Sports Performance Analytics App and Dashboard Final Report

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Introduction

This report will go into deeper detail and provide insight as to how this project was designed. It aims to portray my experiences, skills I learnt, mistakes made and how it helped me grow mentally and professionally. I will also discuss how these problems were solved and the technologies used to make this project possible.

The aim of this system is to combine the worlds of coaching and analysis into one shippable product. Stats is becoming a big part of sports and this system aims to bridge that gap. Coaches and analysts are able to monitor the performances of the Athletes through stats.

Application Screenshots

Register Screen

This image shows the mobile applications registration page. It features the illustration of a football player that emphasizes the sports theme. Users are given the option to sign up or register through prominent buttons, set against a dark theme for aesthetic clarity. The design is clean, modern and user central.

Sign in screen

This screen is where athlete's login to see their stats for the day, and they are greeted with a warm welcome message. There are two input fields that are provided for users to fill in their credentials, with an eye icon for the password to toggle visibility. The sign in button submits the credentials.
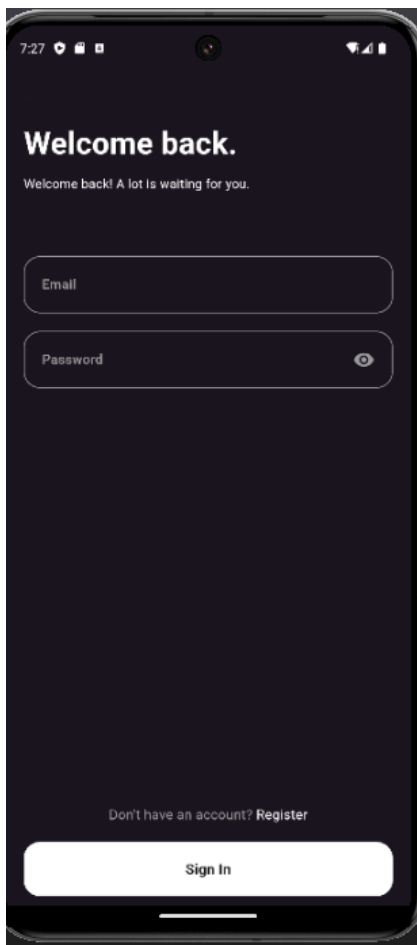
Homepage

This page is tailored for the athlete in this case Bukayo, highlighting a radar chart that tracks athletic performance across various metrics. This page also details crucial stats such as Speed, Heart Rate, Stamina and Strength with progress bars.
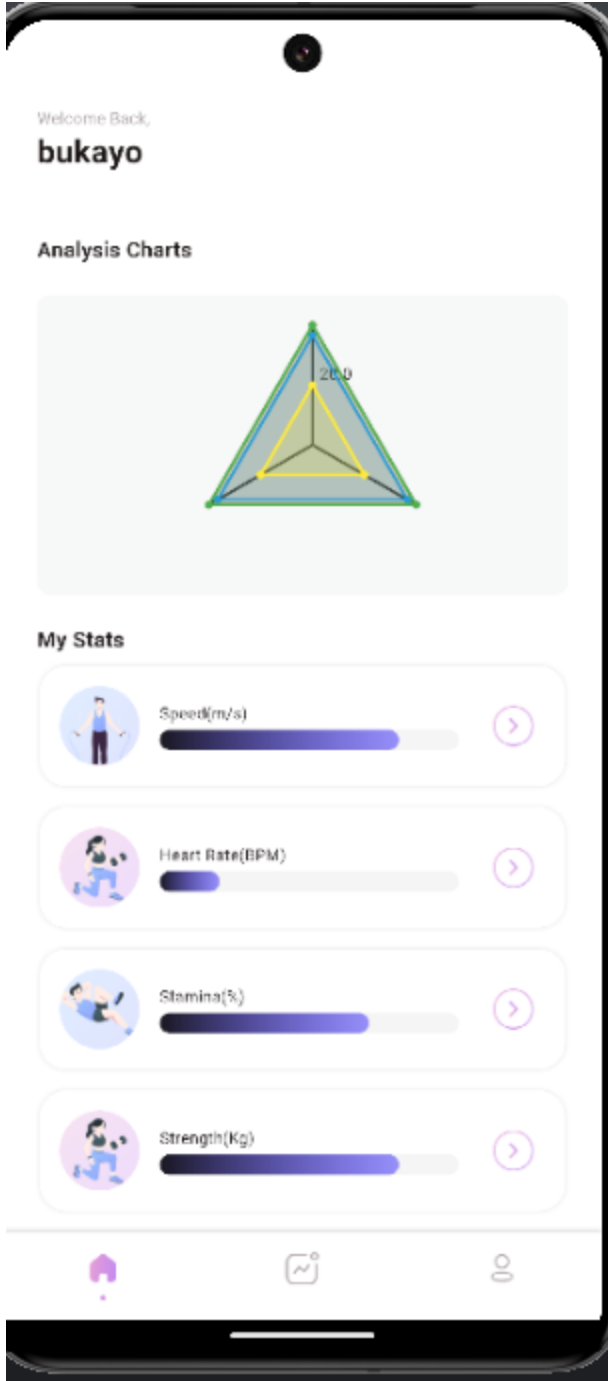
Tracker

This tracker function displays a performance graph across a week and suggestions for workout areas like Stamina and Physical. The graph

contrasts in purple going against a plain background, it has interactive icons to suggest a focus for user engagement in fitness progress tracking.
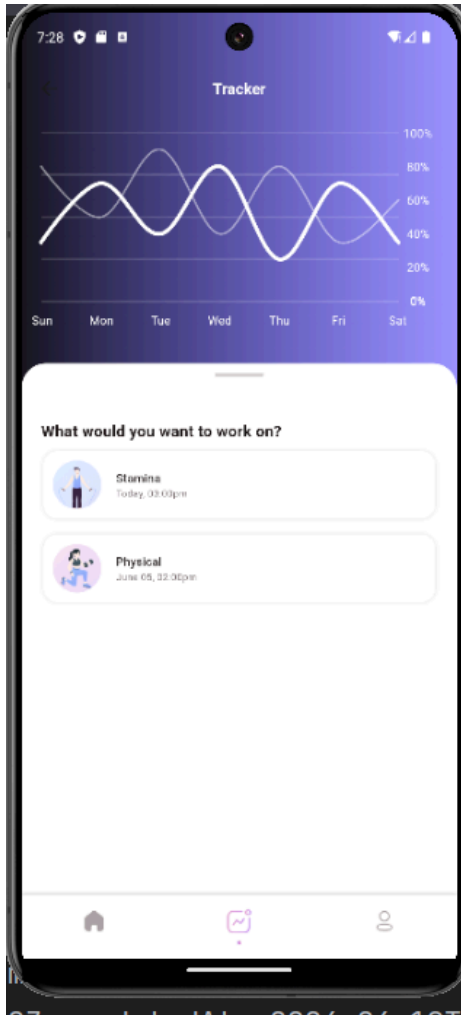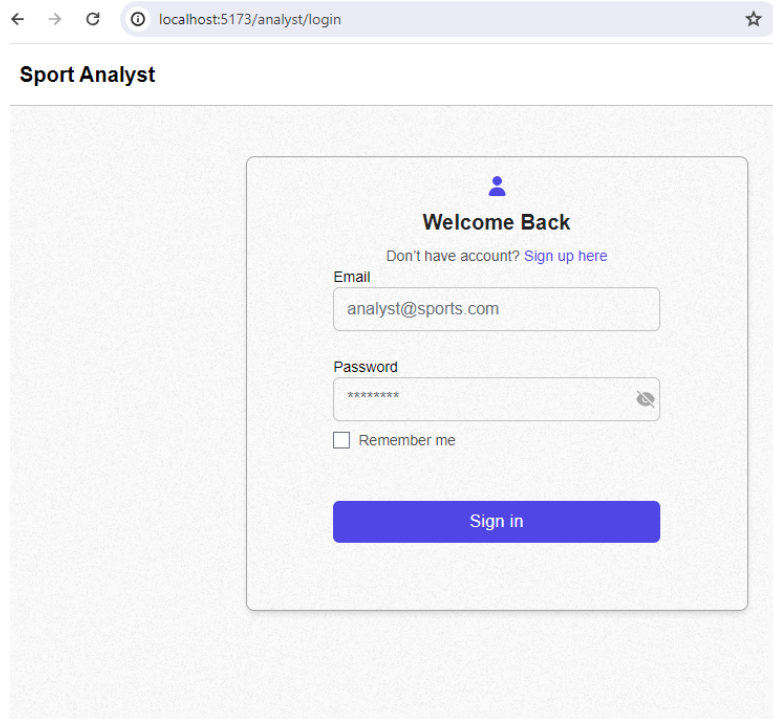
Profile Page

This is the profile page for the user which features a logout function, personal data, activity history and a contact us link for support.
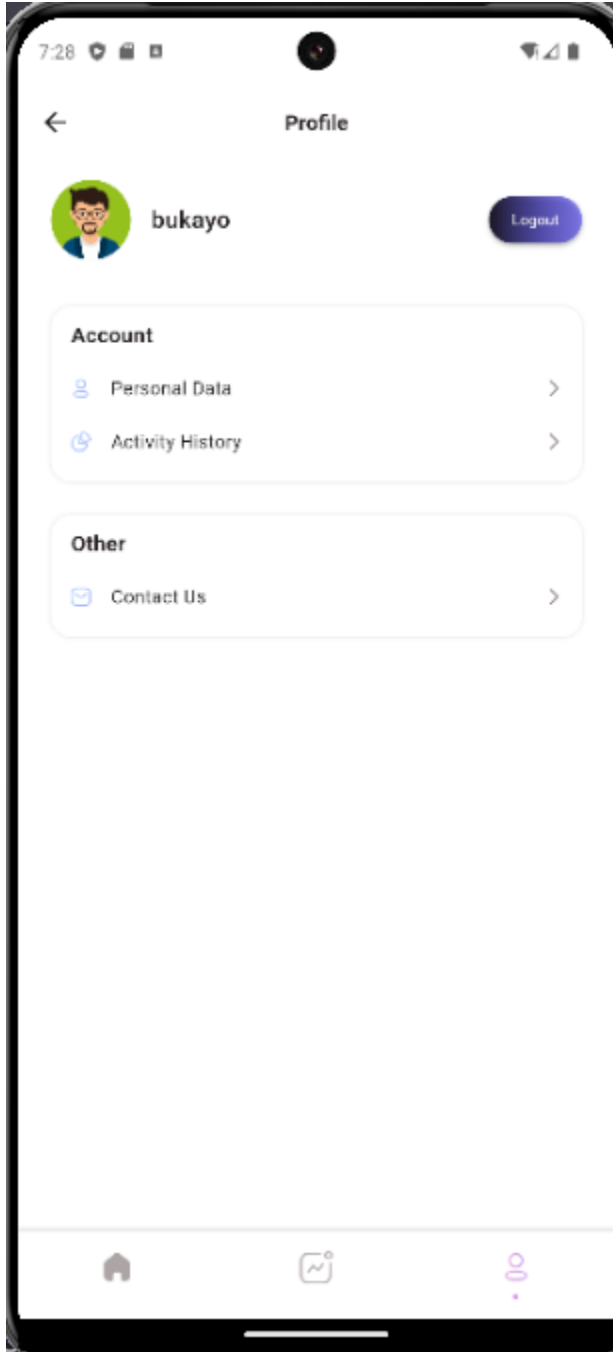
Login

This is the platform where the analysts and the coaches can log in to create, update, study and delete player stats. It holds fields for email and password, a "Remember me" checkbox, and a "Sign in" button, with an option to sign up for a new account.
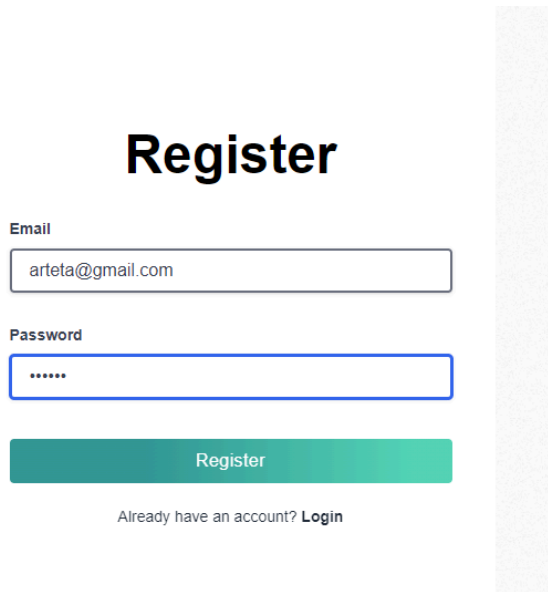
Register

This is where users who do not have an account, are able to register.

Register

Email

arteta@gmail.com

Password

••••••

Register

Already have an account? **Login**

Dashboard

This image shows the dashboard for the application, this can only be shown for coaches and analysts. It displays 3 metrics: total players, total stats and players without stats

Analyst

Dashboard

Total Players	Total Stats	Players Without Stats
4	**2**	**2**

Profile

This is the user profile section featuring editable fields for personal details including First Name, Last Name, Phone number and Email address. There is also a tab for security here a user is able to change their password.

Analyst

Profile	Security

Personal Details

First Name		Edit
Last Name		Edit
Phone Number		Edit
Email	arteta@gmail.com	Edit

Athlete List

This page lists out all the registered athletes in the organization, coaches and analysts are able to see their details and are also able to delete them off the list for whatever reason.

EMAIL	FIRST NAME	LAST NAME	PHONE NUMBER	CREATE AT
tolu1@gmail.com	Tolu	Ibiwoye	123456789	2024-04-17T11:11:38.000Z
messi@gmail.com	Lionel	Messi	0873902139	2024-04-18T11:29:24.000Z
Ronaldo@football.com	Cristiano	Ronaldo	222222222222	2024-04-18T11:33:08.000Z
saka@athlete.com	bukayo	saka	123456789	2024-04-19T18:26:47.000Z

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Analyst

ACTION

Delete

Delete

Delete

Delete

Athlete Stats

This list shows users that have been assigned stats, the data includes Heart Rate (BPM), Stamina (%), Speed (m/s), Strength (kg), and the account creation date. Two users, are shown with their respective statistics, and there's an "Add" button above the table, which allows you to add stats to a registered user.

Sports Tracker

Analyst
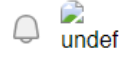
Add

USER	HEART RATE(BPM)	STAMINA(%)	SPEED(M/S)	STRENGTH(KG)	CREATE AT
3	80	70	20	80	2024-04-17T11:14:23.000Z
4	25	70	80	80	2024-04-19T19:27:34.000Z

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General Issues

Problems Encountered and Resolutions:

- I had issues integrating third-party APIs, state management in a complicated flutter application and optimising performance. These were fixed by using strategies such as; putting strong error handling in place, using state management programmes like Provider, and optimising queries and data processing to boost efficiency.
- Integrating frontend(Vite React) and backend(Node.js, Express, Sequelize,MySQL) caused me some issues initially due to variations in data formats and API endpoints. By precisely drafting API contracts and making sure both parties abided by them, this was fixed.
- Dealing with athlete statistical inputs presented particular challenges in terms of ensuring data integrity and correctly addressing failures. Error handling middleware and server-side validation were implemented to clean up inputs and give the front end useful messages.
- Authentication and authorisation: I used role-based access control(RBAC) for authorisation and JWT(JSON Web Tokens) for authentication. Now coaches and analysts can safely manage athletes' stats.

What I achieved:

The project's successful completion resulted in the creation of an extensive sports analytics application that combines game and training data in a

cross platform framework. Coaches and analysts can utilise the online applications extensive capabilities, which include real time statistical visualisation, the ability to add and manage athlete stats, and the ability to track engagement and performance indicators. It uses strong permission and authentication procedures to guarantee data security. The application makes use of Vite React, provides a user-friendly interface that makes user interactions easy and productive.

What I did not achieve

Although the sports analytics applications core crud function was successfully implemented, real time updates of athlete metrics, which would have greatly enhanced usability and offered instantaneous insights, were not completed within the project schedule. In addition, the short time period and the complex nature of AI technology prevented the achievement of more sophisticated features, such as advanced predictive analytics and video visualisation.

What I Learned

There was a significant learning curve for this project, especially when it came to grasping advanced Flutter development, interacting with RESTful APIs and exploring the subtleties of user experience design. State management strategies with tools like Redux or React Context API were combined with an enhanced understanding of frontend programming utilising Vite React, as well as a stronger awareness of backend technologies like Node.js, Express, Sequelize and MySQL. Furthermore by using techniques like JSON online Tokens (JWT) and Role-Based Access Control (RBAC), this project provided an in depth guide to the implementation of strong authentication and authorisation procedures in online applications and improved abilities in safe software development.

What would i do differently

If we could restart the project, we would prioritise major improvements like providing enough time and funding to enable real time updates of athlete metrics using technologies like WebSockets or Server-Sent Events. Additionally, a major focus would be placed on integrating automated testing as early as possible in the development cycle, using end-to-end and unit tests to guarantee the dependability of the programme. Enhancing error handling would also be a top goal in order to provide consumers more understandable feedback and enable more efficient troubleshooting. Additionally, the planning stage would be strengthened by creating an architecture that is scalable right from the start and maybe selecting a stable database system such as PostgreSQL to handle intricate queries and big datasets with ease.

Technical Issues

Differences from earlier design and research

Changes to the original design were necessary as the project progressed, especially with regard to the user interface and data format. Several UI components were redesigned to improve usability in response to user input. Furthermore we updated the data processing structures to accommodate a wider range of user statistics. Regarding security, JSON Web Tokens (JWT) have replaced the original idea of using session cookies for authentication, improving security and scalability simultaneously. This change was crucial to bolstering the applications overall security and dependability, as was further study into best practices for authentication, authorisation, and data validation.

Modules Description

The modules of the application have been carefully designed to represent all aspects of the platform's operation.

User Authentication Module

- Manage user registration and login
- Ensures security through JWT generation
- Backend and frontend aligned for access control

Data Analytics Module

- Processes and visualises data from sessions and matches

Athlete Management Module

- Backend provides CRUD operations for athlete stats
- Frontend offers forms and UI components for managing athlete data

Middleware

- Ensures data validation and handles errors

Database Integration

- Utilises sequelize models and controllers for MySQL database interactions.

Authentication UI

- Handles interface for user registration, login and authentication.

Athlete Management UI

- Enables interaction with athletes and profiles

API Integration

- Uses Axios or Fetch for backend communication

Database Structures

Database Schema

- Athletes Table: Holds details like name and age
- Stats Table: Records athlete performance metrics such as speed and strength, linked via athlete_id
- Users Table: Contains information for coaches and analysts for authentication and authorisation purposes

Local Data Storage

Utilises shared preferences to store user, session and analytics data locally, optimising data retrieval and storage efficiency.

Testing

The applications testing strategy included a wide range of methodologies, such as unit tests(jest) to evaluate specific backend functionalities like authentication and CRUD operations, integration tests(To ensure smooth interactions between frontend and backend components), and UI tests to confirm frontend usability. Frontend assessments were supported by flutters testing framework, while backend testing was made easier by tools like postman. Before deployment, extensive manual testing was done on the whole programme to find and fix any usability or operational problems.

Conclusion

In Conclusion, the applications project for sports analytics offered important insights and problems. Robust tools for managing and visualising sports data, together with complete data integration for coaches and analysts, are examples of features that have been successfully implemented. Strategic solutions, such as improved error handling, were used to overcome challenges like complicated state management in flutter and API interactions. Although time restrictions prevented us from obtaining real-time updates or sophisticated AI functions, the project greatly increased our proficiency in system architecture, safe authentication, and effective backend management.
Advanced user interface development and more efficient front-end and back-end integration were amongst the most important lessons discovered. In order to accommodate greater functionality and greater datasets, future developments would concentrate on creating a more scalable system architecture and enabling real-time data updates

Declaration

*I declare that all material in this submission e.g thesis/essay/project/assignment is entirely my/our own work except where duly acknowledged.

*I have cited the sources of all quotations, paraphrases, summaries of information, tables, diagrams or other material; including software and other electronic media in which intellectual property rights may reside.

*I have provided a complete bibliography of all works and sources used in the preparation of this submission.

*I understand that failure to comply with the Institute's regulations governing plagiarism constitutes a serious offence.

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