FORMAL SPECIFICATION AND RELATIONAL MODEL

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Project Description

Soccer Glimpse is a web based application soccer fans can use to view scores, fixtures, information about competitions, teams, players, managers, and stadiums. This system is modeled after popular sports websites such as ESPN Sports. The application's database will be populated using the football-data RESTful API; an open source that serves football (Soccer) data and makes it easy-to-use for free. As a result, the users of Soccer Glimpse will only be able to access information about certain competitions that are available in the football-data API. The system will allow the website administrator to add, modify and delete data from the database. Additionally, the user will be able to search information based on distinct filters as well as to keep up to date with the latest scores and upcoming fixtures.

Functions

Administrator Use Cases

UC1- Add new competition

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects "update data"
4. Output: The system displays base table names and "insert", "delete", "modify" options.
5. Input: Administrator selects the "competition" table and the "insert" option.
6. Output: System prompts administrator to enter information in each of the competition table fields.
7. Output: System displays "Table will be updated, click yes to continue".
8. Input: Administrator clicks on "yes" option.
9. Output: The system checks to verify that the entered information does not already exist in the system.
10. If the data is not a duplicate the new competition is added to the system and is displayed including the generated ID field.

UC2- Add new team

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects "update data"
4. Output: The system displays base table names and "insert", "delete", "modify" options.
5. Input: Administrator selects the "team" table and the "insert" option.
6. Output: System prompts administrator to enter information in each of the team table fields.
7. Output: System displays "Table will be updated, click yes to continue".
8. Input: Administrator clicks on "yes" option.pla
9. Output: The system checks to verify that the entered information does not already exist in the system.

10. If the data is not a duplicate the new team is added to the system and is displayed including the generated ID field.

UC3- Add new player

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the “player” table and the “insert” option.
6. Output: System prompts administrator to enter information in each of the player table fields.
7. Output: System displays “Table will be updated, click yes to continue”.
8. Input: Administrator clicks on “yes” option.
9. Output: The system checks to verify that the entered information does not already exist in the system.
10. If the data is not a duplicate the new player is added to the system and is displayed including the generated ID field.

UC4-Add new league_table entry

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the “league_table” table and the “insert” option.
6. Output: System outputs “Please enter the name of competition you would like to create league table for.”
7. Input: Administrator enters the name of the competition.
8. Output: The system verifies that there is not an existing league_table entry for the entered competition.
9. Output: System prompts administrator to enter information in each of the league_table fields.
10. Output: System displays “Table will be updated, click yes to continue”.
11. Input: Administrator clicks on “yes” option.
12. Output: New league_table is added to the system and is displayed including the generated ID field.

UC5- Add new fixture

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the “fixture” table and the “insert” option.
6. Output: System prompts administrator to enter information in each of the fixture table fields.
7. Output: System displays “Table will be updated, click yes to continue”.

8. Input: Administrator clicks on “yes” option.
9. Output: The system checks to verify that the entered information does not already exist in the system.
10. If the data is not a duplicate the new fixture is added to the system and is displayed including the generated ID field.

UC6- Add new stadium

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the “stadium” table and the “insert” option.
6. Output: System prompts administrator to enter information in each of the stadium table fields.
7. Output: System displays “Table will be updated, click yes to continue”.
8. Input: Administrator clicks on “yes” option.
9. Output: The system checks to verify that the entered information does not already exist in the system.
10. Output: If the data is not a duplicate the new stadium is added to the system and is displayed including the generated ID field.

UC7- Add new manager

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the “manager” table and the “insert” option.
6. Output: System prompts administrator to enter information in each of the manager table fields.
7. Output: System displays “Table will be updated, click yes to continue”.
8. Input: Administrator clicks on “yes” option.
9. Output: The system checks to verify that the entered information does not already exist in the system.
10. Output: If the data is not a duplicate the new manager is added to the system and is displayed including the generated ID field.

UC8- Modify competition

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the competition table and the “modify” option.
6. Output: System displays selected table and a search field.
7. Input: The administrator may search for the record to be modified by name or ID number or select it from the table.

8. Output: The record is displayed and the fields become editable.
9. Input: The user modifies the desired fields of the record.
10. Output: System displays “Table will be updated, click yes to continue”.
11. Input: Administrator clicks on “yes” option.
12. Output: The system verifies that the modification does not make the record a duplicate.
13. Output: If the data is not a duplicate the record is updated in the system and is displayed.

UC9- Modify team

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the team table and the “modify” option.
6. Output: System displays selected table and a search field.
7. Input: The administrator may search for the record to be modified by name or ID number or select it from the table.
8. Output: The record is displayed and the fields become editable.
9. Input: The user modifies the desired fields of the record.
10. Output: System displays “Table will be updated, click yes to continue”.
11. Input: Administrator clicks on “yes” option.
12. Output: The system verifies that the modification does not make the record a duplicate.
13. Output: If the data is not a duplicate the record is updated in the system and is displayed.

UC10- Modify player

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the player table and the “modify” option.
6. Output: System displays selected table and a search field.
7. Input: The administrator may search for the record to be modified by name or ID number or select it from the table.
8. Output: The record is displayed and the fields become editable.
9. Input: The user modifies the desired fields of the record.
10. Output: System displays “Table will be updated, click yes to continue”.
11. Input: Administrator clicks on “yes” option.
12. Output: The system verifies that the modification does not make the record a duplicate.

13. Output: If the data is not a duplicate the record is updated in the system and is displayed.

UC11- Modify league_table

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the league_table table and the “modify” option.
6. Output: System displays selected table and a search field.
7. Input: The administrator may search for the record to be modified by name or ID number or select it from the table.
8. Output: The record is displayed and the fields become editable.
9. Input: The user modifies the desired fields of the record.
10. Output: System displays “Table will be updated, click yes to continue”.
11. Input: Administrator clicks on “yes” option.
12. Output: The system verifies that the modification does not make the record a duplicate.
13. Output: If the data is not a duplicate the record is updated in the system and is displayed.

UC12- Modify fixture

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the fixture table and the “modify” option.
6. Output: System displays selected table and a search field.
7. Input: The administrator may search for the record to be modified by name or ID number or select it from the table.
8. Output: The record is displayed and the fields become editable.
9. Input: The user modifies the desired fields of the record.
10. Output: System displays “Table will be updated, click yes to continue”.
11. Input: Administrator clicks on “yes” option.
12. Output: The system verifies that the modification does not make the record a duplicate.
13. Output: If the data is not a duplicate the record is updated in the system and is displayed.

UC13- Modify stadium 1. Input: The administrator logs in the system. 2. Output: The menu options are displayed. 3. Input: Administrator selects “update data” 4. Output: The system displays base table names and “insert”, “delete”, “modify” options. 5. Input: Administrator selects the stadium table and the “modify” option. 6. Output: System displays selected table and a search field. 7. Input: The administrator may search for the record to be modified by name or ID number or select it from the table. 8. Output: The record is displayed and the fields become editable. 9. Input: The user modifies the desired fields of the record. 10. Output: System displays “Table will be updated, click yes to continue”. 11. Input: Administrator clicks on “yes” option. 12. Output: The system verifies that the modification does not make the record a duplicate. 13. Output: If the data is not a duplicate the record is updated in the system and is displayed.
UC14- Modify manager 1. Input: The administrator logs in the system. 2. Output: The menu options are displayed. 3. Input: Administrator selects “update data” 4. Output: The system displays base table names and “insert”, “delete”, “modify” options. 5. Input: Administrator selects the manager table and the “modify” option. 6. Output: System displays selected table and a search field. 7. Input: The administrator may search for the record to be modified by name or ID number or select it from the table. 8. Output: The record is displayed and the fields become editable. 9. Input: The user modifies the desired fields of the record. 10. Output: System displays “Table will be updated, click yes to continue”. 11. Input: Administrator clicks on “yes” option. 12. Output: The system verifies that the modification does not make the record a duplicate. 13. Output: If the data is not a duplicate the record is updated in the system and is displayed.
UC15- Delete competition entry 1. Input: The administrator logs in the system. 2. Output: The menu options are displayed. 3. Input: Administrator selects “update data” 4. Output: The system displays base table names and “insert”, “delete”, “modify” options.

5. Input: Administrator selects the name of the competition table and the “delete” option.
6. Output: System displays the competition table and a search field.
7. Input: The administrator may search for the record to be deleted by name or ID number or select it from the table.
8. Input: The user clicks on “delete” button.
9. Output: System displays “Table will be updated, click yes to continue”.
10. Input: Administrator clicks on “yes” option.
11. Output: Record is deleted from the system and the updated table is displayed.

UC16- Delete team entry

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the team and the “delete” option.
6. Output: System displays the team table and a search field.
7. Input: The administrator may search for the record to be deleted by name or ID number or select it from the table.
8. Input: The user clicks on “delete” button.
9. Output: System displays “Table will be updated, click yes to continue”.
10. Input: Administrator clicks on “yes” option.
11. Output: Record is deleted from the system and the updated table is displayed.

UC17- Delete player entry

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the player table and the “delete” option.
6. Output: System displays player table and a search field.
7. Input: The administrator may search for the record to be deleted by name or ID number or select it from the table.
8. Input: The user clicks on “delete” button.
9. Output: System displays “Table will be updated, click yes to continue”.
10. Input: Administrator clicks on “yes” option.
11. Output: Record is deleted from the system and the updated table is displayed.

UC18- Delete league_table entry

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the name of the league_table table and the “delete” option.

6. Output: System displays the league_table table and a search field.
7. Input: The administrator may search for the record to be deleted by name or ID number or select it from the table.
8. Input: The user clicks on “delete” button.
9. Output: System displays “Table will be updated, click yes to continue”.
10. Input: Administrator clicks on “yes” option.
11. Output: Record is deleted from the system and the updated table is displayed.

UC19- Delete fixture entry

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the name of the fixture table and the “delete” option.
6. Output: System displays fixture table and a search field.
7. Input: The administrator may search for the record to be deleted by name or ID number or select it from the table.
8. Input: The user clicks on “delete” button.
9. Output: System displays “Table will be updated, click yes to continue”.
10. Input: Administrator clicks on “yes” option.
11. Output: Record is deleted from the system and the updated table is displayed.

UC20- Delete stadium entry

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the stadium table and the “delete” option.
6. Output: System displays stadium table and a search field.
7. Input: The administrator may search for the record to be deleted by name or ID number or select it from the table.
8. Input: The user clicks on “delete” button.
9. Output: System displays “Table will be updated, click yes to continue”.
10. Input: Administrator clicks on “yes” option.
11. Output: Record is deleted from the system and the updated table is displayed.

UC21- Delete manager entry

1. Input: The administrator logs in the system.
2. Output: The menu options are displayed.
3. Input: Administrator selects “update data”
4. Output: The system displays base table names and “insert”, “delete”, “modify” options.
5. Input: Administrator selects the manager table and the “delete” option.
6. Output: System displays manager table and a search field.
7. Input: The administrator may search for the record to be deleted by name or ID number or select it from the table.

8. Input: The user clicks on “delete” button.
9. Output: System displays “Table will be updated, click yes to continue”.
10. Input: Administrator clicks on “yes” option.
11. Output: Record is deleted from the system and the updated table is displayed.

Customer Use Cases

UC1- Search for competition by name

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: The user clicks on the search box and types in the desired competition name.
4. Output: If the competition exists in the system, then the options for the competition are displayed.
5. Input: The user selects the menu option of what they want to view about the competition. (eg. Fixtures)
6. Output: The system displays the requested information.

UC2- Search for team by name

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: The user clicks on the search box and types in the desired team name.
4. Output: If the team exists in the system, then the options for the team are displayed.
5. Input: The user selects the menu option of what they want to view about the completion. (eg. players)
6. Output: The system displays the requested information.

UC3- Search for player by name

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: The user clicks on the search box and types in the desired player name.
4. Output: If the player exists in the system, then the options for the player’s team are displayed along with a tab for player info.
5. Input: The user selects the menu option of what they want to view about the player. (eg. General Info)
6. Output: The system displays the requested information.

UC6- Search for stadium by name

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: The user clicks on the search box and types in the desired stadium name.
4. Output: If the stadium exists in the system, then the general information about the stadium is displayed

UC7- Search for manager by name

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: The user clicks on the search box and types in the desired manager name.

4. Output: If the player exists in the system, then the options for the manager's team are displayed along with a tab for manager info.
5. Input: The user selects the menu option of what they want to view about the manager. (eg. General Info)
6. Output: The system displays the requested information.

UC8- View standings of a competition

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User selects the "competition" tab.
4. Output: System shows the league table for the competition, which contains the rank of each team.

UC9- View teams in a competition

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User searches or selects competition from menu.
4. Output: Competitions are displayed.
5. Input: The user selects the desired competition and the "teams" option.
6. Output: The system displays the list of teams participating in the competition.

UC10 –View basic stats of a competition

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User searches or selects competition from menu.
4. Output: The menu options of the competition are displayed.
5. Input: The user selects the "Statistics" option.
6. Output: The system displays the most home goals, most away goals, most wins and most losses.

UC11- View fixtures by competition

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User searches or selects competition from menu.
4. Output: The menu options for the competition are displayed.
5. Input: The user selects the "fixtures & scores" option.
6. Output: The system displays the upcoming matches and results for the competition.

UC12- View fixtures by week

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User clicks on "fixtures & scores"
4. Input: The user clicks on the week he wants to view the matches or scores for.
5. Output: The system displays the matches and results across competitions for the selected week.

UC13- View Scores across competitions

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User selects the "fixtures & scores" tab.

4. Output: Shows scores in order from most recent to less recent.

UC14- View fixtures of a team

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User searches or selects team from menu.
4. Output: The menu options for the team are displayed.
5. Input: The user selects the “fixtures & scores” option.
6. Output: The system display upcoming matches of the team as well as results of the finished matches.

UC15- View youngest manager and largest capacity of stadiums

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User selects basic stats
4. Output: The system displays youngest manager and largest stadium contained in the database.

UC16- View players of a team

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User searches or selects team from menu.
4. Output: The menu options for the team are displayed.
5. Input: User selects the “squad” option.
6. Output: The list of players belonging to the team is displayed.

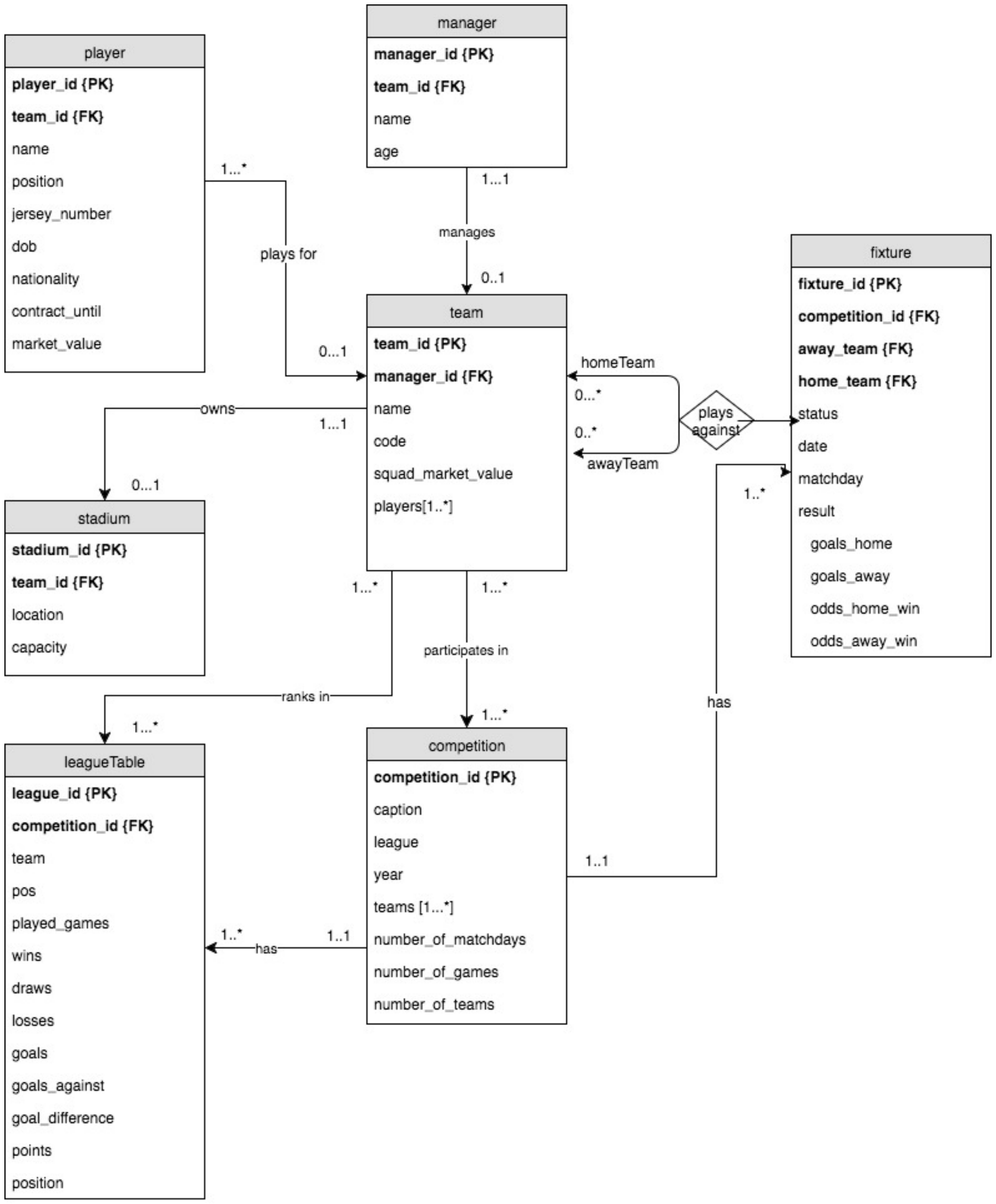
UC17- View team’s standings in competitions

1. Input: User accesses the system.
2. Output: The homepage is displayed along with the menu tabs.
3. Input: User searches or selects team from menu.
4. Output: The menu options for the team are displayed.
5. Input: User selects the “Standings” option.
6. Output: The rank of the team within the competition(s) it is currently participating in is displayed.

UC18 –View basic stats of a team

5. Input: User accesses the system.
6. Output: The homepage is displayed along with the menu tabs.
7. Input: User searches or selects team from menu.
8. Output: The menu options of the team are displayed.
9. Input: The user selects the “Statistics” option.
10. Output: The system displays average player market_values, youngest player, number of wins, losses and draws.

Entity Relationship Diagram



Relational Model

The Competition Relation

Each tuple in the competition relation will represent each competition in the Soccer Glimpse system. A tuple of the competition relation will contain the following attributes: name, year, number_of_games, number_of_teams, and an id which is automatically generated by the database system.

Key constrains

The competition_id attribute is the primary key of the competition relation. The name attribute is a candidate key since each competition has a unique name.

Referential integrity constrains:

There are no foreign key fields in this relation.

Null constrains:

The id, name, year, number_of_games, number_of_teams in the Competition relation cannot be Null.

Attribute	**Domain**
ID	serial primary key
name	text not null
year	integer not null
number_of_games	integer not null
number_of_teams	integer not null

The Team Relation

Each tuple in the team relation will represent each team. A tuple of the team relation will contain the following attributes: a team_id, manager_id, name, code, squad_market_value. The team_id will be generated automatically by the database system.

Key constrains

The team_id attribute is the primary key of the team relation.

Referential integrity constrains:

The manager_id attribute in team relation takes values from the manager_id attribute in the manager relation.

Null constrains:

The team_id, manageID, name, code attributes in the team relation cannot be Null. The only attribute on the team relation which may contain a Null value is the attribute denoting the squad_market_value.

Attribute	**Domain**
ID	serial primary key
manager_id	references Manager(id) not null
name	text not null
code	text
squad_market_value	numeric

The Player Relation

Each tuple in the player relation will represent each player. A tuple of the player relation will contain the following attributes: a player_id, team_id, name, position, jersey_number, dob, nationality, contracUnit, market_value. The player_id will be generated automatically by the database system.

Key constrains

The player_id attribute is the primary key of the player relation.

Referential integrity constrains:

The team_id attribute in player relation takes values from the team_id attribute in the team relation.

Null constrains:

The player_id, team_id, and name attributes in the player relation cannot be Null. The only attributes on the team relation which may contain a Null values are the attributes denoting the position, dob, nationality, contract_until and market_value.

Attribute	**Domain**
ID	serial primary key
team_id	references Team(id) not null
name	text not null
position	text
jersey_number	integer

dob	date
nationality	text
contract_until	date
market_value	numeric

The Fixture Relation

Each tuple in the fixture relation will represent each fixture in the Soccer Glimpse system. A tuple of the fixture relation will contain the following attributes: competition_id, away_team, home_team, result, status, date, matchday, and an id which is automatically generated by the database system.

Key constrains

The fixture_id attribute is the primary key of the fixture relation.

Referential integrity constrains:

The competiton, away_team, home_team and result take values from the competition, team and result relation respectively.

Null constrains:

The fixture_id, competition_id, away_team, home_team, and status in the fixture relation cannot be Null.

Attribute	**Domain**
ID	serial primary key
competition_id	references Competition(id) not null
home_team	references Team(id) not null
away_team	references Team(id) not null
result	references Result(id)
status	boolean not null
date	date
machday	integer not null

The Result Relation
Each tuple in the result relation will represent each result in the Soccer Glimpse system. A tuple of the result relation will contain the following attributes: fixture_id, goals_home, goals_away, odds_away_win, odds_home_win and an id which is automatically generated by the database system.

Key constrains
The ID attribute is the primary key of the fixture relation.

Referential integrity constrains:
The fixture_id will take values from the Fixture relation.

Null constrains:
The ID and fixture_id may in the Result relation cannot be Null.

Attribute	**Domain**
ID	serial primary key
fixture_id	references Fixture(id) not null
goals_home	references Competition(id) not null
goals_away	references Team(id) not null
odds_away_win	references Team(id) not null
odds_home_win	references Result(id)

The League_table Relation
Each tuple in the league_table relation will represent each league table entry in the database system. Each competition will have a distinct view of the league table, which only includes the entries belonging to the selected competition. The competitions that will have this version of the league table are: Premier League, Serie A, Primera Division, and Bundesliga. A tuple of the league_table relation will contain the following attributes: a league_id, competition, position, games_played, team, wins, draws, losses, goals, goals_against, goal_difference and points. The ID will be automatically generated by the database system.

Key constrains
The ID attribute is the primary key of the league_table relation.

Referential integrity constrains:
The competition_id attribute in league_table relation takes values from the competition_id attribute in the competition relation.
Null constrains:

None of the attributes in the league_table relation may be null, all the fields must contain information regarding each team in the competition.

Attribute	**Domain**
ID	serial primary key
competition_id	references Competition(id) not null
position	integer not null
games_played	integer not null
team_id	references Team(id) not null
wins	integer not null
draws	integer not null
losses	integer not null
goals	integer not null
goals_against	integer not null
goal_difference	integer not null
points	integer not null

The Champions League_table Relation

Each tuple in the Champions league_table relation will represent the league table entries belonging the Champions League competition. The league table of this competition has a different set of fields, since participating teams are divided into groups. A tuple of the Champions league_table relation will contain the following attributes: a league_id, competition, group, position, team, games_played, goals, goals_against, goal_difference and points. The ID will be automatically generated by the database system.

Key constrains

The ID attribute is the primary key of the Champions league_table relation.

Referential integrity constrains:

The competition attribute in the Champions league_table relation takes values from the competition_id attribute in the competition relation.

Null constrains:
None of the attributes in the Champions league_table relation may be null, all the fields must contain information regarding each team in the competition.

Attribute	**Domain**
ID	serial primary key
competition_id	references Competition(id) not null
position	integer not null
group	ENUM ('A', 'B', 'C', 'D', 'E', 'F', 'G', 'H')
games_played	integer not null
team_id	references Team(id) not null
goals	integer not null
goals_against	integer not null
goal_difference	integer not null
points	integer not null

The Manager Relation
Each tuple in the Manager relation will represent the manager of a soccer team. A tuple of the Manager relation will contain the following attributes: a manager_id, team, name, and age. The ID will be automatically generated by the database system.

Key constrains
The ID attribute is the primary key of the Manager relation.

Referential integrity constrains:
The team attribute takes values from the team_id in the Team Relation.

Null constrains:
The ID, name and team cannot be null in the Manager relation.

Attribute	**Domain**
ID	serial primary key

team_id	references Team(id) not null
name	text not null
age	integer

The Stadium Relation

Each tuple in the Stadium relation will represent the stadium that belongs to a soccer team. A tuple of the Stadium relation will contain the following attributes: a stadium_id, team, name, location and capacity. The ID will be automatically generated by the database system.

Key constrains

The ID attribute is the primary key of the Stadium relation.

Referential integrity constrains:

The team attribute takes values from the team_id in the Team Relation.

Null constrains:

The ID, name and team cannot be null in the Stadium relation.

Attribute	**Domain**
ID	serial primary key
team_id	references Team(id) not null
name	text not null
location	text
Capacity	integer

The Competition_Team Relation

This relation is meant to associate a competition with all teams participating in it. Some of the teams in the database system may participate in more than one competition. It contains pairs of competition_id and team_id attributes.

Key constrains

Both the competition_id and the team_id attribute are primary keys in their native tables. Therefore, each tuple is uniquely identifiable using a combination of these two attributes.

Referential integrity constrains
The team_id attribute in the Competition_Team relation takes values from the id attribute in the Team relation. The competition_id attribute takes values from the id in the competition relation.

Null constraints
None of the values in the Competition_Team relation can be null.

Attribute	**Domain**
competition_id	references Competition(id)
team_id	References Team(id)

The League_table_Team Relation
This relation is meant to associate league_table tuples with teams. Some of the teams in the database system may participate in more than one competition, therefore they may be present in more than one league_table. It contains pairs of league_id and team_id attributes.

Key constrains
Both the league_id and the team_id attributes are primary keys in their native tables. Therefore, each tuple is uniquely identifiable using a combination of these two attributes.

Referential integrity constrains
The team_id attribute in the League_table_Team relation takes values from the id attribute in the Team relation. The league_id attribute takes values from the id in the competition relation.

Null constraints
None of the values in the League_table_Team relation can be null.

Attribute	**Domain**
league_id	references League_table(id)
team_id	References Team(id)

The Fixture_Team Relation
This relation is meant to associate teams participating in a match and the corresponding fixture. A tuple of the Fixture_Team relation contains home_team, away_team, and fixture_id.

Key constrains
The home_team, away_team, and the fixture_id attributes take values from primary keys in their native tables. Therefore, each tuple is uniquely identifiable using a combination of these three attributes.

Referential integrity constrains

The home_team, away_team and Fixture_Team attributes take values from the id attribute in the Team relation and Fixture relation respectively.

Null constraints

None of the values in the Fixture_Team relation can be null.

Attribute	**Domain**
home_team	references Team(id)
away_team	references Team(id)
fixture_id	references Fixture(id)

Database Functionalities

Add new competition

The administrator may add a new competition to the database system. This functionality is performed by inserting the corresponding data into each attribute of the Competition relation. The new row including an automatically generated ID is only created if it did not previously exist in the system.

```
INSERT INTO competition(caption, league, year, teams, number_of_matches,
number_of_games, number_of_teams)
VALUES ('','','','','','','');
```

Add new team

The administrator may add a new team to the database system. This functionality is performed by inserting the corresponding data into each attribute of the Team relation. The new row including an automatically generated ID is only created if it did not previously exist in the system.

```
INSERT INTO team(manager_id, name, code, squad_market_value, players)
VALUES ((SELECT manager_id FROM manager m WHERE
m.manager_id=manager_id),'','','','');
```

Add new player

The administrator may add a new player to the database system. This functionality is performed by inserting the corresponding data into each attribute of the Player relation. The new row including an automatically generated ID is only created if it did not previously exist in the system.

```
INSERT INTO player(team_id, name, position, jersey_number, dob, nationality,
contract_until, market_value)
```

```
VALUES ((SELECT team_id FROM team t WHERE
t.team_id=team_id),'','','','','','','');
```

Add new league_table entry

The administrator may add a new league_table entry to the database system. This functionality is performed by inserting the corresponding data into each attribute of the league_table relation. The new row including an automatically generated ID is only created if it did not previously exist in the system.

```
INSERT INTO league_table(competition_id, team, pos, played_games, wins, draws,
losses, goals, goals_aggainst, goal_difference, points, position)
VALUES ((SELECT competition_id FROM competition c WHERE
c.competition_id=competition_id),'','','','','','','','','','','','');
```

Add new fixture

The administrator may add a new fixture to the database system. This functionality is performed by inserting the corresponding data into each attribute of the fixture relation. The new row including an automatically generated ID is only created if it did not previously exist in the system.

```
INSERT INTO fixture(competition_id, status, date, matchday, results, goals_home,
goals_away, odds_home_win, odds_away_win)
VALUES ((SELECT competition_id FROM competition c WHERE
c.competition_id=competition_id),'','','','','','','','');
```

Add new Stadium

The administrator may add a new stadium to the database system. This functionality is performed by inserting the corresponding data into each attribute of the Stadium relation. The new row including an automatically generated ID is only created if it did not previously exist in the system.

```
INSERT INTO stadium(team_id, location, capacity)
VALUES
((SELECT team_id FROM team t WHERE t.team_id=team_id), '','');
```

Add new Manager

The administrator may add a new manager to the database system. This functionality is performed by adding the corresponding data into each attribute of the Manager relation. The new row including an automatically generated ID is only created if it did not previously exist in the system.

```
INSERT INTO manager(team_id, name, age)
VALUES
((SELECT team_id FROM team t WHERE t.team_id=team_id), '','');
```

Modify competition

The administrator may change a competition's information. This functionality is performed by selecting the row to be updated by competition caption. Then the attributes of the Competition relation are updated with the new inputted values.

```
UPDATE competition
SET caption = 'newname' WHERE caption='oldname';
```

Modify team

The administrator may change a team's information. This functionality is performed by selecting the row to be updated by team name. Then the attributes of the Team relation are updated with the new inputted values.

```
UPDATE team
SET name = 'newname' WHERE name='oldname';
```

Modify player

The administrator may change a player's information. This functionality is performed by selecting the row to be updated by player name. Then the attributes of the Player relation are updated with the new inputted values.

```
UPDATE player
SET name = 'newname' WHERE name='oldname';
```

Modify league_table

The administrator may change a league table's information. This functionality is performed by selecting the row to be updated by team and position. Then the attributes of the league_table relation are updated with the new inputted values.

```
UPDATE league_table
SET (team, pos) = (team='newteam',pos='newpos' WHERE competition_id='0943';
```

Modify fixture

The administrator may change a fixture's information. This functionality is performed by selecting the row to be updated by status and date. Then the attributes of the Fixture relation are updated with the new inputted values.

```
UPDATE fixture
SET (status, date) = (status='newstatus', date='newdate') WHERE
competition_id='0944';
```

Modify stadium

The administrator may change a stadium's information. This functionality is performed by selecting the row to be updated by stadium location. Then the attributes of the Stadium relation are updated with the new inputted values.

```
UPDATE stadium
```

```
SET location = 'newlocation' WHERE location='oldlocation';
```

Modify manager

The administrator may change a manager's information. This functionality is performed by selecting the row to be updated by manager name. Then the attributes of the Manager relation are updated with the new inputted values.

```
UPDATE manager
SET name = 'newname' WHERE name='oldname';
```

Delete competition

The administrator may delete a competition from the system. This functionality is performed by selecting the competition to be deleted by name. The selected competition and its league table and fixtures will be deleted from the system.

```
DELETE FROM competition WHERE year = 'selectedyear';
```

Delete player

The administrator may delete a player from the system. This functionality is performed by selecting the player to be deleted by name. The selected player will be deleted from the system.

```
DELETE FROM player WHERE name = 'selectedname';
```

Delete fixture

The administrator may delete a fixture from the system. This functionality is performed by selecting the home team, away team and competition names of the fixture. The selected fixture will be deleted from the system.

```
DELETE FROM fixture WHERE status = 'selectedstatus';
```

Delete stadium

The administrator may delete a stadium from the system. This functionality is performed by selecting the stadium to be deleted by name. The selected stadium will be deleted from the system.

```
DELETE FROM stadium WHERE capacity = 'selectedcapacity';
```

Delete manager

The administrator may delete a manager from the system. This functionality is performed by selecting the manager to be deleted by name. The selected manager will be deleted from the system.

```
DELETE FROM manager WHERE name = 'selectedname';
```

Search for competition by name

The user may search for a competition by name. This functionality is performed by selecting the competition by name. The system displays basic information about the selected competition.

```
SELECT *
FROM competition
WHERE LOWER(competition.caption) ~ LOWER(competition_name);
```

Search for team by name

The user may search for a team by name. This functionality is performed by selecting the team by name and joining the team and manager table. The system displays basic information about the selected team, including the name of the manager.

```
SELECT team.name,
       team.code,
       team.squad_market_value,
             manager.name AS manager
FROM team
JOIN manager ON manager.id = team.manager_id
WHERE LOWER(team.name) ~ LOWER(name);
```

Search for player by name

The user may search for a player by name. This functionality is performed by selecting the player by name. The system displays basic information about the selected player including their age which is a derived attribute.

```
SELECT *
FROM player1
WHERE LOWER(player1.name) ~ LOWER(player_name);
```

Search for stadium by name

The user may search for a stadium by name. The stadium will be selected by name and will be joined with the team table. The system displays information about the selected stadium including the home team name.

```
SELECT   stadium.name,
         stadium.capacity,
         stadium.location,
         team.name
FROM stadium
JOIN team ON team.id = stadium.team_id
WHERE LOWER(stadium.name) ~ LOWER(stadium_name);
```

Search for manager by name

The user may search for a manager by name. The manager will be selected by name and will be joined with the team table. The system displays information about the selected manager including the name of the team he manages.

```
SELECT   manager.name,
         manager.dob,
         team.name
FROM manager
JOIN team ON team.id = manager.team_id
WHERE LOWER(manager.name) ~ LOWER(name);
```

View standings of a competition

The user may view the league table of a competition. The league table will be a view created for the selected competition. The league_table, competition and team base tables will be joined.

```
CREATE OR REPLACE VIEW league_table1 AS
SELECT   league_table.id,
         competition.caption AS competition,
         team.name AS team,
         league_table.played_games,
         league_table.wins,
         league_table.draws,
         league_table.losses,
         league_table.goals,
         league_table.goals_against,
         league_table.goal_difference,
         league_table.points,
         league.table.position
FROM league_table
JOIN league_table_team ON league_table_team.league_id = league_table.id
JOIN team ON team.id = league_table_team.team_id
JOIN competition ON competiton.id = league_table.competition_id;
```

```
SELECT   *
FROM league_table1
WHERE league_table1.competition = competition_name;
```

View teams in a competition

The user may view the teams participating in a competition. The team and the competition base tables will be joined. The system will display the basic information of the teams participating in the selected competition.

```
SELECT   team.id,
         team.name,
         team.code,
         team.squad_market_value,
         competition.caption AS competition
FROM team
JOIN competition_team ON competition_team.team_id = team.id
JOIN competition ON competition.id = competition_team.competition_id
WHERE competition.caption = competition_name;
```

View basic stats of a competition

The user may view basic stats of a competition. The attributes of this table will be derived from attributes contained in base tables. This table will show **Most Home Goals, Most Away Goals, Most Wins and Most Losses and Average squad market value**.

Most Home Goals

This function calculates the maximum amount of home goals within a competition. This is performed by using the max () aggregate function on the homeGoals attribute of the league table. The system displays the name of the team with the most goals.

```
SELECT name, MAX(home_goals)
FROM league_table1
WHERE league_table1.home_goals = (SELECT MAX(home_goals) FROM league_table1)
      AND league_table1.competition = competition_name;
```

Most Away Goals

This function calculates the maximum amount of away goals within a competition. This is performed by using the max () aggregate function on the awayGoals attribute of the league table. The system displays the name of the team with the most away goals.

```
SELECT name, MAX(away_goals)
FROM league_table1
WHERE league_table1.away_goals = (SELECT MAX(away_goals) FROM league_table1)
      AND league_table1.competition = competition_name;
```

Most Wins

This function calculates the maximum amount of wins within a competition. This is performed by using the max () aggregate function on the Wins attribute of the league table. The system displays the name of the team with the most wins.

```
SELECT name, MAX(wins)
FROM league_table1
WHERE league_table1.wins = (SELECT MAX(wins) FROM league_table1)
      AND league_table1.competition = competition_name;
```

Most Losses

This function calculates the maximum amount of losses within a competition. This is performed by using the max () aggregate function on the Losses attribute of the league table. The system displays the name of the team with the most losses.

```
SELECT name, MAX(losses)
FROM league_table1
WHERE league_table1.losses = (SELECT MAX(losses) FROM league_table1)
      AND league_table1.competition = competition_name;
```

View average squad market value

This function calculates the average squad market value of the teams within a competition. This is performed by calculating the avg () aggregate function on the squad_market_value attribute of the team table.

```
SELECT AVG(squad_market_value)
FROM team
WHERE competiton.name = name;
```

View fixtures by competition

The user may view the fixtures and results of the teams participating in a competition. The fixtures are selected by competition name. This functionality is performed by joining the competition, teams and fixtures tables (which is done in a view). The upcoming fixtures and results for the selected competition will be displayed.

```
SELECT *
FROM fixture1
WHERE fixture1.competition = competition_name;
```

View fixtures by week

The user may view fixtures and results of teams by week across competitions. The fixtures are selected by date. This functionality is performed by joining the teams and fixtures tables (which is done in a view). The upcoming fixtures and results for the selected week are displayed.

```
SELECT *
FROM fixture1
WHERE fixture1.date = date;
```

View Scores across competitions

The user may view the past scores contained in the database system in order from most recent to less recent. This is performed displaying ordering by date in descending order. The results of finished matches will be displayed with the most recent first.

```
CREATE OR REPLACE VIEW fixture1 AS
SELECT fixture.id,
      competition.caption AS competition,
      (SELECT name FROM team WHERE team.id = fixture_team.home_team) AS home
      (SELECT name FROM team WHERE team.id = fixture_team.away_team) AS away
      fixture.status AS status,
      fixture.date AS date,
      fixture.matchday,
      result.goals_home,
      result.goals_away,
      result.odds_home_win,
      result.odds_away_win
FROM fixture
JOIN fixture_team ON (fixture_team.home_team = fixture.home_team,
      AND fixture_team.away_team = fixture.away_team)
```

```
JOIN team ON (team.id = fixture_team.home_team OR team.id = fixture_team.away_team)
JOIN competition ON competition.id = fixture.competititon_id
JOIN result ON result.fixture_id = fixture.id
```

```
SELECT
       home,
       away,
       result.goals_home,
       result.goals_away,
       result.odds_home_win,
       result.odds_away_win
FROM fixture1
WHERE fixture1.status = FINISHED
GROUP BY date DESC;
```

Average number of Games

This function calculates the average number of games in the competitions contained in the database system. This functionality is performed using the avg () function on the number_of_games attribute of the Competition table.

```
SELECT AVG(competiton.number_of_games) FROM competition;
```

View fixtures & scores of a team

The user may view the fixtures and scores of a team. The fixtures are selected by team name. This functionality is performed by joining the team and fixture table. The fixtures and results of the selected team will be displayed.

```
SELECT *
FROM fixtures1
WHERE fixtures1.home = team_name OR fixtures1.away = team_name;
```

View players of a team

The user may view the squad of a team. The players are selected by team name. This functionality is performed by joining the player and team tables (which was already done by creating view). A list of players that play for the selected team will be displayed.

```
SELECT *
FROM player1
WHERE player1.team = player_name;
```

View team's standings in competitions

The user may view the rank, wins, losses and draws of a team in all of the competitions it is currently participating in. Essentially the user will view all the league table entries a team appears in. This functionality is performed by joining the league_table, team and competition base tables (which was already done by creating a view).

```
SELECT   *
FROM league_table1
```

```
WHERE league_table1.team = team_name;
```

View basic stats of a team

The user may view basic stats of a team. The attributes of this table will be derived from attributes contained in base tables. This table will show **Wins, Losses, Draws, Youngest Player and Average player market_value.**

Age

This attribute is derived field from the date of birth. This function is performed by using the age () function.

```
CREATE OR REPLACE VIEW player1 AS
SELECT  player.id,
        player.name,
        team.name AS team,
        player.position,
        player.jersey_number,
        player.dob,
        player.nationality,
        player.contract_until,
        player.market_value,
        EXTRACT(YEAR FROM (AGE(dob::timestamp))) AS age
FROM player
JOIN team ON team.id = player.team_id;
```

Youngest Player

This function calculates the minimum age of the players in a team. This is performed by using the min () aggregate function on the Age attribute.

```
SELECT name, MIN(age)
FROM player1
WHERE team.name = name;
```

Average player market_value

This function calculates the average market_value of the players in a team. This is performed by using the avg () function on the market_value attribute.

```
SELECT AVG(market_value)
FROM player1
WHERE team.name = name;
```

Number of wins

This function displays the number of wins of the team.

```
SELECT wins
FROM league_table1
WHERE team.name = name;
```

Number of losses
This function displays the number of losses of the team.

```
SELECT losses
FROM league_table1 --from league_table1 view table
WHERE team.name = name;
```

Number of draws
This function displays the number of draws of the team.

```
SELECT draws
FROM league_table1
WHERE team.name = name;
```

Youngest Manager
This function calculates the minimum age of the managers of teams contained in the database system. This is performed by using the min () aggregate function on the Age attribute.

```
SELECT MIN(Age) FROM manager1; -- from manager1 view table
```

Largest Capacity
This function calculates the maximum capacity of the stadiums contained in the database system. This is performed by using the max () aggregate function on the capacity attribute of the stadium table.

```
SELECT MAX(capacity) FROM stadium;
```

Count number of fixtures with each status
This function counts the number of fixtures with a finished or scheduled status. This is performed by using the count () aggregate function on the status attribute of the fixture table.

```
SELECT status, COUNT(*)
FROM fixture
GROUP BY status;
```

Prototype’s Technical Specifications

The project will be implemented using the Postgres Database Management System. Also, the application’s source code will be hosted on a remote GitHub repository. Our Postgres SQL database will be populated using the football-data REST API Python Client. Lastly, Python will be used to process json objects and insert data into the database system.

Time Table

Tasks	**Completed by**	**Status**
Create use cases	Nilufar, Abigail	Complete
Complete E/R diagram	Nilufar, Abigail	Complete
Formalize relational model	Nilufar, Abigail	Complete
Request data from RESTful API	Abigail	In progress
Organize json data into data frames	Abigail	Complete
Acquire data from online sources	Nilufar, Abigail	In progress
Create database on Postgres server	Nilufar, Abigail	In progress
Implement database tables	Nilufar, Abigail	In progress
Implement mapping tables	Nilufar, Abigail	In progress
Implement database views	Nilufar, Abigail	In progress
Implement stored procedures	Nilufar, Abigail	In progress
Create GitHub repository	Abigail	Complete
Manage version control	Nilufar, Abigail	In progress
Complete and revise documentation	Nilufar, Abigail	In progress
Perform black box testing / record outcome	Nilufar, Abigail	Pending
Write unit tests for critical components	Nilufar, Abigail	Pending
Perform BCNF verification	Nilufar, Abigail	Pending