CS425 Final Project

Group members (Hawk ID):

1. Aung Kham Naung (A20491106)
2. Mazin Khider (A20553731)
3. Sakariye Abdi (A20507403)
4. Sreejan Shrestha (A20519569)

Introduction

Our main objective is to develop a Football Management System that would give a comprehensive database covering all aspects of football teams, players, coaches, and owners. The major purpose is to make it easier to access a variety of data, such as player performance metrics, club statistics, and financial information. By providing stakeholders with relevant information, our system strives to improve strategic planning and elevate football management standards through a data-driven approach. This program combines technology innovation and sports management in order to transform football administration and strategic formulation.

Problem Statement

The core challenge of our project is to organize and analyze a vast array of data relevant to football management. This data spans several categories, including intricate player statistics, team management complexities, and extensive financial information. The main obstacle is the effective integration and management of these different data sets. Our goal is to improve the decision-making process, enable more informed strategic planning, and improve overall

efficiency in football team administration. Taking on this challenge involves understanding complex data relationships and ensuring the usability and accessibility of the information.

Project Goals

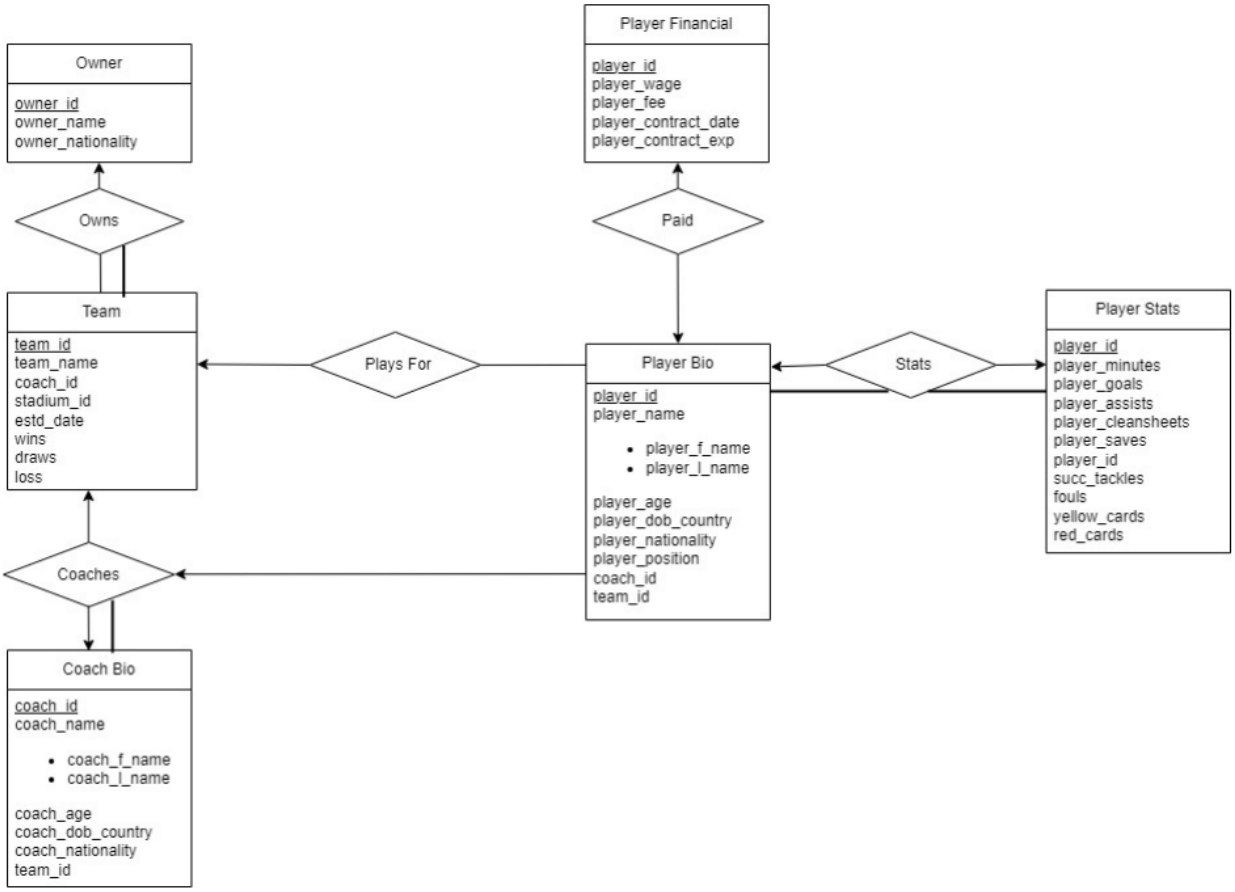
Our project's primary objective is to develop an advanced Football Management System. This system is intended to create a detailed and comprehensive database that will contain detailed information about football teams, players, coaches, and owners. Our primary goals are to simplify access to player performance measurements, team statistics, and financial records, allowing stakeholders to make informed decisions. The system is intended to encourage strategic planning and improve operational standards in football management. We hope to transform the way football teams are managed and strategies are developed and implemented by combining technological innovation with sports management principles.

Team Members and Responsibilities

Member Name	Responsibilities	Comments
Aung Kham Naung	● Python scripting	● Led the Python Scripting. ● Implemented core application logic.
Mazin Khider	● Python-PostgreSQL connection	● Worked to establish the Python-PostgreSQL connection.

	• Schema design	• Designed the schema for the project
Sakariye Abdi	• SQL DDL writing • Documentation • Video Demonstration	• Wrote the SQL DDL for the ER Diagram. • Responsible for creating the final project report. • Recorded the final video demonstration.
Sreejan Shrestha	• Python scripting • ER Diagram • Sample Data	• Assisted in Python scripting. • Drew the ER Diagram. • Created sample data.

The ER model



SQL queries to implement the ER model

```
CREATE TABLE playerBio (
    player_id VARCHAR(4) PRIMARY KEY,
    player_firstname VARCHAR(40),
    player_lastname VARCHAR(40),
    player_age int,
    player_dob_country VARCHAR(30),
    player_nationality VARCHAR(30),
```

```
    player_position VARCHAR(2),
    coach_id VARCHAR(4),
    team_id VARCHAR(4),
    FOREIGN KEY (team_id) REFERENCES team(team_id),
    FOREIGN KEY (coach_id) REFERENCES coachBio(coach_id)
)



CREATE TABLE team (
    team_id VARCHAR(4) PRIMARY KEY,
    team_name VARCHAR(30),
    coach_id VARCHAR(4),
    owner_id VARCHAR(4),
    stadium_id VARCHAR(4),
    estd_date DATE,
    wins int,
    draws int,
    loss int,
    FOREIGN KEY (owner_id) REFERENCES owner(owner_id),
    FOREIGN KEY (coach_id) REFERENCES coachBio(coach_id)
);
```

```
CREATE TABLE coachBio (
    coach_id VARCHAR(4) PRIMARY KEY,
    coach_firstname VARCHAR(40),
    coach_lastname VARCHAR(40),
    coach_age int,
    coach_dob_country VARCHAR(30),
    coach_nationality VARCHAR(30)
    team_id VARCHAR(4)
    FOREIGN KEY (team_id) REFERENCES team(team_id)
);
```

Tools used for completion and description of its use in the project

Python Programming Language:

- Role in the Project: Python was the backbone of our Football Management System. It allowed us to develop complex features with relative ease, thanks to its straightforward syntax and huge library ecosystem.
- Specific Application: Python was utilized in several aspects of our project:
    - Data Processing: Python was used to parse and analyze football statistics data, converting raw data into useful and visualized data.
    - Database Integration: We used Python to connect to our PostgreSQL database, executing SQL queries and handling data transactions.
    - Algorithm Development: Complex algorithms, such as player performance analysis and match predictions, were written in Python.

- Backend Development: Python was at the heart of our backend services, processing requests and sending processed data to the front-end.

PostgreSQL and pgAdmin4:

- Role in the Project: PostgreSQL served as our primary database, with significant data management tools, while pgAdmin4 was the interface we used for database administration.
- Specific Usage:
  - Data Storage: We used PostgreSQL to store detailed football statistics, player profiles, match histories, and user data.
  - Query Execution: To obtain and change data according to requirements by the application, complex SQL queries were developed and run in PostgreSQL.
  - Data Integrity and Security: PostgreSQL's strong integrity constraints ensure data accuracy and consistency.
  - Database Management: pgAdmin4 was extensively used for visually managing database schemas, running queries, and debugging database issues.

draw.io for ER Diagrams:

- Role in the Project: draw.io was instrumental in designing the database schema for our Football Management System.
- Specific Usage:
  - Schema Design: We used draw.io to create detailed Entity-Relationship diagrams, visually representing the structure of our database.

    - Data Relationship Mapping: It helped in illustrating how different data entities like players, teams, and matches were interlinked.

QuickTime Player:

- Role in the Project: QuickTime Player was our tool of choice for recording demonstrations of our system.
- Specific Usage:
    - Demonstration Recordings: We recorded walkthroughs of our Football Management System, showcasing its features, user interface, and interactions.

Google Documents:

- Role in the Project: Google Documents was our central platform for documentation and collaboration.
- Specific Usage:
    - Project Documentation: All project reports, meeting notes, and documentation were composed and stored in Google Docs.
    - Collaborative Editing: It enabled real-time collaboration among team members, allowing us to work together on documents

Design Approach Followed and Challenges Faced

Design Approaches:

Project Topic: The first approach was to decide what we wanted our project to be based off of. Since everyone in our group was interested in football we decided to work on a football management database system.

- Identifying Requirements: We identified the requirements set by the instructors and gave them the highest priority.
- Choosing Software: The relational database management software we chose PostgreSQL. It is a popular and powerful relational database management software, and it was recommended by our instructor as well. Python was used for the coding portion. Everyone in the group had experience in python programming that is why we chose it.
- Schema Design: In our database we created relations that users would prefer to use in a football management system. We wanted to create a system where users could access statistics and other information about their soccer player, coach or team of choice.

Challenges Faced:

- Python-PostgreSQL Connection: Our initial challenge was establishing a connection between Python and PostgreSQL. This task was daunting as it was our first experience with PostgreSQL and integrating it with a programming language. We had to navigate through learning psycopg2, a PostgreSQL adapter for Python, which involved understanding database connections, executing SQL queries, and handling transactions. Debugging and error handling also became crucial components of our learning curve.
- Data Modeling and Schema Design: Designing an efficient and scalable database schema was challenging. We had to ensure that our data model accurately reflected the complex relationships in football management, such as player statistics, team dynamics, and match histories. Balancing normalization with performance considerations was a critical aspect of this challenge.

- Scalability and Maintenance for Academic Projects: We realized how important it is to write maintainable and scalable code, even in a small-scale academic project. This included learning about code modularity, documentation, and version control using technologies like Git.

Future Scope of the Project

Database Schema Expansion: We are extending our database schema to cover a broader range of football-related statistics and information. This upgrade will provide detailed statistics on player performance across several seasons, substantial tracking of player career progressions, and a sophisticated appraisal of individual skills and traits. We're also incorporating prior data from ex-players, which will give a greater context for performance analysis. In addition, our system will include extensive information on coaches, such as their career histories and tactical preferences, as well as detailed profiles of club owners, with a focus on their investment patterns and influence on team dynamics. These enhancements are meant to give a more complete analytical framework, broadening our understanding of the football ecosystem.

Security Features: Recognizing the critical importance of data security, we want to incorporate enhanced user authentication protocols into our project. This will very certainly include installing multi-factor authentication, encrypting data in transit and at rest, and instituting role-based access limits. These protections are designed to regulate data visibility and access based on user responsibilities, so significantly boosting the security and privacy of our system's data.

Frontend-Development: We are prioritizing the development of a more user-friendly and interactive frontend, utilizing frameworks like Django or Flask. Our goal is to create a seamless and engaging user experience that includes visualization tools for data and customizable dashboards tailored to different user roles, including team managers and analysts. We are committed to designing an interface that is accessible and easy to navigate for both technical and non-technical users. By enhancing the usability and accessibility of our system, we aim to improve user engagement and make our platform more efficient and versatile for a variety of users involved in football management.

References

1. CS 425 lectures and pdfs provided online
2. Python Official Documentation: Essential for understanding Python features, syntax, and libraries.
3. PostgreSQL Documentation: Comprehensive documentation for PostgreSQL, covering installation, usage, and advanced topics.