DATABASE MANAGEMENT SYSTEMS - ASSIGNMENT 4

The Formula 1 Database

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1. Dependencies for Front End

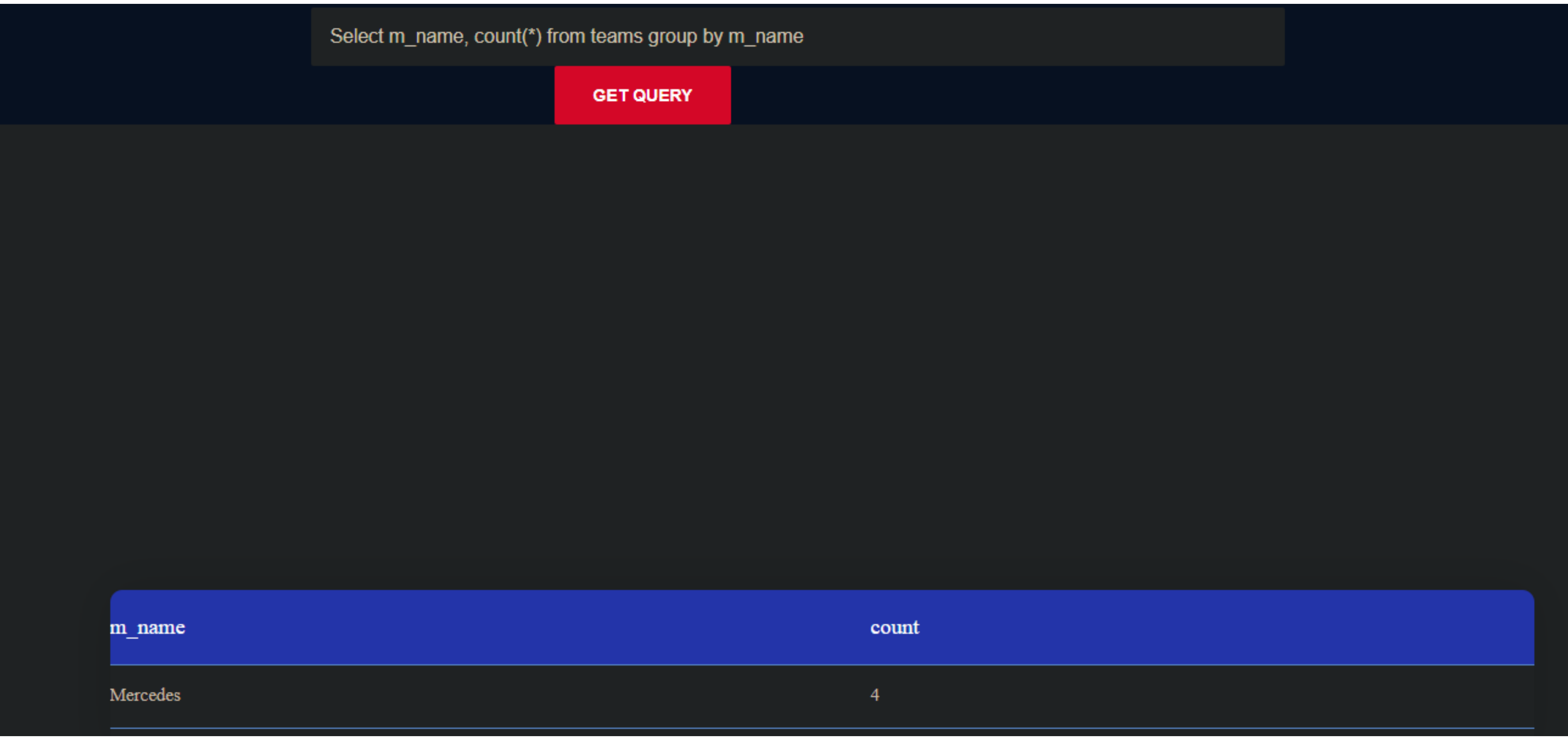
FastAPI is a modern, fast, web framework for building APIs with Python based on standard Python type hints. FastAPI is fasst compiling environment and with fewer bugs. It provides a easy yet robust design framework to work with and supports most of the standard libraries.

Jinja is a fast, expressive, extensible templating engine. Special placeholders in the template allow writing code similar to Python syntax. Then the template is passed data to render the final document.We used Jinja to connect backend and front end without using any other external server

Psycopg is the most popular PostgreSQL database adapter for the Python programming language. Its main features are the complete implementation of the Python DB API 2.0 specification and the thread safety. We used psycopy to run queries on our database

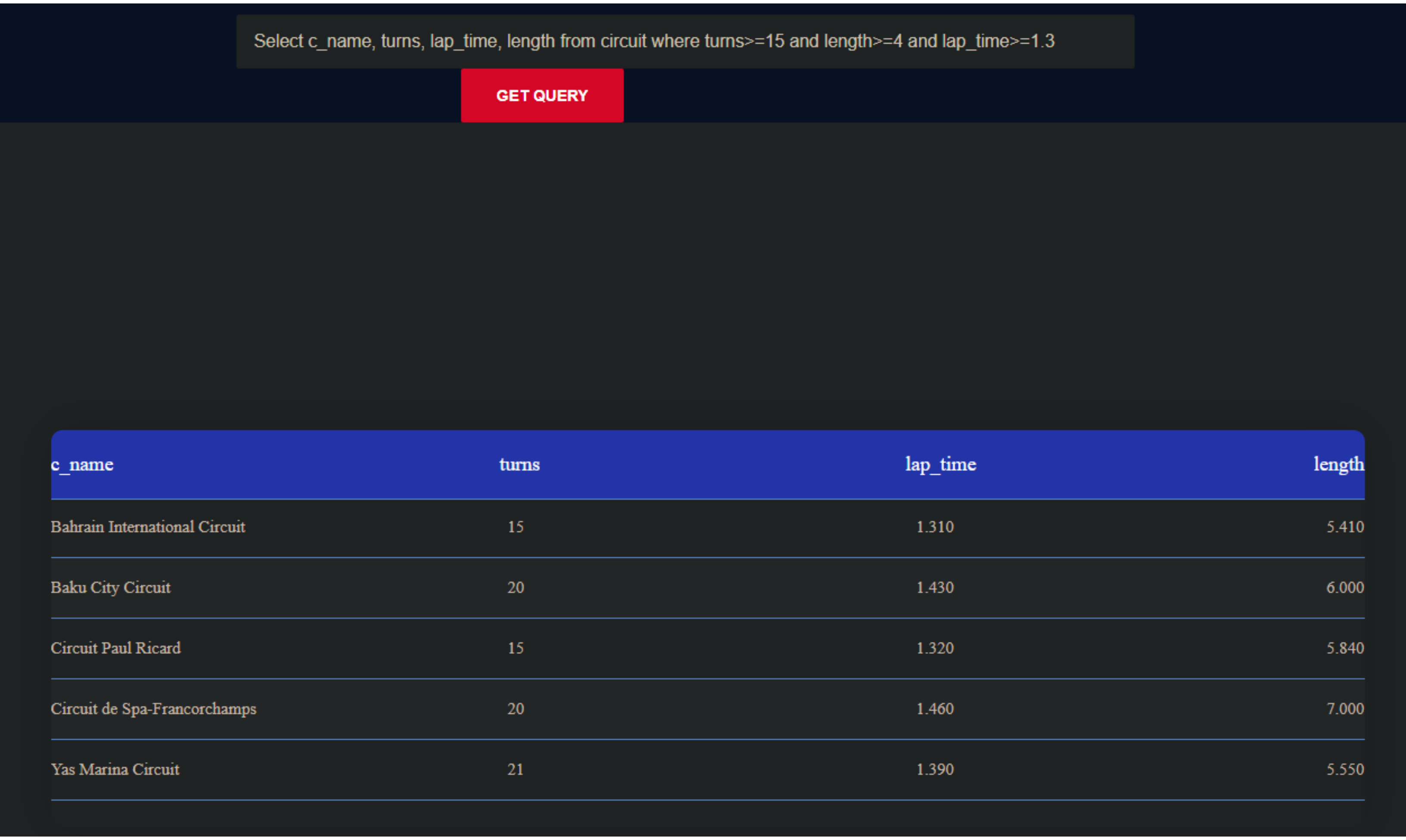
HTML, CSS were used to develop the front end of the website

2. Screenshots for the statements executed



```
Select m_name, count(*) from teams group by m_name
```

m_name	count
Mercedes	4



```
Select c_name, turns, lap_time, length from circuit where turns>=15 and length>=4 and lap_time>=1.3
```

c_name	turns	lap_time	length
Bahrain International Circuit	15	1.310	5.410
Baku City Circuit	20	1.430	6.000
Circuit Paul Ricard	15	1.320	5.840
Circuit de Spa-Francorchamps	20	1.460	7.000
Yas Marina Circuit	21	1.390	5.550

3. Change in Format

Formula 1 is an ever evolving sport as the rules and regulations are changed every year leading to many internal changes in the teams and the way races are conducted across the globe. The major changes will be observed in the manufacturer supplying the various teams and the components that will be allowed to supply every year i.e. schema change. Also due to the Covid restrictions we can observe a change in the race formats where multiple races can be conducted in the same race track multiple times a year which will lead to a constraint change. And the latest introduction of shorter race formats prior to the main race event where drivers will be allowed to gain partial points will add to the complexity by introducing additional tables in which the data should be stored and accessed

Keeping all the following changes in mind we have structured out database to accommodate all these changes that will be brought into the sport in the future as well as we have created multiple tables to ensure that the data storage and the access methods can be altered by altering the schema description of the table or additional tables can be easily integrated into the existing database

4. Migrating the Database

For migrating the database from postgresql to MonogDB we convert the database to json format where the schema and the table details are stored and the json file is imported into MongoDB.

To migrate data, you’ll extract it from PostgreSQL and then import it to MongoDB using the mongoimport tool. Let’s look at the two different ways to extract the data: returning queries as tab-separated values (TSV) or as JSON.

- TSV - The TSV format is the quick and easy option. However, it only works if the original PostgreSQL schema is relatively simple and you don’t need to embed documents in other documents with a one-to-many relationship Syntax: Copy(Select statements) TO ’/tmp/xyz.tsv’ WITH (FORMAT CSV, HEADER TRUE, DELIMITER E’’$\overset{\frown}{)}$;

- JSON - To return the results of a PostgreSQL query as JSON, you will need three functions:

  - row_to_json: Returns a row as a JSON object with column names as keys and the values from the row
  - array_to_json: Returns an array of data as a JSON array

- array_agg: Accepts a set of values and returns an array where each value in the set becomes an element in the array

Synrax: - Copy(select statement) TO '/tmp/abc.json' WITH (FORMAT text, HEADER FALSE);

5. Work Division

The front end was done by Rohan
The back end was managed by Royston and Rahul
The queries were built by all of us discussing it together