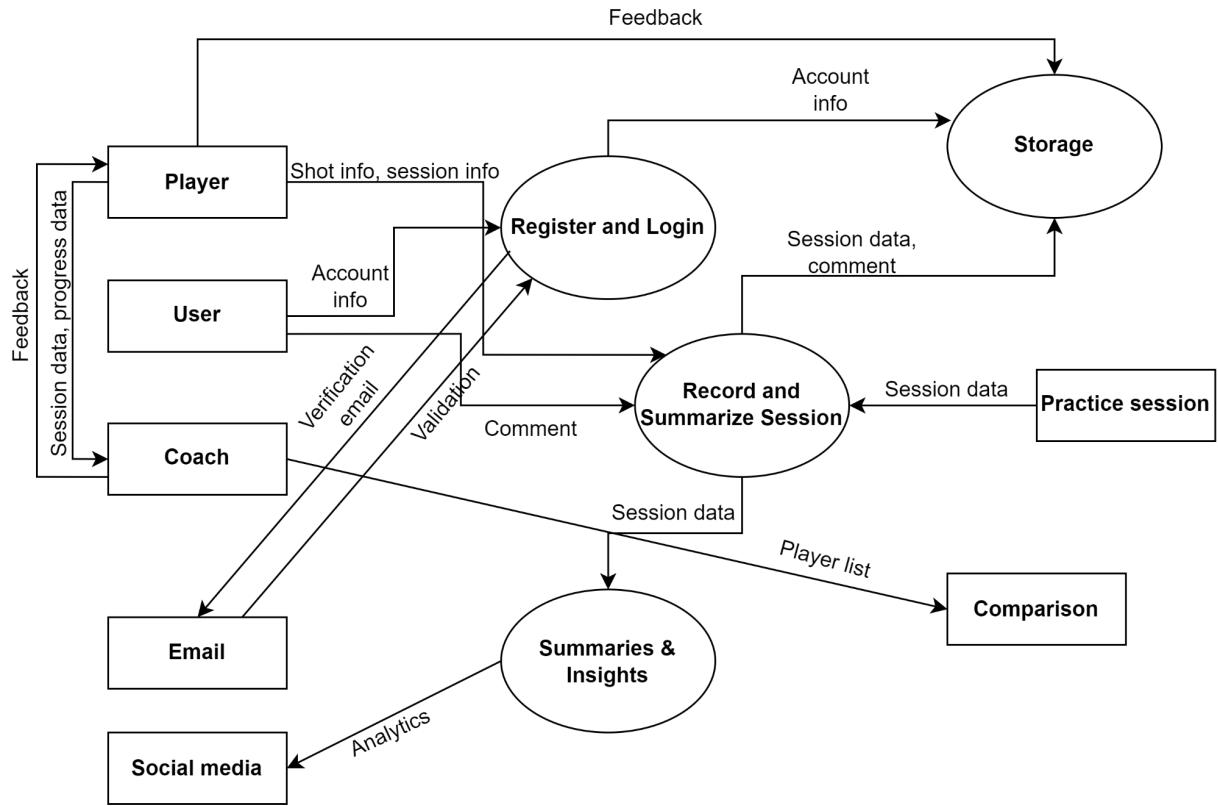


Fig: ShotMaster

### Level 1.1: Register and Login

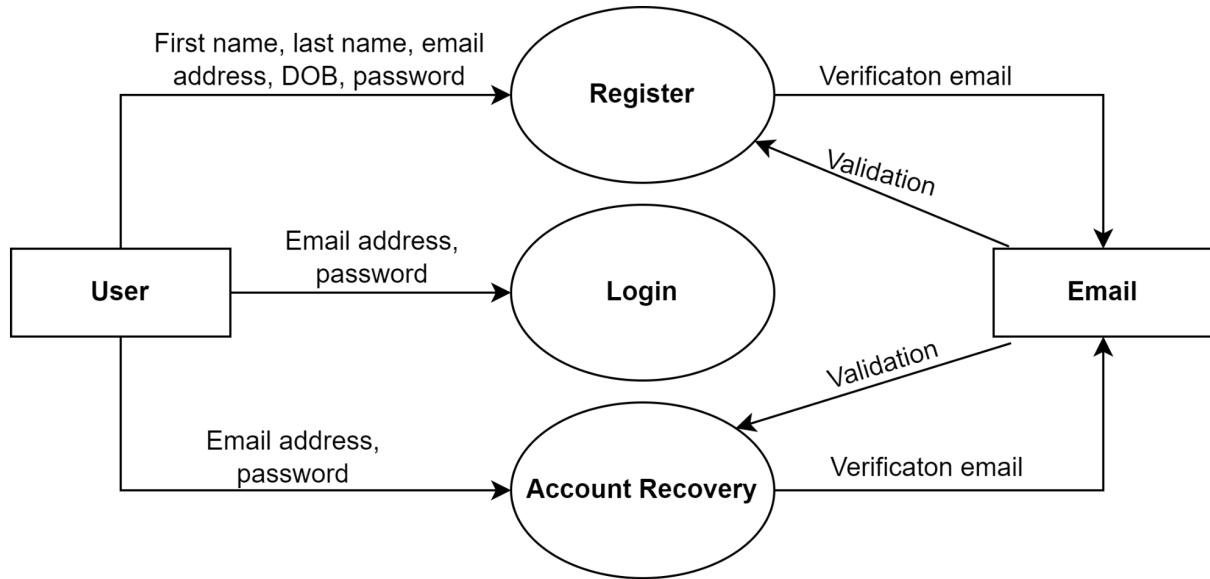


Fig: Register & Login

### Level 1.2: Record and Summarize Session

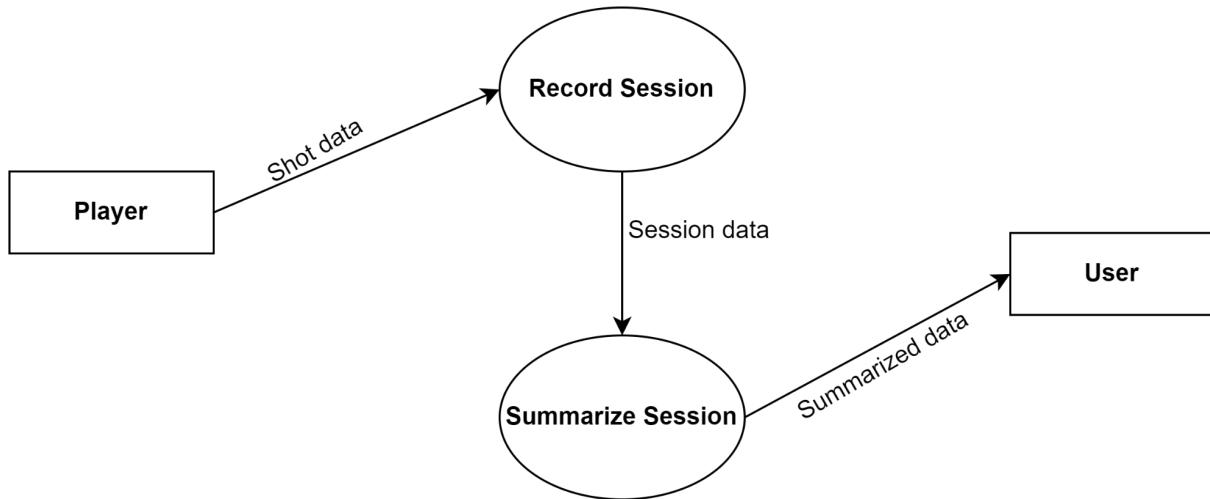


Fig: Record and Summarize Session

### Level 1.3: Connect your coach

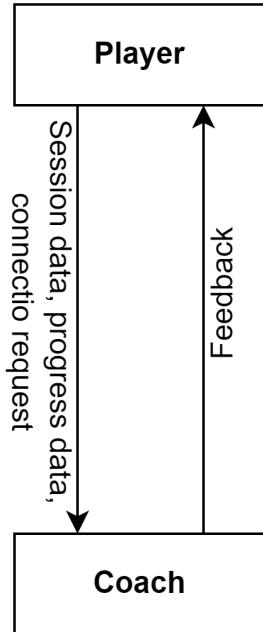


Fig: Connect your coach

### Level 1.4: Summaries and Insights

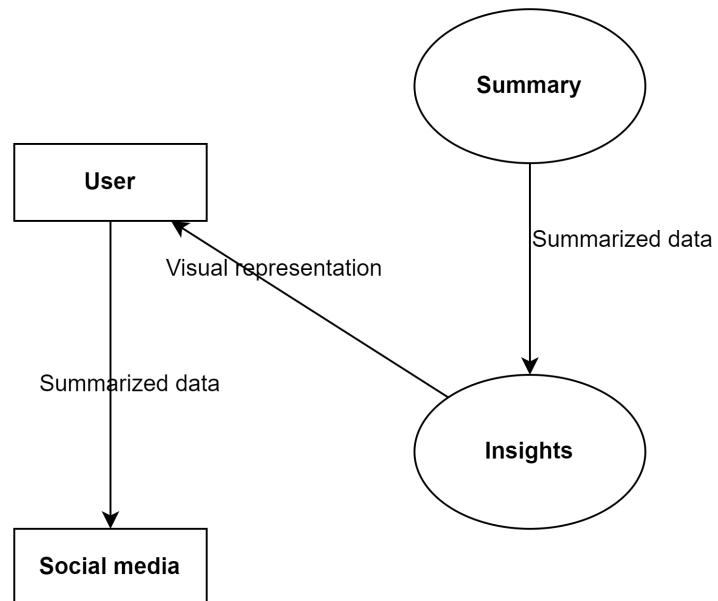


Fig: Summaries and Insights