Conversion and Analysis of a Soccer Database in MongoDB

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Contents

1 Application and Domain

Domain: System that tracks soccer matches, teams, and players statistics and performance data.

Application Description: A platform where users can access detailed information about soccer matches, including team statistics, player performances, and match outcomes. Users can query for specific matches, compare team performances, and analyze player statistics over seasons. The application supports statistical operations for match analysis and player comparison. It can be useful even for analyzing the opponent teams when the instructors of team want to recognize their opponent performance for example, their wins, their previous matches or even the performance of each players and their list for example which foot they prefer or what is their speed class are there fast or slow,.... The coaches can even analyzing their own team because this database separate the home team and away team in every steps so They can find their positive and negative part of their teams and players, in different type and places.

2 Nature of the Application

Transactional and Analytical Nature: The application supports transactional operations, such as updating match outcomes, player statistics, and team data. It also supports analytical queries for match analysis, player performance comparison, and team statistics over different seasons. The application support eventual consistency because user tend to read and use previous data only for analyzing and tracking their team and player so it seems It is read-intensive application. So consistency is not so important but in some cases it is vital, for example when we add a new match or team in our database.

**Workload**: Primarily read-intensive with occasional writes to update match, team, and player statistics.

Consistency is important for match outcomes and statistics, but eventual consistency is acceptable for analytical queries.

Availability: The system aims for eventual consistency with a focus on high availability, especially for read operations, allowing users to access match and player data efficiently.

3 Conceptual Schema

The database schema includes:

- **Matches:** ID, season, stage, date, away_team_goal, home_team_goal, away_team, home_team, home_player, away_player, match.

- **Teams:** ID, team_api_id, team_short_name, team_name.

- **Players:** ID, player_name, player_api_id, birthday, height, weight.

- **League:** ID, name

- **Country:** ID, name

- **Team_Attribute:** ID, date, chanceCreatingPosition, defencePressure, buildUpPlayDribblingClass, buildUpPlaySpeedClass, buildUpPlayPassingClass

- **Player_Attribute:** ID, overall_rating, potential, preferred_foot, vision, penalties
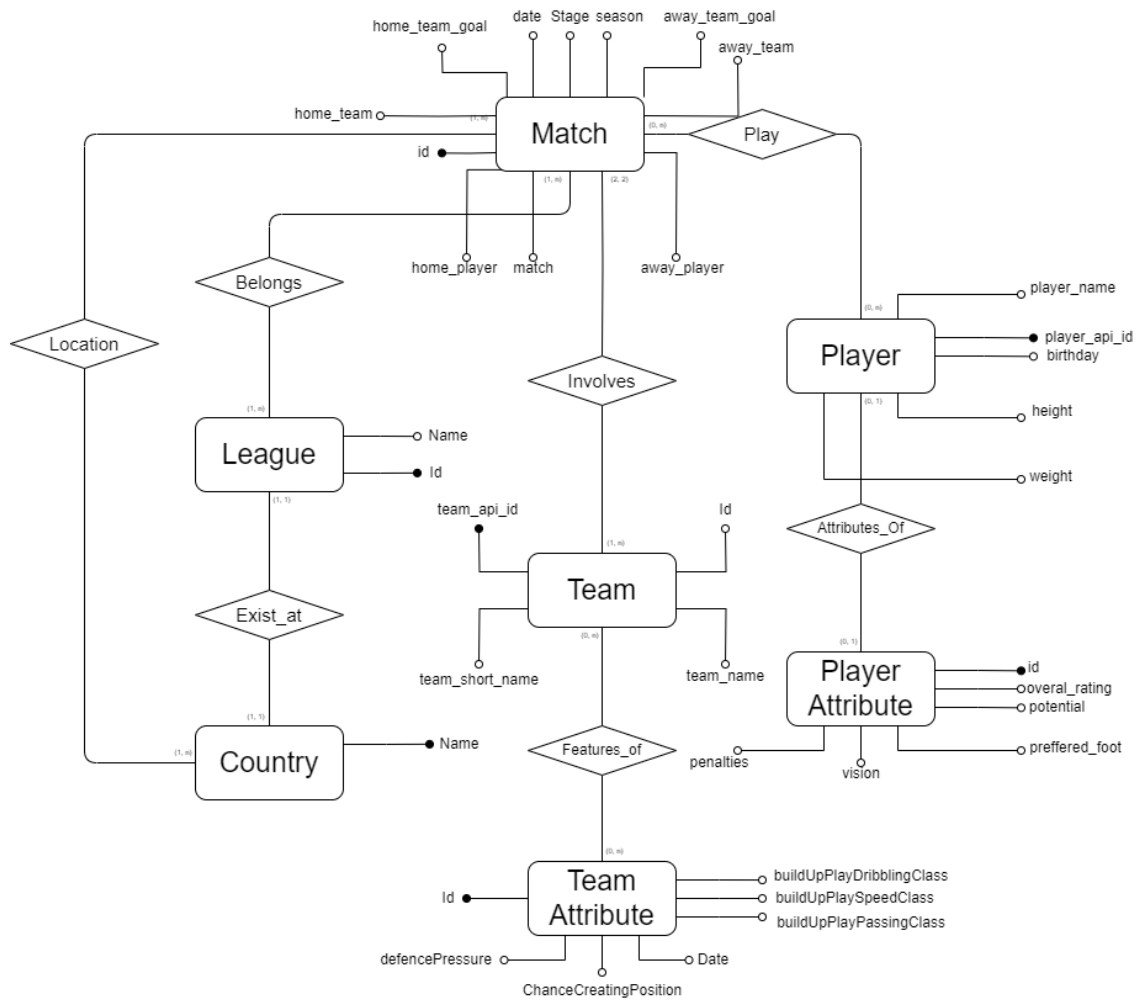
4 Workload for the Application

Q1 Finding the matches with higher than 3 goals for home team and 5 for away team in eigher 2008/2009 or 2010/2011 in Italy and convey its date and stage and its league name with counts of each team goals.

Q2 Finding the match in stage 10 till 20, in season 2008/2009, and played in Serie A league with more than two goal for each the home and away teams, than a value and then showing its winner, date of the match and each team goals count.

Q3 Finding a player name, birthday and his weight who has 185 or more cm height and more than 75 and 90 percent in overall_rating and potential and preferred to shoot with his right foot.

Q4 Finding the team with higher than 50 percent defence pressure and 60 percent chance to creating pass which are in fast class of speed and then show its name and short name with date and dribbling class.

Q5 Find the matches in "Belgium Jupiler League" in 2008/2009 season when the total teams goals are higher than 4 and show its season and stage and each team goals count

Q6 The name of Player with more than 190cm height and less than 150 pounds weight who born in 1970 and more than 70 percent overall rate in matches and give its birthday and potential percent and his foot that preferred.

Q7 Team name and short name which has a balanced speed and little dribbling ability that has more than 72 percent defence pressure in their matches. Give its creating pass chance, defence pressure and its date too.

Q8 Finding the Match that a team has more than 5 goals in his own stadium in season 2010/2011 and give its stage, country and the name of winner and its deffence pressure, creating pass chance and its total goals in that match.

5 Translation of Workload and ER Diagram into Aggregates

Q1
- E : Match
- Ls : [Match(home_team_goal, away_team_goal, season)_!, Country(name)_BEA]
- Lp : [Match(date, stage, home_team_goal, away_team_goal)_!, League(name)_Play]
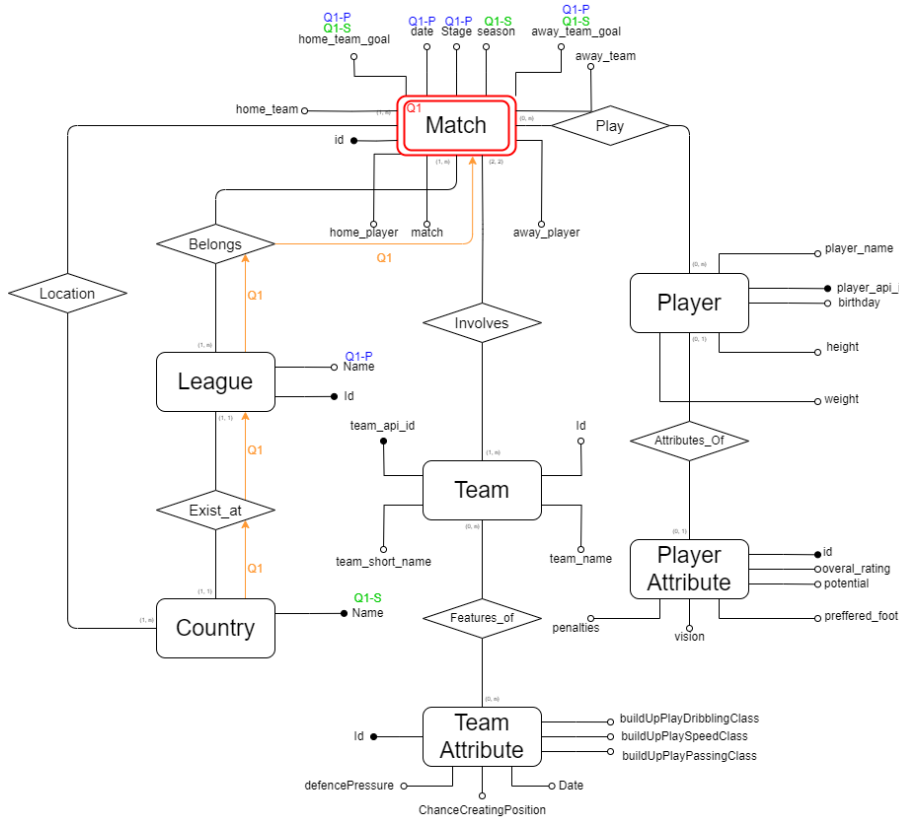
Q2
- E : Match
- Ls : [Match(home_team_goal, away_team_goal, season, stage)_!, League(name)_B]
- Lp : [Match(match_status, home_team_goal, away_team_goal)_!, League(name)_Play]
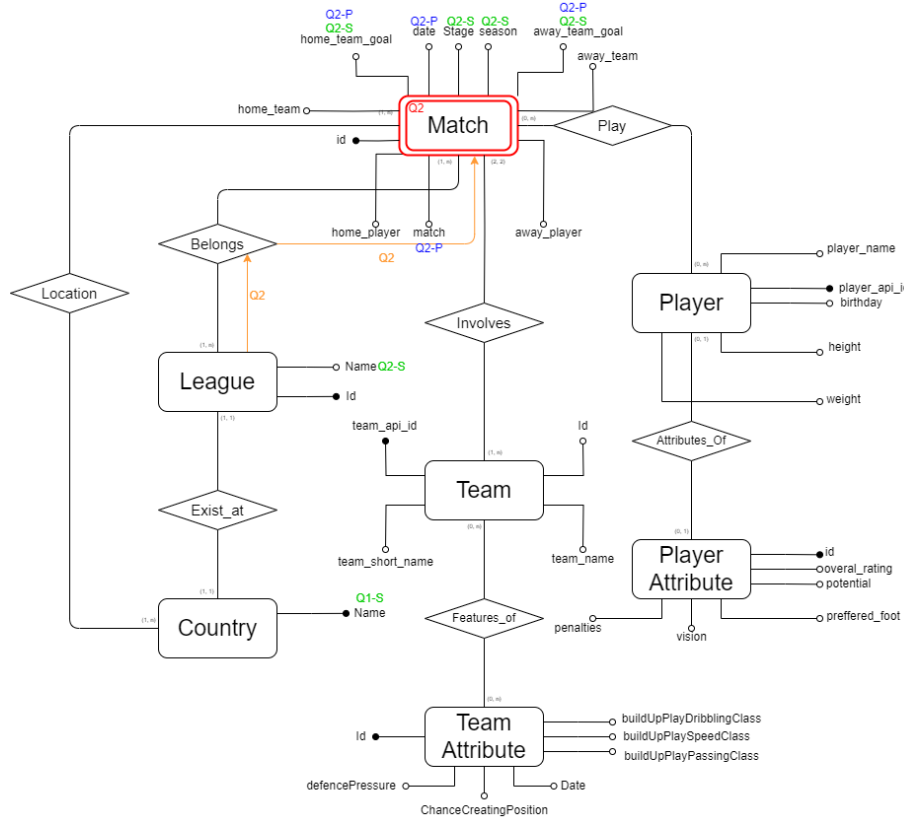
Q3
- E : Player
- Ls : [Player(height)_!, Player_Attribute(overall_rating, potential, preferred_foot)_Ao]
- Lp : [player(player_name, birthday)_!]
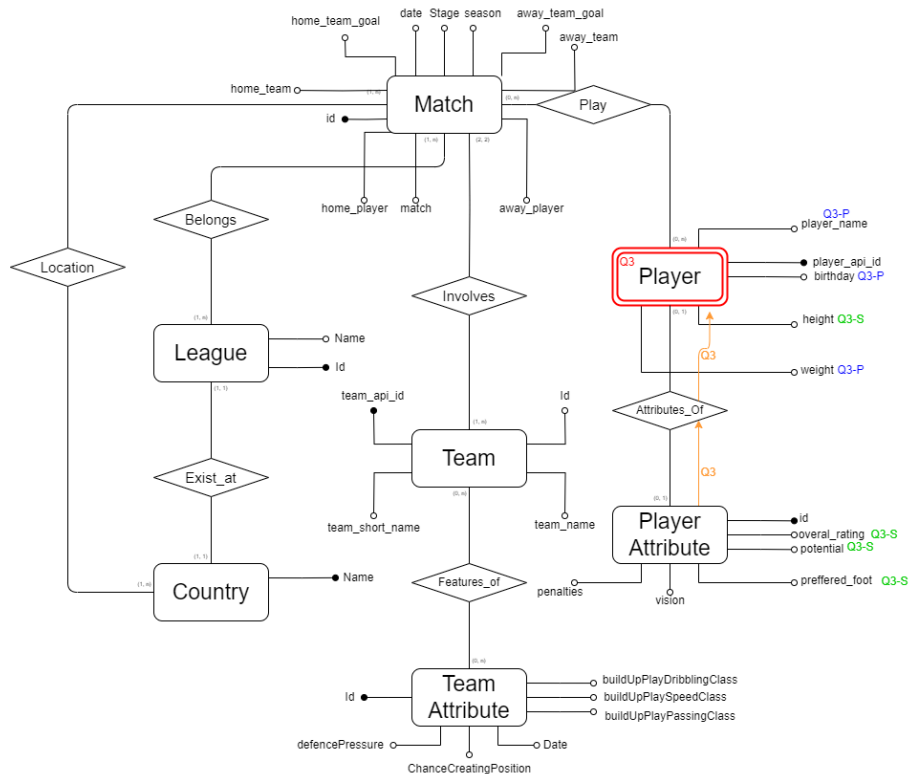
Q4   • E : Team

   • Ls : [Team_Attribute(defencePressure, chanceCreationPassing, buildUpPlaySpeed-
     Class)_Fo]

   • Lp   :   [Team(team_name,   team_short_name)_!,
     Team_Attribute(buildUpPlayDribblingClass, date)_Fo]
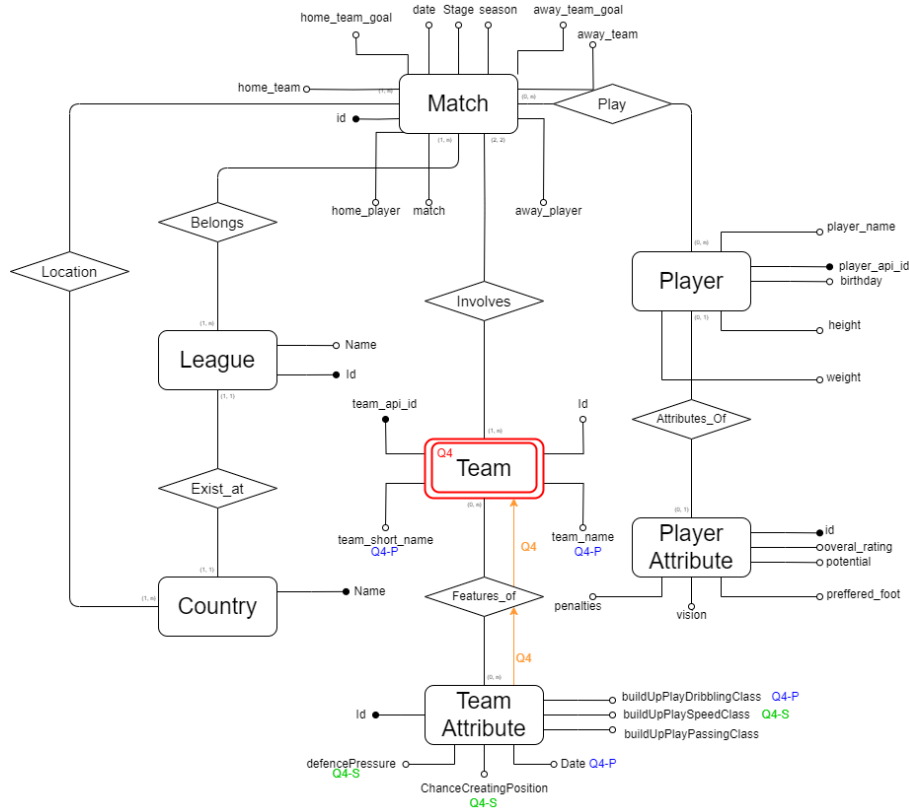
Q5   • E : Match

   • Ls : [Match(season, home_team_goal, away_team_goal)_!, League(name)_B]

   • Lp : [Match(season, stage, home_team_goal, away_team_goal)_!]
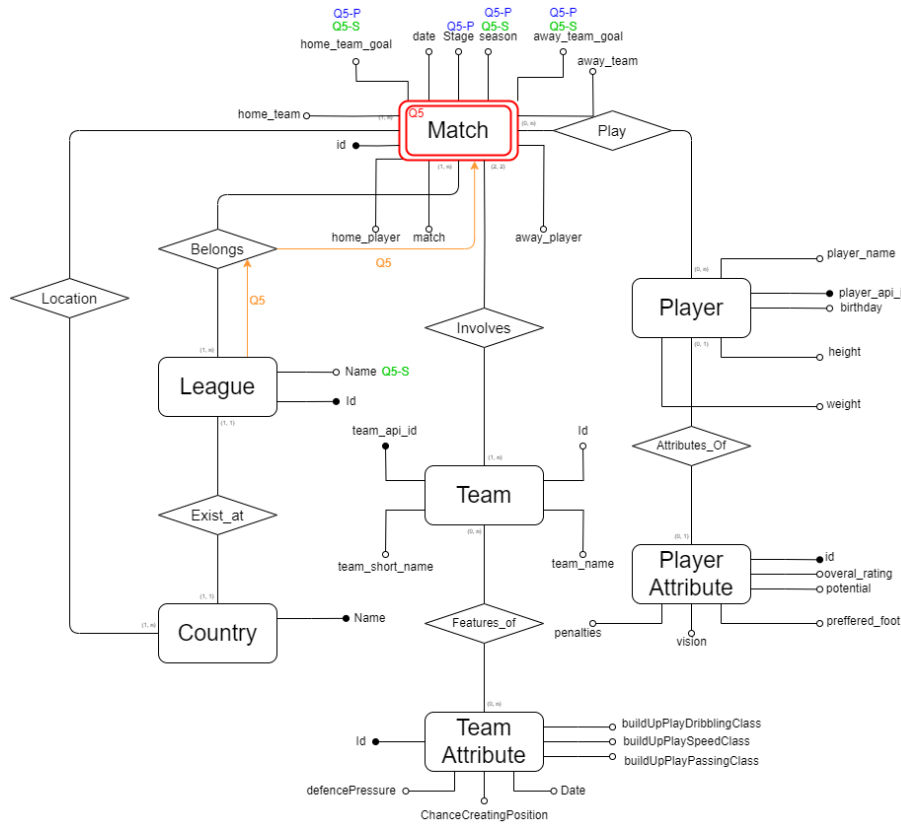
Q6
- E : Player
- Ls : [Player(birthday, height, weight)_!, Player_Attribute(overall_rating)_Ao]
- Lp : [player(player_name, birthday), Player_Attribute(potential, pre-ferred_foot)_Ao]
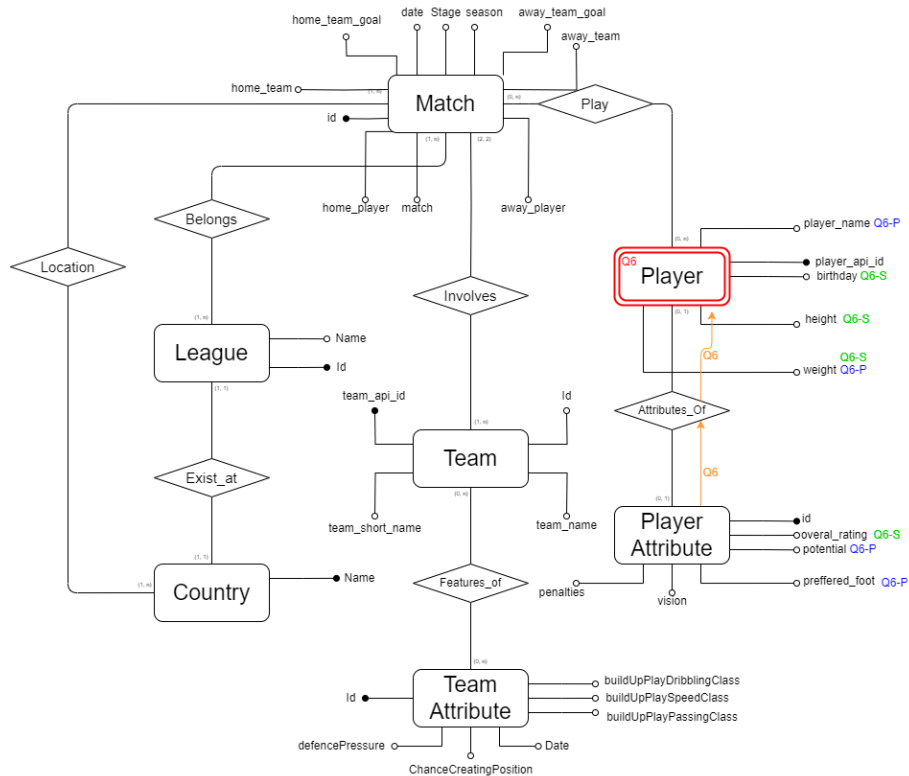
Q7
- E : Team
- Ls : [Team_Attribute(buildUpPlaySpeedClass, BuildUpPlayDribblingClass, defencePressure)_Ao]
- Lp : [Team(team_name, team_short_name), Team_Attribute(chanceCreationPassing, defencePressure, date)_Ao]
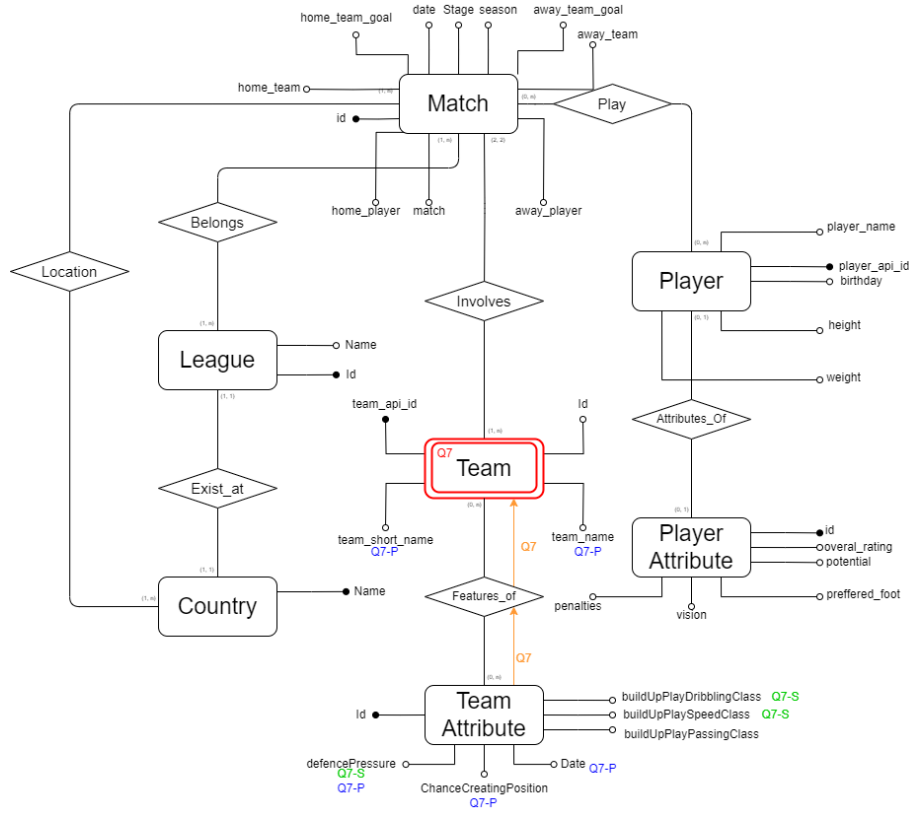
Q8
- E : Match
- Ls : [Match(home_team_goal, season, match_status, "home_team")_!]
- Lp : [Match(stage, home_team_goal), Country(name)_BEa,Team(team_name)_I, Team_Attribute(chanceCreationPassing, defencePressure)_Ao]]
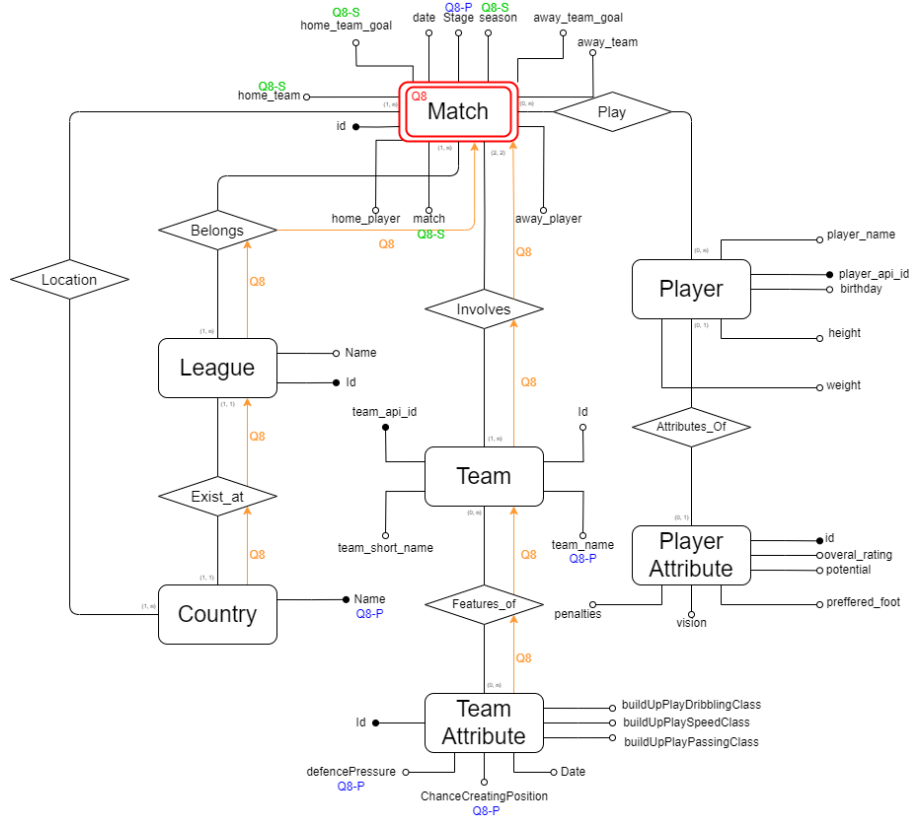
Indexes and Structure:

- Queries: Q1, Q2, Q5, Q8
  Match: {home_team_goal, away_team_goal, date, Stage, season, match, home_team,

  Belongs: [{League: {name, Exist_at: [{Country: {name}}]}}],

  Involves: [{Team: {team_name Feature_of: [{Team_attribute: {chanceCreation-Passing, defencePressure}}]}}] }

- Queries: Q4, Q7
  Player: {player_name, player_api_id, birthday, height, weight,
      Attributes_of: [{Player_Attribute: {overall_rating, potential, preferred_foot}}]

- Queries: Q3, Q6
  Team: {team_name, team_short_name,
      Feature_of: [{Team_Attribute: {Date, ChanceCreatingPosition, defencePressure,
  buildUpPlayDribblingClass, buildUpPlaySpeedClass, buildUpPlayPassingClass}}}

6 Designing a Schema for MongoDB

Match:
Partition Key: season
Index: season
db.match.ensureIndex({season:1})

```
1  {
2    "id": 146,
3    "season": "2008/2009",
4    "stage": 24,
5    "date": "2009-02-27",
6    "home_team": 8203,
7    "away_team": 9987,
8    "home_player": [38327,67950,67958,67959,37112,36393,148286,67898
       ↪ ,164352,38801,26502],
9    "away_player": [37937,38293,148313,104411,148314,37202,43158,930
       ↪ 7,42153,32690,38782],
```

```
10      "home_team_goal": 2,
11      "away_team_goal": 1,
12      "match_status": 8203,
13      "league": {
14        "id": 1,
15        "name": "Belgium Jupiler League",
16        "country": {
17          "id": 1,
18          "name": "Belgium"
19        }
20      }
21    }
```

Player :
Partition Key: height
Index: height, overall_rating, potential
db.match.ensureIndex({team_attribute.overall_rating:1, height: 1, potential: 1})

```
1     {
2       "id": 1,
3       "player_name": "Aaron Appindangoye",
4       "birthday": "1992-02-29",
5       "height": 182,
6       "weight": 187,
7       "player_attribute": [
8         {
9           "id": 1,
10          "player_api_id": 505942,
11          "overall_rating": 67,
12          "potential": 71,
13          "preferred_foot": "right",
14          "penalties": 48
15        },
16        {
17          "id": 2,
18          "player_api_id": 505942,
19          "overall_rating": 67,
20          "potential": 71,
21          "preferred_foot": "right",
22          "penalties": 48
23        },
24        {
25          "id": 3,
26          "player_api_id": 505942,
27          "overall_rating": 62,
28          "potential": 66,
29          "preferred_foot": "right",
30          "penalties": 48
31        },
32      ]
33    },
34    {
```

```
35      "id": 2,
36      "player_name": "Aaron Cresswell",
37      "birthday": "1989-12-15",
38      "height": 170,
39      "weight": 146,
40      "player_attribute": [
41        {
42          "id": 6,
43          "player_api_id": 155782,
44          "overall_rating": 74,
45          "potential": 76,
46          "preferred_foot": "left",
47          "penalties": 59
48        },
49        {
50          "id": 7,
51          "player_api_id": 155782,
52          "overall_rating": 74,
53          "potential": 76,
54          "preferred_foot": "left",
55          "penalties": 59
56        }
57      ]
58    },
```

Team:
Partition Key: team_name
Index: team_name, defencePressure
db.match.ensureIndex({team_name, defencePressure})

```
1  {
2    "_id": {
3      "$oid": "65bfbb503efca0fb8aa4e165"
4    },
5    "id": 1,
6    "team_api_id": 9987,
7    "team_name": "KRC Genk",
8    "team_short_name": "GEN",
9    "team_attributes": [
10      {
11        "id": 485,
12        "buildUpPlaySpeedClass": "Balanced",
13        "buildUpPlayDribblingClass": "Little",
14        "buildUpPlayPassingClass": "Mixed",
15        "defencePressure": 70,
16        "chanceCreationPassing": 50,
17        "date": "2010-02-22"
18      },
19      {
20        "id": 486,
21        "buildUpPlaySpeedClass": "Balanced",
22        "buildUpPlayDribblingClass": "Little",
```

```
23        "buildUpPlayPassingClass": "Mixed",
24        "defencePressure": 48,
25        "chanceCreationPassing": 65,
26        "date": "2011-02-22"
27      }
28    ]
29 }
```

7 Design Neo4J
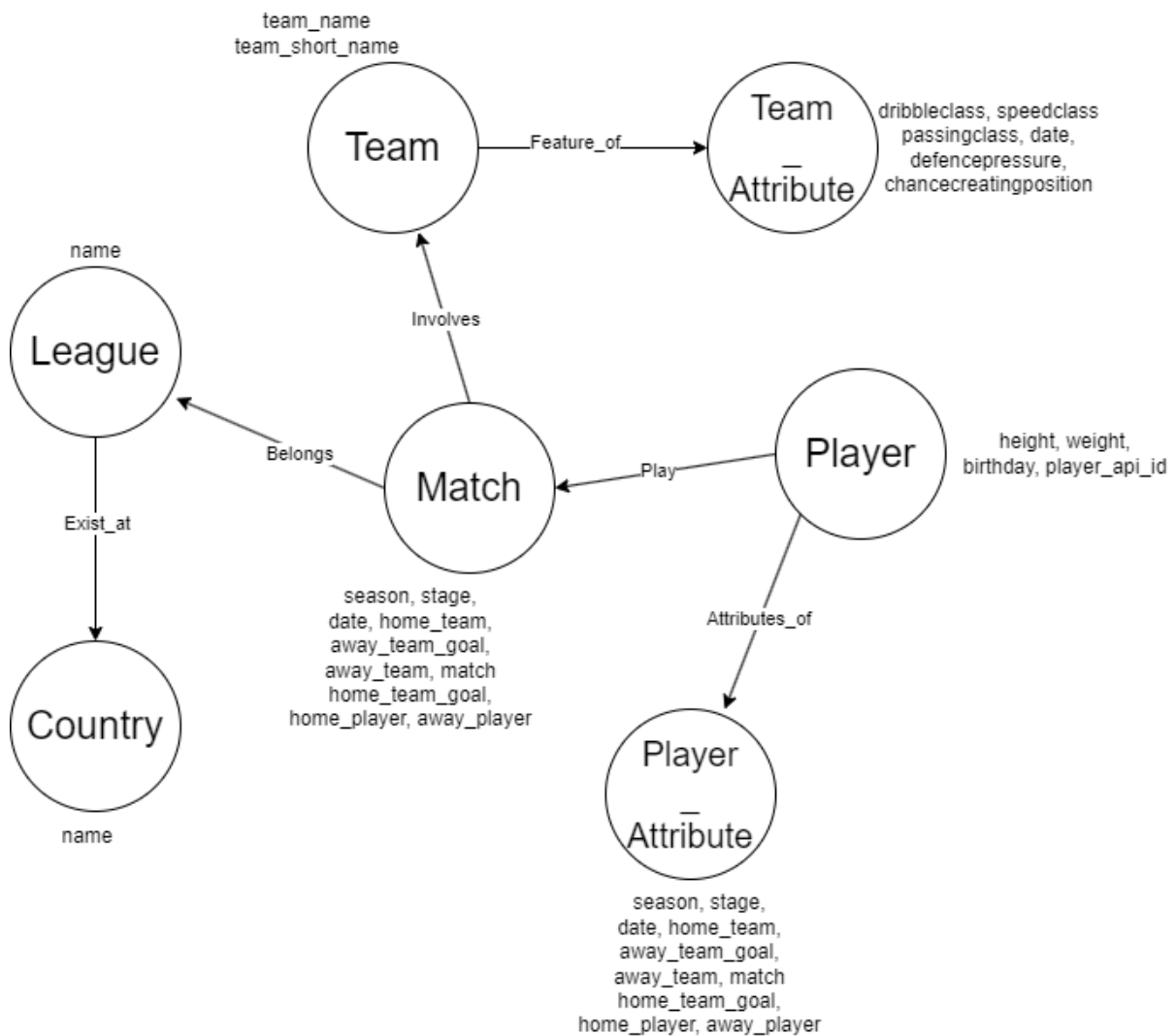
WorkLoads in Neo4j:

Query 1

```
MATCH (m:Match)-[:BELONGS_TO]->(l:League)-[:LOCATED_IN]->(c:
    ↪ Country)
WHERE m.home_team_goal >= 3 AND m.away_team_goal <= 5
AND m.season IN ['2008/2009', '2010/2011'] AND c.name = 'Italy'
RETURN m.home_team_goal, m.away_team_goal, m.date, m.stage, l.name
```

Query 2

```
MATCH (m:Match)-[:BELONGS_TO]->(l:League)
WHERE m.stage >= 10 AND m.stage <= 20
AND (m.home_team_goal >= 2 OR m.away_team_goal >= 2)
AND m.season = '2008/2009' AND l.name = 'Italy Serie A'
RETURN m.match_status, m.home_team_goal, m.away_team_goal, m.date
```

Query 3

```
MATCH (p:Player)-[:HAS_ATTRIBUTE]->(pa:PlayerAttribute)
WHERE p.height > 185 AND pa.overall_rating > 75
AND pa.potential > 90 AND pa.preferred_foot = 'right'
RETURN p.player_name, p.birthday, p.weight
```

Query 4

```
MATCH (t:Team)-[:HAS_ATTRIBUTE]->(ta:TeamAttribute)
WHERE ta.defencePressure > 50 AND ta.chanceCreationPassing > 60
AND ta.buildUpPlaySpeedClass = 'Fast'
RETURN t.team_name, t.team_short_name, ta.
    ↪ buildUpPlayDribblingClass, ta.date
```

Query 5

```
MATCH (m:Match)-[:BELONGS_TO]->(l:League)
WHERE l.name = 'Belgium Jupiler League' AND m.season = '2008/2009'
AND (m.home_team_goal + m.away_team_goal) >= 4
RETURN m.season, m.stage, m.home_team_goal, m.away_team_goal
```

Query 6

```
MATCH (p:Player)-[:HAS_ATTRIBUTE]->(pa:PlayerAttribute)
WHERE p.birthday > '1970-01-01' AND p.height > 180 AND p.weight <
    ↪ 150
AND pa.overall_rating >= 70
RETURN p.player_name, p.birthday, pa.potential, pa.preferred_foot
```

Query 7

```
MATCH (t:Team)-[:HAS_ATTRIBUTE]->(ta:TeamAttribute)
WHERE ta.buildUpPlaySpeedClass = 'Balanced'
  AND ta.buildUpPlayDribblingClass = 'Little'
  AND ta.defencePressure >= 72
RETURN
  t.team_name,
  t.team_short_name,
  ta.chanceCreationPassing,
  ta.defencePressure,
  ta.date
```

Query 8

```
MATCH (m:Match)-[:PLAYED_BY]->(t:Team)-[:HAS_PLAYER]->(p:Player)
WHERE m.home_team_goal > 3 AND m.match_status = t.team_api_id
RETURN m.id AS match_id, m.season, t.team_name, collect(p.
    ↪ player_name) AS home_player_names, m.home_team_goal AS
    ↪ total_home_goals
```

8 Why MongoDB

In the process of designing our soccer database, we carefully evaluated various database management systems, including MongoDB and Cassandra. Our decision to choose MongoDB was influenced by several key factors that align closely with the specific needs of our application.

Firstly, MongoDB's flexible document model is particularly well-suited to the complex and varied data associated with soccer matches, teams, and player statistics. This flexibility allows us to easily adapt our schema as new requirements emerge, such as incorporating new types of match data or player statistics without extensive database refactoring.

Moreover, our application's requirements place a strong emphasis on read availability over strict consistency. While MongoDB is often categorized as a CP (Consistency and Partition tolerance) system in the context of the CAP theorem, it offers configurable consistency levels. We leverage this feature to prioritize eventual consistency, which provides the high read availability our application demands. This is particularly important given that our users are more likely to consume match data and statistics rather than submit new data, making read performance a critical aspect of the user experience.

By utilizing MongoDB's replica sets, we ensure that our application remains highly available and resilient to node failures. Replica sets also enhance read performance by allowing read operations to be distributed across multiple nodes. For write operations, which are less frequent in our use case, the availability provided by MongoDB's default configuration is more than adequate.

Furthermore, MongoDB's rich query language and powerful aggregation framework enable us to construct complex queries to analyze soccer data. These capabilities allow us to provide insightful statistics and match analyses, which are essential features of our application.

In contrast, while Cassandra is known for its write performance and scalability, it imposes restrictions on query flexibility that would limit our ability to execute the complex queries our application requires. Similarly, while a graph database like Neo4j offers excellent relationship traversal capabilities, the relational complexity of our domain does not justify the overhead that comes with a graph database model.

In summary, MongoDB stands out as the optimal choice for our soccer database due to its flexibility, high availability for read operations, suitable consistency model for our use case, and its powerful querying and aggregation capabilities. These features collectively ensure that our application can deliver a robust and responsive user experience, with the ability to evolve alongside the dynamic world of soccer data analytics.

9 Details of the System

The Soccer Database is designed to leverage MongoDB's distributed database architecture to ensure high availability, scalability, and appropriate consistency for a data-driven application focused on soccer analytics. The following outlines the key aspects of our system configuration:

9.1 Replica Sets for High Availability

Our system employs MongoDB replica sets, which consist of several nodes that maintain the same data set, providing redundancy and increasing data availability. With multiple nodes in a replica set, the system can continue to operate effectively even in the event of hardware failure or maintenance.

- **Primary Node**: The primary node receives all write operations. In our configuration, the primary node is set up to acknowledge write operations as soon as the operation is completed on its own data set, without waiting for the data to be replicated to secondary nodes. This provides a balance between data durability and system responsiveness, which is acceptable for our application where eventual consistency is sufficient.

- **Secondary Nodes**: These nodes replicate the primary node's oplog and apply the operations in an asynchronous manner. This ensures that all data is eventually consistent across nodes, allowing for read scalability. For read-heavy operations, such as querying match statistics or player performance, clients can be directed to secondary nodes to distribute the load.

9.2 Sharding for Performance

To address performance and scalability, our data is partitioned across multiple shards. Sharding allows the database to distribute collections across different database instances, enabling the system to manage large datasets and high throughput operations by performing operations in parallel.

- **Shard Key**: The choice of shard key is crucial for distributing data evenly across shards. For our Soccer Database, we utilize compound shard keys based on fields that offer high cardinality and support the database's query patterns, such as 'season' and 'match_id' for the 'matches' collection.

- **Data Distribution**: By sharding on these keys, we ensure that documents are distributed based on the season and individual matches, which aligns with the typical access patterns of our users querying for match data within specific seasons or time ranges.

9.3 Scalability Considerations

The initial deployment includes three shards, with each shard hosted on a separate physical or virtual server to provide fault tolerance and reduce the risk of a single point of failure. Each shard is backed by a replica set with three nodes, ensuring that the system can handle a significant number of concurrent operations, both read and write.

As the application grows, both in terms of data volume and user base, new shards and nodes can be added to the cluster. This flexible approach allows us to scale out the database horizontally to meet increasing demands, ensuring that the Soccer Database remains performant and available even as it scales.

9.4 Operational Management

The MongoDB cluster is monitored and managed using MongoDB Ops Manager, which provides tools for real-time monitoring, backup, and fine-grained control over the database configuration. This allows our database administrators to proactively manage the system's health and performance, and automate routine tasks such as backups and restores.

In summary, the system configuration for the Soccer Database is designed to provide a robust, scalable, and high-performance environment suitable for the complex and dynamic nature of

soccer data analytics.

10 logical Schema in MongoDB

10.1 Match

```
{
    "_id": ObjectId("..."),
    "id": Integer,
    "season": String,
    "stage": Integer,
    "date": Date,
    "home\_team": Integer,
    "away\_team": Integer,
    "home\_player": [
        Integer, // Player ID
        // ... more player IDs
    ],
    "away\_player": [
        Integer, // Player ID
        // ... more player IDs
    ],
    "home\_team\_goal": Integer,
    "away\_team\_goal": Integer,
    "match\_status": Integer,
    "league": {
        "id": Integer,
        "name": String
    },
    "country": {
        "id": Integer,
        "name": String
    }
}
```

10.2 Player

```
{
    "_id": ObjectId("..."),
    "id": Integer,
    "player\_name": String,
    "birthday": Date,
    "height": Integer,
    "weight": Integer,
    "player\_attribute": [
        {
            "id": Integer,
            "player\_api\_id": Integer,
            "overall\_rating": Integer,
            "potential": Integer,
            "preferred\_foot": String,
```

```
            "penalties": Integer
        },
    ]
}
```

10.3 Team

```
{
    "_id": ObjectId("..."),
    "id": Integer,
    "team\_api\_id": Integer,
    "team\_name": String,
    "team\_short\_name": String,
    "team\_attributes": [
        {
            "id": Integer,
            "buildUpPlaySpeedClass": String,
            "buildUpPlayDribblingClass": String,
            "buildUpPlayPassingClass": String,
            "defencePressure": Integer,
            "chanceCreationPassing": Integer,
            "date": Date
        },
    ]
}
```

11 Implementing Workload: MongoDB Queries and (Partial) Results

Further details are provided on implementing the workload with MongoDB queries, including specific query examples, partial results, and performance considerations.

```python
[5]: import sqlite3
     import pandas as pd
     db_file_path = 'database.sqlite'
     conn = sqlite3.connect(db_file_path)

     team_query = "SELECT * FROM Team;"
     team_dataframe = pd.read_sql_query(team_query, conn)

     country_query = "SELECT * FROM Country;"
     country_dataframe = pd.read_sql_query(country_query, conn)

     league_query = "SELECT * FROM League;"
     league_dataframe = pd.read_sql_query(league_query, conn)

     match_query = "SELECT * FROM Match;"
     match_dataframe = pd.read_sql_query(match_query, conn)

     player_query = "SELECT * FROM Player;"
```

```
player_dataframe = pd.read_sql_query(player_query, conn)

player_Attributes_query = "SELECT * FROM Player_Attributes;"
player_Attributes_dataframe = pd.read_sql_query(player_Attributes_query, conn)

team_Attributes_query = "SELECT * FROM Team_Attributes;"
team_Attributes_dataframe = pd.read_sql_query(team_Attributes_query, conn)

conn.close()
```

Team

```
[8]:  print(team_dataframe.columns)
      team_dataframe.head()
      team = team_dataframe.drop(["team_fifa_api_id"], axis = 1)
```

```
Index(['id', 'team_api_id', 'team_fifa_api_id', 'team_long_name',
       'team_short_name'],
      dtype='object')
```

```
[9]:  team.shape
```

```
[9]:  (299, 4)
```

```
[10]:  team.isna().sum()
```

```
[10]:  id                 0
       team_api_id        0
       team_long_name     0
       team_short_name    0
       dtype: int64
```

Country

```
[11]:  print(country_dataframe.columns)
       country_dataframe.head()
       country = country_dataframe.copy()
```

```
Index(['id', 'name'], dtype='object')
```

```
[12]:  country.isna().sum()
```

```
[12]:  id      0
       name    0
       dtype: int64
```

```
[13]:  country.name.unique()
```

```
[13]:  array(['Belgium', 'England', 'France', 'Germany', 'Italy', 'Netherlands',
              'Poland', 'Portugal', 'Scotland', 'Spain', 'Switzerland'],
             dtype=object)
```

League

```
[14]: print(league_dataframe.columns)
      league_dataframe.head()
      league = league_dataframe.copy()
```

```
Index(['id', 'country_id', 'name'], dtype='object')
```

```
[15]: league.isna().sum()
```

```
[15]: id            0
      country_id    0
      name          0
      dtype: int64
```

```
[16]: league['name'].unique()
```

```
[16]: array(['Belgium Jupiler League', 'England Premier League',
             'France Ligue 1', 'Germany 1. Bundesliga', 'Italy Serie A',
             'Netherlands Eredivisie', 'Poland Ekstraklasa',
             'Portugal Liga ZON Sagres', 'Scotland Premier League',
             'Spain LIGA BBVA', 'Switzerland Super League'], dtype=object)
```

Match

```
[17]: match_dataframe.columns
```

```
[17]: Index(['id', 'country_id', 'league_id', 'season', 'stage', 'date',
             'match_api_id', 'home_team_api_id', 'away_team_api_id',
             'home_team_goal',
             ...
             'SJA', 'VCH', 'VCD', 'VCA', 'GBH', 'GBD', 'GBA', 'BSH', 'BSD', 'BSA'],
            dtype='object', length=115)
```

```
[34]: match_dataframe["date"] = match_dataframe["date"].apply(lambda x: x.replace("␣
      ↪00:00:00", ""))
      match = match_dataframe.copy()
```

```
[35]: def statusofgame(row):
          if row["home_team_goal"] > row["away_team_goal"]:
              return row["home_team_api_id"]
          elif row["home_team_goal"] < row["away_team_goal"]:
              return row["away_team_api_id"]
          else:
              return 0

      match_dataframe["match_status"] = match_dataframe.apply(statusofgame, axis=1)

      match = match_dataframe[["id","home_team_api_id", "away_team_api_id",␣
      ↪"country_id", "league_id", "season", "stage", "date", "home_team_goal",␣
      ↪"away_team_goal", "match_status",
                             "home_player_1", "home_player_2", "home_player_3",␣
      ↪"home_player_4", "home_player_5", "home_player_6", "home_player_7",␣
      ↪"home_player_8", "home_player_9", "home_player_10", "home_player_11",
```

```
    "away_player_1", "away_player_2", "away_player_3", "away_player_4",␣
    ↪"away_player_5", "away_player_6", "away_player_7", "away_player_8",␣
    ↪"away_player_9", "away_player_10", "away_player_11"
                                      ]]
match.head()
```

[36]: `match["match_status"][545]`

[36]: 8203

[37]:
```
match.isna().sum()
match.dropna(inplace = True)
match.shape
```

[37]: (21374, 33)

[38]:
```
def player_list(row):
    home_players = [row["home_player_1"], row["home_player_2"],␣
 ↪row["home_player_3"], row["home_player_4"], row["home_player_5"],␣
 ↪row["home_player_6"], row["home_player_7"], row["home_player_8"],␣
 ↪row["home_player_9"], row["home_player_10"], row["home_player_11"]]  #␣
 ↪Replace ... with other player columns
    away_players = [row["away_player_1"], row["away_player_2"],␣
 ↪row["away_player_3"], row["away_player_4"], row["away_player_5"],␣
 ↪row["away_player_6"], row["away_player_7"], row["away_player_8"],␣
 ↪row["away_player_9"], row["away_player_10"], row["away_player_11"]]  #␣
 ↪Replace ... with other player columns
    return home_players, away_players

match["home_player"], match["away_player"] = zip(*match.apply(player_list,␣
 ↪axis=1))
```

[39]: `match`

[40]:
```
match.drop(["home_player_1", "home_player_2", "home_player_3",␣
 ↪"home_player_4", "home_player_5", "home_player_6", "home_player_7",␣
 ↪"home_player_8", "home_player_9", "home_player_10", "home_player_11",
"away_player_1", "away_player_2", "away_player_3", "away_player_4",␣
 ↪"away_player_5", "away_player_6", "away_player_7", "away_player_8",␣
 ↪"away_player_9", "away_player_10", "away_player_11"], axis = 1, inplace =␣
 ↪True)
```

[41]: `match.head()`

Player

[26]:
```
print(player_dataframe.columns)
player_dataframe["birthday"] = player_dataframe["birthday"].apply(lambda x: x.
 ↪replace(" 00:00:00", ""))
player_dataframe.head()
player = player_dataframe.drop(["player_fifa_api_id"], axis =  1)
```

21

```
Index(['id', 'player_api_id', 'player_name', 'player_fifa_api_id', 'birthday',
       'height', 'weight'],
      dtype='object')
```

[27]: `player.head()`

[27]:
```
   id  player_api_id        player_name    birthday  height  weight
0   1         505942  Aaron Appindangoye  1992-02-29  182.88     187
1   2         155782     Aaron Cresswell  1989-12-15  170.18     146
2   3         162549        Aaron Doran  1991-05-13  170.18     163
3   4          30572      Aaron Galindo  1982-05-08  182.88     198
4   5          23780       Aaron Hughes  1979-11-08  182.88     154
```

Player Attribute

[28]:
```python
print(player_Attributes_dataframe.columns)
player_Attributes_dataframe.head()
player_attr = player_Attributes_dataframe[["id","player_api_id",
 ↪"overall_rating","potential","preferred_foot", "penalties"]]
```

```
Index(['id', 'player_fifa_api_id', 'player_api_id', 'date', 'overall_rating',
       'potential', 'preferred_foot', 'attacking_work_rate',
       'defensive_work_rate', 'crossing', 'finishing', 'heading_accuracy',
       'short_passing', 'volleys', 'dribbling', 'curve', 'free_kick_accuracy',
       'long_passing', 'ball_control', 'acceleration', 'sprint_speed',
       'agility', 'reactions', 'balance', 'shot_power', 'jumping', 'stamina',
       'strength', 'long_shots', 'aggression', 'interceptions', 'positioning',
       'vision', 'penalties', 'marking', 'standing_tackle', 'sliding_tackle',
       'gk_diving', 'gk_handling', 'gk_kicking', 'gk_positioning',
       'gk_reflexes'],
      dtype='object')
```

Team Attribute

[29]:
```python
print(team_Attributes_dataframe.columns)
team_Attributes_dataframe.head()
team_Attributes_dataframe["date"] = team_Attributes_dataframe["date"].
 ↪apply(lambda x: x.replace(" 00:00:00", ""))
team_attr = team_Attributes_dataframe.copy()
```

```
Index(['id', 'team_fifa_api_id', 'team_api_id', 'date', 'buildUpPlaySpeed',
       'buildUpPlaySpeedClass', 'buildUpPlayDribbling',
       'buildUpPlayDribblingClass', 'buildUpPlayPassing',
       'buildUpPlayPassingClass', 'buildUpPlayPositioningClass',
       'chanceCreationPassing', 'chanceCreationPassingClass',
       'chanceCreationCrossing', 'chanceCreationCrossingClass',
       'chanceCreationShooting', 'chanceCreationShootingClass',
       'chanceCreationPositioningClass', 'defencePressure',
       'defencePressureClass', 'defenceAggression', 'defenceAggressionClass',
       'defenceTeamWidth', 'defenceTeamWidthClass',
       'defenceDefenderLineClass'],
      dtype='object')
```

```
[30]: team_attr.date
```

```
[30]: 0        2010-02-22
      1        2014-09-19
      2        2015-09-10
      3        2010-02-22
      4        2011-02-22
                  ...
      1453     2011-02-22
      1454     2012-02-22
      1455     2013-09-20
      1456     2014-09-19
      1457     2015-09-10
      Name: date, Length: 1458, dtype: object
```

```
[31]: team_attr.buildUpPlaySpeedClass.unique()
```

```
[31]: array(['Balanced', 'Fast', 'Slow'], dtype=object)
```

```
[62]: team_attr.shape
```

```
[62]: (1458, 25)
```

Importing Into MongoDB Format

```python
[43]: import math
      import pymongo
      client = pymongo.MongoClient("mongodb://localhost:27017")
      db = client["new_db_socer1"]

      collection_match = db["match"]
      for index, row in match.iterrows():
          leagues = league[league["id"] == row["league_id"]].iloc[0]
          countries = country[country["id"] == row["country_id"]].iloc[0]
          matches = {
              "id" : int(row["id"]),
              "season" : row["season"],
              "stage" : row["stage"],
              "date" : row["date"],
              "home_team": row["home_team_api_id"],
              "away_team": row["away_team_api_id"],
              "home_player": row["home_player"],
              "away_player": row["away_player"],
              "home_team_goal" : row["home_team_goal"],
              "away_team_goal" : row["away_team_goal"],
              "match_status" : row["match_status"],
              "league" : {
                  "id": int(row["league_id"]),
                  "name" : leagues["name"],
                  "country": {
                      "id": int(row["league_id"]),
                      "name" : countries["name"],
```

```
            }
        },
    }
    collection_match.insert_one(matches)
```

```python
import math
import pymongo
client = pymongo.MongoClient("mongodb://localhost:27017")
db = client["new_db_socer1"]

collection_teams = db["teams"]
for index, row in team.iterrows():
    team_attr_df = team_attr[team_attr["team_api_id"] == row["team_api_id"]]

    team_attrs = []
    for _, ht_attr in team_attr_df.iterrows():
        team_attrs.append({
            "id": int(ht_attr["id"]),
            "buildUpPlaySpeedClass" : ht_attr["buildUpPlaySpeedClass"],
            "buildUpPlayDribblingClass" :␣
 ↪ht_attr["buildUpPlayDribblingClass"],
            "buildUpPlayPassingClass" : ht_attr["buildUpPlayPassingClass"] ,
            "defencePressure" : int(ht_attr["defencePressure"]),
            "chanceCreationPassing" : int(ht_attr["chanceCreationPassing"]),
            "date" : ht_attr["date"]
        })

    teams = {
        "id" : int(row["id"]),
        "team_api_id" : int(row["team_api_id"]),
        "team_name" : row["team_long_name"],
        "team_short_name" : row["team_short_name"],
        "team_attributes" : team_attrs
    }
    collection_teams.insert_one(teams)
```

```python
import math
import pymongo
client = pymongo.MongoClient("mongodb://localhost:27017")
db = client["new_db_socer1"]

collection_player = db["player"]
for index, row in player.iterrows():
    player_attr_df = player_attr[player_attr["player_api_id"] ==␣
 ↪row["player_api_id"]]

    player_attrs = []
    for _, ht_attr in player_attr_df.iterrows():
        player_attrs.append({
            "id": int(ht_attr["id"]),
            "player_api_id" : ht_attr["player_api_id"],
```

```python
            "overall_rating" : ht_attr["overall_rating"],
            "potential" : ht_attr["potential"] ,
            "preferred_foot" : ht_attr["preferred_foot"],
            "penalties" : float(ht_attr["penalties"]),
        })
    players = {
        "id" : int(row["id"]),
        "player_name" : row["player_name"],
        "birthday":row["birthday"],
        "height":int(row["height"]),
        "weight":int(row["weight"]),
        "player_attribute": player_attrs
    }

    collection_player.insert_one(players)
```

12   Implementing workload:

Query 1

```python
[ ]: query1 = [
    {
        "$match": {
            "home_team_goal": {"$gte": 3},
            "away_team_goal": {"$lte": 5},
            "season": {"$in": ["2008/2009", "2010/2011"]},
            "league.country.name": "Italy"
        }
    },
    {
        "$project": {
            "_id": 0,
            "home_team_goal": 1,
            "away_team_goal": 1,
            "date": 1,
            "stage": 1,
            "league.name" : 1
        }
    }
]
results = collection_match.aggregate(query1)
for result in results:
    pprint(result)
```

```
{'away_team_goal': 0,
 'date': '2008-08-31',
 'home_team_goal': 3,
 'league': {'name': 'Italy Serie A'},
 'stage': 1}
{'away_team_goal': 1,
 'date': '2008-08-30',
```

```
   'home_team_goal': 3,
   'league': {'name': 'Italy Serie A'},
   'stage': 1}
```

Query 2

```python
query2 = [
    {
        "$match": {
            "stage": {"$gte": 10, "$lte": 20},
            "$or": [
                {"home_team_goal": {"$gte": 2}},
                {"away_team_goal": {"$gte": 2}}
            ],
            "season": "2008/2009",
            "league.name" : "Italy Serie A"
        }
    },
    {
        "$project": {
            "_id": 0,
            "match_status": 1,
            "home_team_goal": 1,
            "away_team_goal": 1,
            "date": 1
        }
    }
]

results = collection_match.aggregate(query2)
for result in results:
    pprint(result)
```

```
{'away_team_goal': 2,
 'date': '2008-11-02',
 'home_team_goal': 2,
 'match_status': 0}
{'away_team_goal': 3,
 'date': '2008-11-01',
 'home_team_goal': 2,
 'match_status': 8636}
{'away_team_goal': 0,
 'date': '2008-11-01',
 'home_team_goal': 2,
 'match_status': 9885}
{'away_team_goal': 1,
 'date': '2008-11-02',
 'home_team_goal': 5,
 'match_status': 8529}
{'away_team_goal': 0,
 'date': '2008-11-09',
 'home_team_goal': 2,
```

'match_status': 9875}
{'away_team_goal': 0,
 'date': '2008-11-09',
 'home_team_goal': 3,
 'match_status': 8543}
{'away_team_goal': 0,
 'date': '2008-11-09',
 'home_team_goal': 4,
 'match_status': 10233}
{'away_team_goal': 1,
 'date': '2008-11-09',
 'home_team_goal': 2,
 'match_status': 8535}
{'away_team_goal': 2,
 'date': '2008-11-09',
 'home_team_goal': 0,
 'match_status': 9885}
{'away_team_goal': 1,
 'date': '2008-11-09',
 'home_team_goal': 2,
 'match_status': 8530}
{'away_team_goal': 2,
 'date': '2008-11-16',
 'home_team_goal': 3,
 'match_status': 9882}
{'away_team_goal': 2,
 'date': '2008-11-16',
 'home_team_goal': 3,
 'match_status': 8530}
{'away_team_goal': 1,
 'date': '2008-11-13',
 'home_team_goal': 4,
 'match_status': 9885}
{'away_team_goal': 1,
 'date': '2008-11-16',
 'home_team_goal': 3,
 'match_status': 8524}
{'away_team_goal': 2,
 'date': '2008-11-22',
 'home_team_goal': 4,
 'match_status': 8535}
{'away_team_goal': 0,
 'date': '2008-11-23',
 'home_team_goal': 3,
 'match_status': 9882}
{'away_team_goal': 2,
 'date': '2008-11-23',
 'home_team_goal': 2,
 'match_status': 0}
{'away_team_goal': 3,
 'date': '2008-11-23',

'home_team_goal': 0,
 'match_status': 8686}
{'away_team_goal': 2,
 'date': '2008-11-23',
 'home_team_goal': 0,
 'match_status': 8551}
{'away_team_goal': 1,
 'date': '2008-11-23',
 'home_team_goal': 3,
 'match_status': 8690}
{'away_team_goal': 2,
 'date': '2008-11-23',
 'home_team_goal': 2,
 'match_status': 0}
{'away_team_goal': 1,
 'date': '2008-11-30',
 'home_team_goal': 3,
 'match_status': 8540}
{'away_team_goal': 0,
 'date': '2008-12-07',
 'home_team_goal': 3,
 'match_status': 8524}
{'away_team_goal': 2,
 'date': '2008-12-07',
 'home_team_goal': 2,
 'match_status': 0}
{'away_team_goal': 4,
 'date': '2008-12-07',
 'home_team_goal': 1,
 'match_status': 8535}
{'away_team_goal': 2,
 'date': '2008-12-07',
 'home_team_goal': 1,
 'match_status': 9885}
{'away_team_goal': 0,
 'date': '2008-12-07',
 'home_team_goal': 2,
 'match_status': 9875}
{'away_team_goal': 0,
 'date': '2008-12-14',
 'home_team_goal': 2,
 'match_status': 8535}
{'away_team_goal': 2,
 'date': '2008-12-13',
 'home_team_goal': 5,
 'match_status': 9857}
{'away_team_goal': 2,
 'date': '2008-12-14',
 'home_team_goal': 3,
 'match_status': 8686}
{'away_team_goal': 0,

```
 'date': '2008-12-13',
 'home_team_goal': 3,
 'match_status': 9875}
{'away_team_goal': 2,
 'date': '2008-12-14',
 'home_team_goal': 0,
 'match_status': 9882}
{'away_team_goal': 2,
 'date': '2008-12-14',
 'home_team_goal': 4,
 'match_status': 8636}
{'away_team_goal': 1,
 'date': '2008-12-21',
 'home_team_goal': 5,
 'match_status': 8564}
{'away_team_goal': 3,
 'date': '2008-12-21',
 'home_team_goal': 1,
 'match_status': 9885}
{'away_team_goal': 2,
 'date': '2008-12-20',
 'home_team_goal': 1,
 'match_status': 8636}
{'away_team_goal': 2,
 'date': '2008-12-21',
 'home_team_goal': 3,
 'match_status': 8530}
{'away_team_goal': 2,
 'date': '2009-01-11',
 'home_team_goal': 3,
 'match_status': 8540}
{'away_team_goal': 3,
 'date': '2009-01-11',
 'home_team_goal': 2,
 'match_status': 8543}
{'away_team_goal': 2,
 'date': '2009-01-11',
 'home_team_goal': 2,
 'match_status': 0}
{'away_team_goal': 2,
 'date': '2009-01-11',
 'home_team_goal': 1,
 'match_status': 9888}
{'away_team_goal': 2,
 'date': '2009-01-18',
 'home_team_goal': 0,
 'match_status': 8540}
{'away_team_goal': 1,
 'date': '2009-01-18',
 'home_team_goal': 2,
 'match_status': 8533}
```

```
{'away_team_goal': 2,
 'date': '2009-01-18',
 'home_team_goal': 1,
 'match_status': 9857}
{'away_team_goal': 0,
 'date': '2009-01-18',
 'home_team_goal': 2,
 'match_status': 8529}
{'away_team_goal': 1,
 'date': '2009-01-18',
 'home_team_goal': 3,
 'match_status': 8524}
{'away_team_goal': 4,
 'date': '2009-01-25',
 'home_team_goal': 1,
 'match_status': 8529}
{'away_team_goal': 4,
 'date': '2009-01-25',
 'home_team_goal': 1,
 'match_status': 8564}
{'away_team_goal': 3,
 'date': '2009-01-25',
 'home_team_goal': 0,
 'match_status': 8686}
{'away_team_goal': 3,
 'date': '2009-01-25',
 'home_team_goal': 3,
 'match_status': 0}
```

Query 3

```python
[102]: query3 = [
    {
        "$match": {
            "height": {"$gte" : 185},
            "player_attribute.overall_rating": {"$gt": 75},
            "player_attribute.potential": {"$gt": 90},
            "player_attribute.preferred_foot": "right"
        }
    },
    {
        "$project": {
            "_id": 0,
            "player_name": 1,
            "birthday" : 1,
            "weight": 1
        }
    }
]

results = collection_player.aggregate(query3)
for result in results:
```

```
        pprint(result)
```

```
{'birthday': '1976-03-19', 'player_name': 'Alessandro Nesta', 'weight': 174}
{'birthday': '1981-07-15', 'player_name': 'Alou Diarra', 'weight': 174}
{'birthday': '1980-11-05', 'player_name': 'Christoph Metzelder', 'weight': 203}
{'birthday': '1989-09-01', 'player_name': 'Daniel Sturridge', 'weight': 168}
{'birthday': '1977-10-15', 'player_name': 'David Trezeguet', 'weight': 176}
{'birthday': '1978-03-11', 'player_name': 'Didier Drogba', 'weight': 176}
{'birthday': '1987-02-02', 'player_name': 'Gerard Pique', 'weight': 187}
{'birthday': '1978-01-28', 'player_name': 'Gianluigi Buffon', 'weight': 201}
{'birthday': '1986-12-26', 'player_name': 'Hugo Lloris', 'weight': 172}
{'birthday': '1987-01-18', 'player_name': 'Johan Djourou', 'weight': 192}
{'birthday': '1980-12-07', 'player_name': 'John Terry', 'weight': 198}
{'birthday': '1987-12-19', 'player_name': 'Karim Benzema', 'weight': 174}
{'birthday': '1978-05-08', 'player_name': 'Lucio', 'weight': 190}
{'birthday': '1986-03-27', 'player_name': 'Manuel Neuer', 'weight': 203}
{'birthday': '1985-07-10', 'player_name': 'Mario Gomez', 'weight': 194}
{'birthday': '1976-09-26', 'player_name': 'Michael Ballack', 'weight': 194}
{'birthday': '1981-10-21', 'player_name': 'Nemanja Vidic', 'weight': 194}
{'birthday': '1980-09-25', 'player_name': 'Nikola Zigic', 'weight': 212}
{'birthday': '1993-03-15', 'player_name': 'Paul Pogba', 'weight': 185}
{'birthday': '1985-02-14', 'player_name': 'Philippe Senderos', 'weight': 185}
{'birthday': '1975-03-09', 'player_name': 'Roy Makaay', 'weight': 165}
{'birthday': '1977-08-17', 'player_name': 'Thierry Henry', 'weight': 183}
{'birthday': '1986-04-10', 'player_name': 'Vincent Kompany', 'weight': 187}
{'birthday': '1981-10-03', 'player_name': 'Zlatan Ibrahimovic', 'weight': 209}
```

Query 4

```
[116]: query4 = [
    {
        "$match": {
            "team_attributes.defencePressure": {"$gt": 50},
            "team_attributes.chanceCreationPassing": {"$gt": 60},
            "team_attributes.buildUpPlaySpeedClass": "Fast"
        }
    },
    {
        "$project": {
            "_id" : 0,
            "team_name": 1,
            "team_short_name" : 1,
            "team_attributes.buildUpPlayDribblingClass": 1,
            "team_attributes.date" : 1
        }
    }
]

results = collection_teams.aggregate(query4)
for result in results:
    pprint(result)
```

```
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
                      'date': '2010-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2011-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2012-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2013-09-20'},
                     {'buildUpPlayDribblingClass': 'Normal',
                      'date': '2014-09-19'},
                     {'buildUpPlayDribblingClass': 'Normal',
                      'date': '2015-09-10'}],
 'team_name': 'KSV Cercle Brugge',
 'team_short_name': 'CEB'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
                      'date': '2010-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2011-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2012-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2013-09-20'},
                     {'buildUpPlayDribblingClass': 'Normal',
                      'date': '2014-09-19'},
                     {'buildUpPlayDribblingClass': 'Normal',
                      'date': '2015-09-10'}],
 'team_name': 'Club Brugge KV',
 'team_short_name': 'CLB'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
                      'date': '2010-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2011-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2012-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2013-09-20'},
                     {'buildUpPlayDribblingClass': 'Normal',
                      'date': '2014-09-19'},
                     {'buildUpPlayDribblingClass': 'Normal',
                      'date': '2015-09-10'}],
 'team_name': 'Manchester United',
 'team_short_name': 'MUN'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
                      'date': '2010-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2011-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2012-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
                      'date': '2013-09-20'},
                     {'buildUpPlayDribblingClass': 'Little',
```

```
                                     'date': '2014-09-19'},
                        {'buildUpPlayDribblingClass': 'Normal',
                         'date': '2015-09-10'}],
   'team_name': 'Newcastle United',
   'team_short_name': 'NEW'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
                         'date': '2010-02-22'},
                        {'buildUpPlayDribblingClass': 'Little',
                         'date': '2011-02-22'},
                        {'buildUpPlayDribblingClass': 'Little',
                         'date': '2012-02-22'},
                        {'buildUpPlayDribblingClass': 'Little',
                         'date': '2013-09-20'},
                        {'buildUpPlayDribblingClass': 'Normal',
                         'date': '2014-09-19'},
                        {'buildUpPlayDribblingClass': 'Normal',
                         'date': '2015-09-10'}],
   'team_name': 'Wigan Athletic',
   'team_short_name': 'WIG'}
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                        {'buildUpPlayDribblingClass': 'Little',
                         'date': '2013-09-20'},
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                         'date': '2014-09-19'},
                        {'buildUpPlayDribblingClass': 'Normal',
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   'team_name': 'Manchester City',
   'team_short_name': 'MCI'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
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   'team_name': 'Middlesbrough',
   'team_short_name': 'MID'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
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                         'date': '2011-02-22'},
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    'team_short_name': 'TOT'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
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    'team_name': 'Wolverhampton Wanderers',
    'team_short_name': 'WOL'}
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                             'date': '2015-09-10'}],
    'team_name': 'Burnley',
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                'team_short_name': 'BUR'}
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 'team_name': 'Blackpool',
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 'team_name': 'Sevilla FC',
 'team_short_name': 'SEV'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
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                      'date': '2013-09-20'},
                     {'buildUpPlayDribblingClass': 'Normal',
                      'date': '2014-09-19'},
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                      'date': '2015-09-10'}],
 'team_name': 'Real Sporting de Gijón',
 'team_short_name': 'SPG'}
{'team_attributes': [{'buildUpPlayDribblingClass': 'Little',
                      'date': '2010-02-22'},
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                      'date': '2011-02-22'},
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                      'date': '2012-02-22'},
                     {'buildUpPlayDribblingClass': 'Little',
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                    'date': '2013-09-20'},
                   {'buildUpPlayDribblingClass': 'Normal',
                    'date': '2014-09-19'},
                   {'buildUpPlayDribblingClass': 'Normal',
                    'date': '2015-09-10'}],
  'team_name': 'RCD Espanyol',
  'team_short_name': 'ESP'}
```

Query 5

```python
query5 = [
    {
        "$match": {
            "league.name": "Belgium Jupiler League",
            "season": "2008/2009",
            "$expr": {"$gte": [{"$add": ["$home_team_goal",␣
 ↪"$away_team_goal"]}, 4]},
        }
    },
    {
        "$project": {
            "_id" : 0,
            "season": 1,
            "stage": 1,
            "home_team_goal": 1,
            "away_team_goal": 1
        }
    }
]

results = collection_match.aggregate(query5)
for result in results:
    pprint(result)
```

```
{'away_team_goal': 3, 'home_team_goal': 1, 'season': '2008/2009', 'stage': 25}
{'away_team_goal': 3, 'home_team_goal': 1, 'season': '2008/2009', 'stage': 31}
{'away_team_goal': 1, 'home_team_goal': 3, 'season': '2008/2009', 'stage': 33}
```

Query 6

```python
query6 = [
    {
        "$match": {
            "birthday": {"$gt": "1970-01-01"},
            "height": {"$gt": 180},
            "weight": {"$lt": 150},
            "player_attribute.overall_rating" : {"$gte" : 70}
        }
    },
    {
        "$project": {
            "_id" : 0,
            "player_name": 1,
```

```python
            "birthday": 1,
            "player_attribute.potential": 1,
            "player_attribute.preferred_foot": 1,
        }
    }
]

results = collection_player.aggregate(query6)
for result in results:
    pprint(result)
```

```
{'birthday': '1979-05-29',
 'player_attribute': [{'potential': 60.0, 'preferred_foot': 'right'},
                      {'potential': 60.0, 'preferred_foot': 'right'},
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 'player_name': 'Alberto Cifuentes'}
{'birthday': '1982-04-23',
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 'player_name': 'Andy Webster'}
{'birthday': '1995-01-20',
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 'player_name': 'Calum Chambers'}
{'birthday': '1985-11-19',
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{'birthday': '1983-01-16',
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                        {'potential': 77.0, 'preferred_foot': 'left'},
                        {'potential': 76.0, 'preferred_foot': 'left'},
                        {'potential': 76.0, 'preferred_foot': 'left'}],
  'player_name': 'Rachid Ghezzal'}
{'birthday': '1990-02-17',
  'player_attribute': [{'potential': 77.0, 'preferred_foot': 'left'},
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{'birthday': '1994-01-06',
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  'player_name': 'Salih Ucan'}
```

Query 7

```python
[159]: query7 = [
    {
        "$match": {
            "team_attributes.buildUpPlaySpeedClass": "Balanced",
            "team_attributes.buildUpPlayDribblingClass": "Little",
            "team_attributes.defencePressure": {"$gte": 72},
        }
    },
    {
        "$project": {
            "_id" : 0,
            "team_name": 1,
            "team_short_name": 1,
            "team_attributes.chanceCreationPassing": 1,
            "team_attributes.defencePressure": 1,
            "team_attributes.date": 1
        }
    }
```

```
]

results = collection_teams.aggregate(query7)
for result in results:
    pprint(result)
```

```
{'team_attributes': [{'chanceCreationPassing': 65,
                      'date': '2010-02-22',
                      'defencePressure': 70},
                     {'chanceCreationPassing': 34,
                      'date': '2011-02-22',
                      'defencePressure': 39},
                     {'chanceCreationPassing': 34,
                      'date': '2012-02-22',
                      'defencePressure': 49},
                     {'chanceCreationPassing': 40,
                      'date': '2013-09-20',
                      'defencePressure': 52},
                     {'chanceCreationPassing': 21,
                      'date': '2014-09-19',
                      'defencePressure': 61},
                     {'chanceCreationPassing': 37,
                      'date': '2015-09-10',
                      'defencePressure': 72}],
 'team_name': 'FC Bayern Munich',
 'team_short_name': 'BMU'}
```

Query 8

```
[182]: query8 = [
           {
               "$match": {
                   "home_team_goal": {"$gt": 5},
                   "season": "2010/2011",
                   "$expr": {"$eq": ["$match_status", "$home_team"]}
               }
           },
           {
               "$lookup": {
                   "from": "teams",
                   "localField": "home_team",
                   "foreignField": "team_api_id",
                   "as": "home_team_info"
               }
           },
           {
               "$project": {
                   "_id": 0,
                   "stage" :1,
                   "league.country.name":1,
                   "home_team_name": "$home_team_info.team_name",
```

```
            "home_team_defencePressure": "$home_team_info.team_attributes.
  ↪defencePressure",
            "home_team_chanceCreationPassing": "$home_team_info.
  ↪team_attributes.chanceCreationPassing",
            "total_home_goals": "$home_team_goal"
        }
    }
]

results = collection_match.aggregate(query8)
for result in results:
    pprint(result)
```

{'home_team_chanceCreationPassing': [[50]],
 'home_team_defencePressure': [[50]],
 'home_team_name': ['KAS Eupen'],
 'league': {'country': {'name': 'Belgium'}},
 'stage': 11,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[56, 60, 55, 46, 41, 41]],
 'home_team_defencePressure': [[30, 35, 60, 42, 39, 39]],
 'home_team_name': ['Chelsea'],
 'league': {'country': {'name': 'England'}},
 'stage': 1,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[45, 65, 46, 46, 49, 49]],
 'home_team_defencePressure': [[40, 45, 40, 49, 42, 54]],
 'home_team_name': ['Manchester United'],
 'league': {'country': {'name': 'England'}},
 'stage': 15,
 'total_home_goals': 7}
{'home_team_chanceCreationPassing': [[30, 40, 41, 41, 28, 28]],
 'home_team_defencePressure': [[30, 50, 57, 64, 51, 51]],
 'home_team_name': ['Arsenal'],
 'league': {'country': {'name': 'England'}},
 'stage': 2,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[65, 60, 54, 48, 47, 47]],
 'home_team_defencePressure': [[45, 45, 52, 41, 56, 41]],
 'home_team_name': ['Newcastle United'],
 'league': {'country': {'name': 'England'}},
 'stage': 2,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[50, 50, 63, 63, 68, 68]],
 'home_team_defencePressure': [[55, 55, 58, 47, 59, 59]],
 'home_team_name': ['LOSC Lille'],
 'league': {'country': {'name': 'France'}},
 'stage': 16,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[60, 60, 56, 58, 60, 58]],
 'home_team_defencePressure': [[65, 45, 47, 47, 46, 41]],
```

  'home_team_name': ['VfB Stuttgart'],
  'league': {'country': {'name': 'Germany'}},
  'stage': 11,
  'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[65, 34, 34, 40, 21, 37]],
  'home_team_defencePressure': [[70, 39, 49, 52, 61, 72]],
  'home_team_name': ['FC Bayern Munich'],
  'league': {'country': {'name': 'Germany'}},
  'stage': 26,
  'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[70, 61, 60, 34, 60, 62]],
  'home_team_defencePressure': [[70, 60, 55, 45, 45, 44]],
  'home_team_name': ['Hamburger SV'],
  'league': {'country': {'name': 'Germany'}},
  'stage': 27,
  'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[60, 60, 56, 58, 60, 58]],
  'home_team_defencePressure': [[65, 45, 47, 47, 46, 41]],
  'home_team_name': ['VfB Stuttgart'],
  'league': {'country': {'name': 'Germany'}},
  'stage': 4,
  'total_home_goals': 7}
{'home_team_chanceCreationPassing': [[33, 67, 40, 55, 53, 53]],
  'home_team_defencePressure': [[30, 57, 43, 43, 50, 40]],
  'home_team_name': ['PSV'],
  'league': {'country': {'name': 'Netherlands'}},
  'stage': 10,
  'total_home_goals': 10}
{'home_team_chanceCreationPassing': [[45, 52, 48, 48, 65, 65]],
  'home_team_defencePressure': [[30, 58, 45, 46, 46, 46]],
  'home_team_name': ['SC Heerenveen'],
  'league': {'country': {'name': 'Netherlands'}},
  'stage': 18,
  'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[33, 67, 40, 55, 53, 53]],
  'home_team_defencePressure': [[30, 57, 43, 43, 50, 40]],
  'home_team_name': ['PSV'],
  'league': {'country': {'name': 'Netherlands'}},
  'stage': 2,
  'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[40, 45, 47, 67, 60, 67]],
  'home_team_defencePressure': [[30, 60, 60, 50, 50, 50]],
  'home_team_name': ['AZ'],
  'league': {'country': {'name': 'Netherlands'}},
  'stage': 21,
  'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[40, 48, 48, 56, 57, 57]],
  'home_team_defencePressure': [[30, 43, 49, 49, 49, 49]],
  'home_team_name': ['FC Groningen'],
  'league': {'country': {'name': 'Netherlands'}},
  'stage': 22,

'total_home_goals': 7}
{'home_team_chanceCreationPassing': [[31, 40, 55, 40, 48, 48]],
 'home_team_defencePressure': [[30, 36, 33, 47, 60, 60]],
 'home_team_name': ['Heracles Almelo'],
 'league': {'country': {'name': 'Netherlands'}},
 'stage': 25,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[44, 43, 60, 48, 48, 48]],
 'home_team_defencePressure': [[30, 48, 43, 43, 43, 43]],
 'home_team_name': ['Feyenoord'],
 'league': {'country': {'name': 'Netherlands'}},
 'stage': 31,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[65, 52, 54, 57, 55, 51]],
 'home_team_defencePressure': [[60, 46, 50, 55, 51, 58]],
 'home_team_name': ['Celtic'],
 'league': {'country': {'name': 'Scotland'}},
 'stage': 11,
 'total_home_goals': 9}
{'home_team_chanceCreationPassing': [[70, 48, 38, 38, 38, 38]],
 'home_team_defencePressure': [[60, 46, 48, 48, 48, 48]],
 'home_team_name': ['Rangers'],
 'league': {'country': {'name': 'Scotland'}},
 'stage': 26,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[70, 67, 71, 68, 68, 61]],
 'home_team_defencePressure': [[65, 68, 49, 39, 39, 52]],
 'home_team_name': ['Real Madrid CF'],
 'league': {'country': {'name': 'Spain'}},
 'stage': 26,
 'total_home_goals': 7}
{'home_team_chanceCreationPassing': [[70, 67, 71, 68, 68, 61]],
 'home_team_defencePressure': [[65, 68, 49, 39, 39, 52]],
 'home_team_name': ['Real Madrid CF'],
 'league': {'country': {'name': 'Spain'}},
 'stage': 38,
 'total_home_goals': 8}
{'home_team_chanceCreationPassing': [[70, 67, 71, 68, 68, 61]],
 'home_team_defencePressure': [[65, 68, 49, 39, 39, 52]],
 'home_team_name': ['Real Madrid CF'],
 'league': {'country': {'name': 'Spain'}},
 'stage': 6,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[70, 67, 71, 68, 68, 61]],
 'home_team_defencePressure': [[65, 68, 49, 39, 39, 52]],
 'home_team_name': ['Real Madrid CF'],
 'league': {'country': {'name': 'Spain'}},
 'stage': 8,
 'total_home_goals': 6}
{'home_team_chanceCreationPassing': [[45, 63, 51, 51, 54, 54]],
 'home_team_defencePressure': [[40, 56, 48, 48, 48, 48]],

```
'home_team_name': ['FC Luzern'],
'league': {'country': {'name': 'Switzerland'}},
'stage': 8,
'total_home_goals': 6}
```

13   Links

Jupyter Notebook file: Google Drive
Detail Video: Google Drive