

Name: Rashi Rajesh Shetty
M.Sc. B.D.A. (BIG DATA ANALYTICS)
UID: 2309045
Roll no. 36

Formula 1 Database Management System

Introduction

This report presents an overview of the Database Management System project aimed at creating a centralized database system with a user-friendly Graphical User Interface for storing Formula 1 Motorsport Racing data. The objective of this project is to streamline the management and accessibility of the sport data for the 2023 season. The project consists of four key modules:

1. Add New Drivers: This module allows users to input and store data for new drivers participating in Formula 1 races.
2. Update and Delete Driver Entries: Users can edit or remove existing driver entries, ensuring data accuracy and relevancy.
3. F1 Constructors: This module deals with teams responsible for engineering and developing the Formula 1 race cars. It facilitates the management of team-related data.
4. Analyze Race Data and Retrievals: This module enables users familiar with SQL syntax to retrieve and display race data from the database via the frontend interface. This provides the capability for users to implement complex SQL commands to understand and analyze data about each race stored in the database, allowing for advanced data insights.

Requirement Specifications

Hardware Requirements

Processor: Intel Core I5
Hard Disk: 256GB
Ram: 8GB
Operating System: 64-Bit Windows 10

Software Specification

Frontend: Java NetBeans 8.2
Backend: MySQL 8.0

ER Model (Entity-Relationship Model)

Relationships:

Constructors to Drivers:

One-to-Many relationship from Constructors.name (Primary Key) to Drivers.constructor_name (Foreign Key)

Drivers to Constructors:

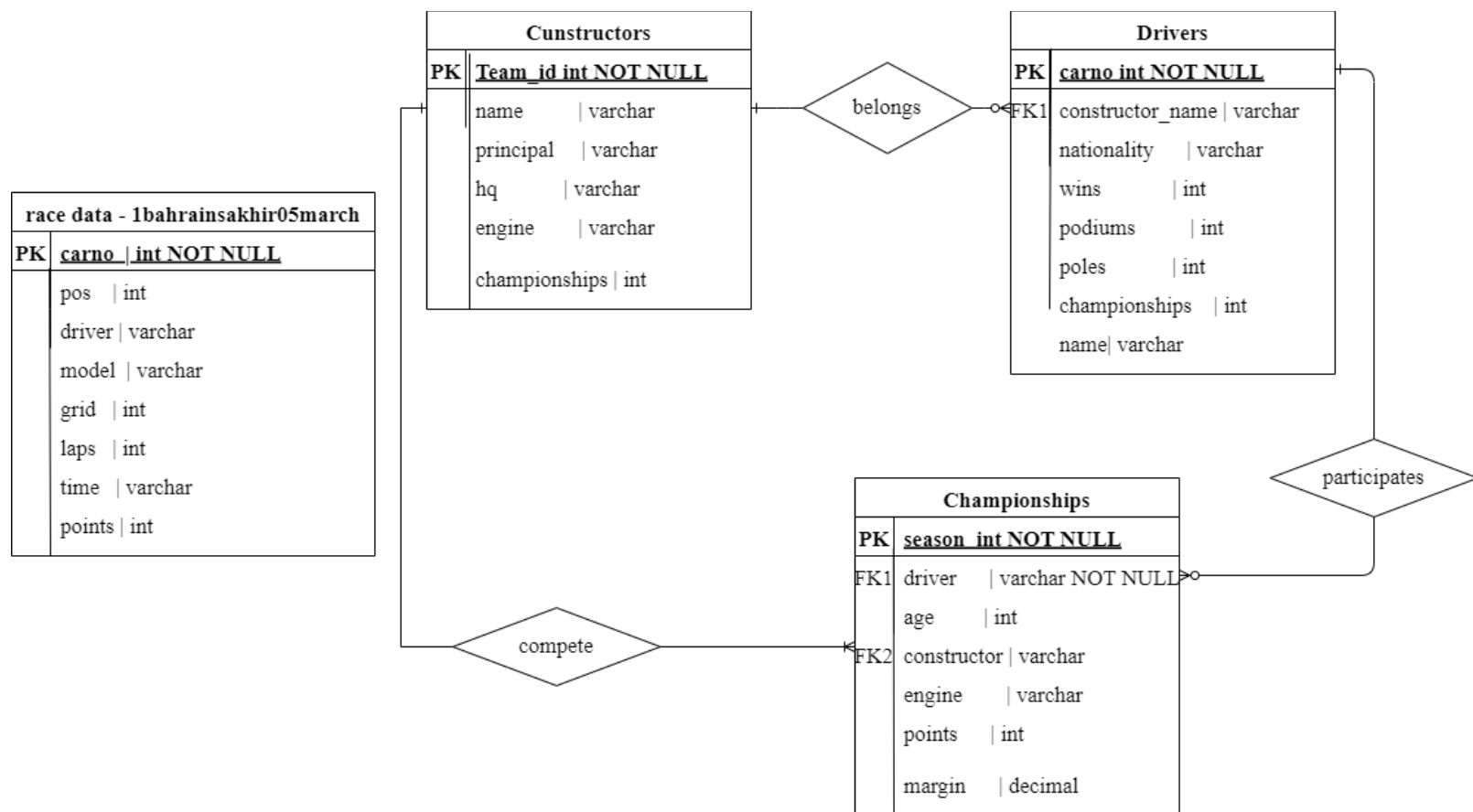
Many-to-One relationship from Drivers.constructor_name (Foreign Key) to Constructors.name (Primary Key)

Championships to Drivers:

Many-to-One relationship from Championships.driver to Drivers.name

Championships to Constructors:

Many-to-One relationship from Championships.constructor to Constructors.name



Implementation and Validations

The homepage contains four buttons, each directing users to the respective modules.

1. In the Driver Standings module, there are two sections: one for data input with text fields and an insertion button, and another displaying a table for viewing table contents, including successfully added data.

A validation measure has been implemented for the constructor field. Rather than a text box, the constructor field is presented as a dropdown menu, offering users a selection of existing constructor names from the constructor's table. This design choice prevents errors, as only valid constructor names will be accepted by the database, this is because the driver and constructor tables are connected as a parent and child table relationship.

2023 GRAND PRIX FORMULA 1 CALENDAR

NEW DRIVER RECORD

EXISTING DRIVER RECORD

CONSTRUCTOR STANDINGS

ANALYZE RACE DATA

SAKHIR

BAHRAIN

03 - 05

JEDDAH

SAUDI ARABIA

17 - 19

MELBOURNE

AUSTRALIA

31 - 02

SHANGHAI

CHINA

14 - 16

BAKU

AZERBAIJAN

20 - 26

MIAMI

UNITED STATES

05 - 07

IMOLA

ITALY

19 - 21

MONTÉ CARLO

MONACO

26 - 28

BARCELONA

SPAIN

02 - 04

MONTREAL

CANADA

16 - 18

RED BULL RING

AUSTRIA

30 - 02

SILVERSTONE

GREAT BRITAIN

03 - 05

HUNGARORING

HUNGARY

23 - 25

SPA

BELGIUM

26 - 28

ZANDVOORT

THE NETHERLANDS

25 - 27

MONZA

ITALY

01 - 03

MARINA BAY

SINGAPORE

15 - 17

SUZUKA

JAPAN

22 - 24

LOSAIL

QATAR

06 - 08

AUSTIN

UNITED STATES

18 - 20

New Driver Record

DRIVERS STANDINGS

Car No.

Driver Name

Nationality

Driving for Constructor

3

Daniel Ricciardo

Australian

Alfa Romeo Racing (formerly Sauber)

5

Sebastian Vettel

German

Aston Martin Aramco Cognizant F1 Team

6

Nicholas Latifi

Canadian

BAR (British American Racing)

8

Romain Grosjean

French

Benetton

10

Pierre Gasly

French

Brabham

11

Sergio Pérez

Mexican

BRM (British Racing Motors)

14

Fernando Alonso

Spanish

Cooper Car Company

16

Charles Leclerc

Monégasque

Eagle

18

Lance Stroll

Canadian

Inari

20

Kevin Magnussen

Danish

Russian

23

Alexander Albon

Thai

Scuderia AlphaTauri

26

Daniil Kvyat

Russian

Renault

31

Esteban Ocon

French

Red Bull Racing

33

Max Verstappen

Dutch

Mercedes-AMG Petronas

44

Lewis Hamilton

British

Williams

63

George Russell

British

Mercedes-AMG Petronas

77

Valtteri Bottas

Finnish

Mercedes-AMG Petronas

Wins Tally

Career Podiums

Pole Positions

Championships

Tally

Podiums Tally

Pole Positions

Championship Vict...

2

1

0

0

0

0

0

0

0

0

0

0

0

0

0

0

2

34

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105

10

7

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2

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0

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1

0

0

0

0

0

0

2

11

3

0

11

17

5

6

0

0

0

0

0

11

5

0

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DRIVERS STANDINGS

Car No.

Wins Tally

Driver Name

Career Podiums

Nationality

Pole Positions

Driving for Constructor

Championships

Car No.	Driver Name	Nationality	Driving for Constructor	Wins Tally	Podiums Tally	Pole Positions	Championship Victories
3	Daniel Ricciardo	Australian	Renault	2	2	0	0
5	Sebastian Vettel	German	Scuderia Ferrari	0	1	0	4
6	Nicholas Latifi	Canadian	Williams	0	0	0	0
8	Romain Grosjean	French	Haas F1 Team	0	0	0	0
10	Pierre Gasly	French	Scuderia AlphaTauri	1	2	0	0
11	Sergio Pérez	Mexico	Oracle Red Bull Racing	3	34	6	0
14	Fernando Alonso	Spain	Aston Martin Aramco Cognizant F1 Team	22	105	32	2
16	Charles Leclerc	Monegasque	Scuderia Ferrari	2	10	7	0
18	Lance Stroll	Canadian	Racing Point (now Aston Martin Cognizant F1 Team)	0	0	0	0
20	Kevin Magnussen	Danish	Haas F1 Team	0	0	0	0
23	Alexander Albon	Thai	Red Bull Racing	0	2	0	0
26	Daniil Kvyat	Russian	Scuderia AlphaTauri	0	1	0	0
31	Esteban Ocon	French	Renault	0	0	0	0
33	Max Verstappen	Dutch	Red Bull Racing	2	11	3	0
44	Lewis Hamilton	British	Mercedes-AMG Petronas	11	17	5	6
63	George Russell	British	Williams	0	0	0	0
77	Valtteri Bottas	Finnish	Mercedes-AMG Petronas	2	11	5	0

Message

Successfully Added

OK

MySQL

```
mysql> select * from drivers;
```

carno	name	nationality	constructor_name	wins	podiums	poles	championships
3	Daniel Ricciardo	Australian	Renault	2	2	0	0
5	Sebastian Vettel	German	Scuderia Ferrari	0	1	0	4
6	Nicholas Latifi	Canadian	Williams	0	0	0	0
7	Kimi Räikkönen	Finnish	Alfa Romeo Racing (formerly Sauber)	18	103	21	1
8	Romain Grosjean	French	Haas F1 Team	0	0	0	0
10	Pierre Gasly	French	Scuderia AlphaTauri	1	2	0	0
11	Sergio Pérez	Mexico	Oracle Red Bull Racing	3	34	6	0
14	Fernando Alonso	Spain	Aston Martin Aramco Cognizant F1 Team	22	105	32	2
16	Charles Leclerc	Monegasque	Scuderia Ferrari	2	10	7	0
18	Lance Stroll	Canadian	Racing Point (now Aston Martin Cognizant F1 Team)	0	0	0	0
20	Kevin Magnussen	Danish	Haas F1 Team	0	0	0	0
23	Alexander Albon	Thai	Red Bull Racing	0	2	0	0
26	Daniil Kvyat	Russian	Scuderia AlphaTauri	0	1	0	0
31	Esteban Ocon	French	Renault	0	0	0	0
33	Max Verstappen	Dutch	Red Bull Racing	2	11	3	0
44	Lewis Hamilton	British	Mercedes-AMG Petronas	11	17	5	6
63	George Russell	British	Williams	0	0	0	0
77	Valtteri Bottas	Finnish	Mercedes-AMG Petronas	2	11	5	0

18 rows in set (0.00 sec)

2. The second module serves as a data manipulation tool, allowing users to update or delete existing entries within the drivers table.

****In the context of Formula 1, each driver selects a unique car number that remains unique to them and which they use throughout their career.**

This module features a dropdown list containing the drivers' car numbers. When a number is selected from the dropdown, and the search button is clicked, the module auto-fills the corresponding data related to the chosen driver. Within this section, text fields are provided to

facilitate the editing of data. Subsequently, clicking the "update" button below will commit the edited data changes to the driver's table. Similarly, clicking the "delete" button will remove the selected driver's data from the table.

In order to prevent editing of the constructor name, a validation measure has been implemented. The text field corresponding to the constructor name has been set to a non-editable state, as the constructor name reference the constructor table. Thus, users can update other driver-related data but are restricted from modifying the constructor name.

```
jTextField3.setEditable(false);
```

Existing Driver Record

[illegible]

UPDATE EXISTING DRIVER RECORDS

Car No.

Driver Name

Nationality

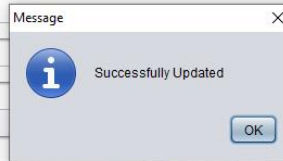
Contractor

Wins

Podiums

Poles

Championships



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Number of wins updates to 19

```
mysql> select * from drivers;
```

carno	name	nationality	constructor_name	wins	podiums	poles	championships
3	Daniel Ricciardo	Australian	Renault	2	2	0	0
5	Sebastian Vettel	German	Scuderia Ferrari	0	1	0	4
6	Nicholas Latifi	Canadian	Williams	0	0	0	0
7	Kimi Räikkönen	Finnish	Alfa Romeo Racing (formerly Sauber)	19	103	21	1
8	Romain Grosjean	French	Haas F1 Team	0	0	0	0
10	Pierre Gasly	French	Sauber AlphaToni	1	2	0	0

UPDATE EXISTING DRIVER RECORDS

Car No.

Driver Name

Nationality

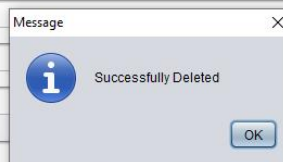
Contractor

Wins

Podiums

Poles

Championships



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Car no. 7 data is deleted from the table, leaving 17 rows

```
mysql> select * from drivers;
```


carno	name	nationality	constructor_name	wins	podiums	poles	championships
3	Daniel Ricciardo	Australian	Renault	2	2	0	0
5	Sebastian Vettel	German	Scuderia Ferrari	0	1	0	4
6	Nicholas Latifi	Canadian	Williams	0	0	0	0
8	Romain Grosjean	French	Haas F1 Team	0	0	0	0
10	Pierre Gasly	French	Scuderia AlphaTauri	1	2	0	0
11	Sergio Pórez	Mexico	Oracle Red Bull Racing	3	34	6	0
14	Fernando Alonso	Spain	Aston Martin Aramco Cognizant F1 Team	22	105	32	2
16	Charles Leclerc	Monégasque	Scuderia Ferrari	2	10	7	0
18	Lance Stroll	Canadian	Racing Point (now Aston Martin Cognizant F1 Team)	0	0	0	0
20	Kevin Magnussen	Danish	Haas F1 Team	0	0	0	0
23	Alexander Albon	Thai	Red Bull Racing	0	2	0	0
26	Daniil Kvyat	Russian	Scuderia AlphaTauri	0	1	0	0
31	Esteban Ocon	French	Renault	0	0	0	0
33	Max Verstappen	Dutch	Red Bull Racing	2	11	3	0
44	Lewis Hamilton	British	Mercedes-AMG Petronas	11	17	5	6
63	George Russell	British	Williams	0	0	0	0
77	Valtteri Bottas	Finnish	Mercedes-AMG Petronas	2	11	5	0

17 rows in set (0.00 sec)

3. The third module, the Constructor module, offers functionalities similar to the Driver module, allowing users to add new constructors and view existing ones.

Here, the constructor table was created first, establishing it as the parent table in the parent-child relationship with the drivers' table. This design decision ensures data integrity, with constraints added when creating the driver.

****In the context of Formula 1, each constructor/team assumes responsibility for engineering, developing, and fielding the car. Typically, each team hires two drivers to represent them during a season.**



CONSTRUCTORS STANDINGS

Team ID

30

Official Team Name

Toyota, Joe Gibbs Racing

Team Principal

Joe Gibbs

Headquarters

Maranello, Italy

Engine Supplier


Toyota

Championships Tally

2

Team ID	Official Team Name	Team Principal	Headquarters	Engine Supplier	Championship Victories
9	Alfa Romeo Racing (fo...	Frederic Vasseur	Hinwil, Switzerland	Ferrari	0
2	Aston Martin Aramco ...	Mike Krack	Silverstone, United Ki...	Mercedes	0
19	BAR (British American...	Craig Pollock, David R...	Brackley, UK	Honda, BAR, Honda	0
16	Benetton	Luciano Benetton, Flav...	Enstone, UK	Ford, Renault	1
14	Brabham	Bernie Ecclestone, Ron...	Chessington, UK	Ford-Cosworth, BMW	2
24	BRM (British Racing M...	Raymond Mays	Bourne, UK	BRM, Various	2
25	Cooper Car Company	John Cooper, Charles ...	Surbiton, UK	Climax, Various	2
27	Eagle	Dan Gurney	Santa Ana, USA	Weslake, Climax	0
22	Gordini	Am.d.e Gordini	Paris, France	Gordini	0
10	Haas F1 Team	Guenther Steiner	Kannapolis, USA	Ferrari	0
28	Honda	Soichiro Honda	Tokyo, Japan	Honda	0
17	Jordan	Eddie Jordan	Silverstone, UK	Ford, Mugen-Honda	0
13	Lotus (Team Lotus)	Colin Chapman, Others	Various (UK)	Ford-Cosworth, Various	7
29	Matra-Simca	Jean-Luc LagardSre	V.lizy-Villacoublav, F...	Matra-Simca	1
4	McLaren	Zak Brown	Woking, UK	Renault	0
1	Mercedes-AMG Petron...	Toto Wolff	Brackley, UK	Mercedes-Benz	7
3	Mercedes-AMG PETRO...	Toto Wolff	Brackley, United King...	Mercedes	8
1	Oracle Red Bull Racing	Christian Horner	Milton Keynes, UK	Honda	6
26	Porsche	Various	Stuttgart, Germany	Porsche, Various	1
5	Racing Point (now Ast...	Lawrence Stroll	Silverstone, UK	Mercedes-Benz	0
3	Red Bull Racing	Christian Horner	Milton Keynes, UK	Honda	4
6	Renault	Cyril Abiteboul	Enstone, UK	Renault	2
18	Sauber	Peter Sauber, Monisha ...	Hinwil, Switzerland	Ford, Ferrari	0
8	Scuderia AlphaTauri	Franz Tost	Faenza, Italy	Honda	0
7	Scuderia Ferrari	Mattia Binotto	Maranello, Italy	Ferrari	16
21	Talbot-Lago	Anthony Lago	Suresnes, France	Talbot-Lago	0
20	Toyota	Tsutomu Tomita, Tad...	Cologne, Germany	Tovota	0
15	Tyrrell	Ken Tyrrell	Ockham, UK	Ford-Cosworth	1
23	Vanwall	Tony Vandervell	Acton, UK	Vanwall	1

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Team ID

30

Official Team Name

Toyota, Joe Gibbs Racing

Team Principal

Joe Gibbs

Headquarters

Maranello, Italy

Engine Supplier

Toyota

Championships Tally

2

*In this module, an additional validation has been implemented to ensure data consistency and streamline the process of adding new entries. When a new constructor entry is added, a team_id is automatically assigned. This team_id is non-editable, and its value is increased to the next number with each new entry. This approach helps maintain a structured and unique identification system for each constructor, preventing users from manually editing or duplicating team_ids.

```

{
    try
    {
        Connection con=ConnectionProvider.getCon();
        Statement
st=con.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,ResultSet.CONCUR_READ
_ONLY);
        ResultSet rs=st.executeQuery("select max(team_id) from
constructor");
        if(rs.first())
        {
            int id=rs.getInt(1);
            id=id+1;
            String str=String.valueOf(id);
            jLabel2.setText(str);
        }
        else
        {
            jLabel2.setText("1");
        }
    }
    catch(SQLException e)
    {
        JOptionPane.showMessageDialog(null,e);
    }
}

```


CONSTRUCTORS STANDINGS

Team ID

31

Headquarters

Official Team Name

Engine Supplier

Team Principal

Championships Tally

Team ID	Official Team Name	Team Principal	Headquarters	Engine Supplier	Championship Victories
9	Alfa Romeo Racing (fo...	Frederic Vasseur	Hinwil, Switzerland	Ferrari	0

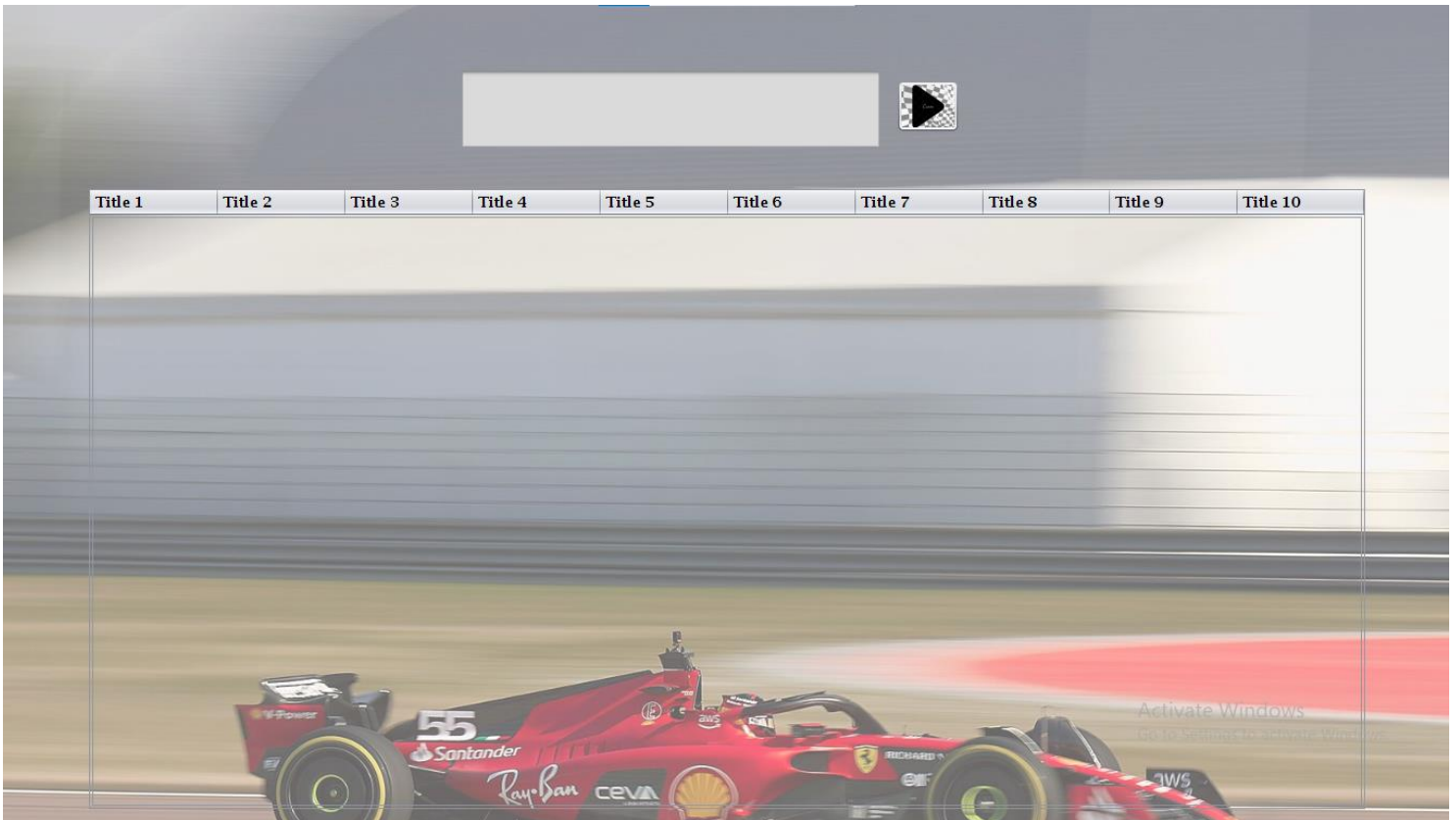
mysql> select * from constructor;

team_id	name	principal	hq	engine	championships
9	Alfa Romeo Racing (formerly Sauber)	Frederic Vasseur	Hinwil, Switzerland	Ferrari	0
2	Aston Martin Aramco Cognizant F1 Team	Mike Krack	Silverstone, United Kingdom	Mercedes	0
19	BAR (British American Racing)	Craig Pollock, David Richards	Brackley, UK	Honda, BAR, Honda	0
16	Benetton	Luciano Benetton, Flavio Briatore	Enstone, UK	Ford, Renault	1
14	Brabham	Bernie Ecclestone, Ron Tauranac	Chessington, UK	Ford-Cosworth, BMW	2
24	BRM (British Racing Motors)	Raymond Mays	Bourne, UK	BRM, Various	2
25	Cooper Car Company	John Cooper, Charles Cooper	Surbiton, UK	Climax, Various	2
27	Eagle	Dan Gurney	Santa Ana, USA	Weslake, Climax	0
22	Gordini	Amédée Gordini	Paris, France	Gordini	0
10	Haas F1 Team	Guenther Steiner	Kannapolis, USA	Ferrari	0
28	Honda	Soichiro Honda	Tokyo, Japan	Honda	0
17	Jordan	Eddie Jordan	Silverstone, UK	Ford, Mugen-Honda	0
13	Lotus (Team Lotus)	Colin Chapman, Others	Various (UK)	Ford-Cosworth, Various	7
29	Matra-Simca	Jean-Luc Lagardère	Vélizy-Villacoublay, France	Matra-Simca	1
4	McLaren	Zak Brown	Woking, UK	Renault	0
1	Mercedes-AMG Petronas	Toto Wolff	Brackley, UK	Mercedes-Benz	7
3	Mercedes-AMG PETRONAS F1 Team	Toto Wolff	Brackley, United Kingdom	Mercedes	8
1	Oracle Red Bull Racing	Christian Horner	Milton Keynes, UK	Honda	6
26	Porsche	Various	Stuttgart, Germany	Porsche, Various	1
5	Racing Point (now Aston Martin Cognizant F1 Team)	Lawrence Stroll	Silverstone, UK	Mercedes-Benz	0
3	Red Bull Racing	Christian Horner	Milton Keynes, UK	Honda	4
6	Renault	Cyril Abiteboul	Enstone, UK	Renault	2
18	Sauber	Peter Sauber, Monisha Kaltenborn	Hinwil, Switzerland	Ford, Ferrari	0
8	Scuderia AlphaTauri	Franz Tost	Faenza, Italy	Honda	0
7	Scuderia Ferrari	Mattia Binotto	Maranello, Italy	Ferrari	16
21	Talbot-Lago	Anthony Lago	Suresnes, France	Talbot-Lago	0
20	Toyota	Tsutomu Tomita, Tadahshi Yamashina	Cologne, Germany	Toyota	0
30	Toyota, Joe Gibbs Racing	Joe Gibbs	Maranello, Italy	Toyota	2
15	Tyrrell	Ken Tyrrell	Ockham, UK	Ford-Cosworth	1
23	Vanwall	Tony Vandervell	Acton, UK	Vanwall	1
11	Williams	Claire Williams	Grove, UK	Mercedes-Benz	9

31 rows in set (0.00 sec)

4. The fourth module caters to users who are proficient in SQL syntax, providing them with a text box to input SQL commands. Upon entering the SQL command and clicking the "execute" button, the system processes the command, retrieves the output from the database, and dynamically displays it in a table format. The table adjusts itself to accommodate the resultant column numbers and headers, ensuring that the displayed data aligns correctly with the executed SQL query.

*The fourth module allows users to run complex SQL commands, enabling them to analyze race data gain valuable insights. By providing a direct interface for SQL queries, users have the flexibility to formulate intricate commands tailored to their specific analytical needs. This functionality is invaluable for extracting, manipulating, and scrutinizing race data.



```
String sqlQuery = jTextArea1.getText();
try {
    Connection con = ConnectionProvider.getCon();
    Statement st = con.createStatement();
    ResultSet rs = st.executeQuery(sqlQuery);

    DefaultTableModel dtm = (DefaultTableModel) jTable1.getModel();
    dtm.setRowCount(0);

    ResultSetMetaData metaData = rs.getMetaData();
    int columnCount = metaData.getColumnCount();

    Vector<String> columnNames = new Vector<>();
    for (int i = 1; i <= columnCount; i++) {
        columnNames.add(metaData.getColumnName(i));
    }
    dtm.setColumnIdentifiers(columnNames);

    while (rs.next()) {
        Object[] rowData = new Object[columnCount];
        for (int i = 1; i <= columnCount; i++) {
            rowData[i - 1] = rs.getObject(i);
        }
        dtm.addRow(rowData);
    }

    JOptionPane.showMessageDialog(null, "Successfully Added");
    clear();
} catch (Exception e) {
```

```
e.printStackTrace();
JOptionPane.showMessageDialog(null, "Error: " + e.getMessage(),
"Error", JOptionPane.ERROR_MESSAGE);
}
```

SELECT *
FROM 1bahrairaisakhir05march

pos	carno	driver	model	grid	laps	time	points
1	1	Max Verstappen	RB19	1	57	0.06524	25
2	11	Sergio Perez	RB19	2	57	+11.987s	18
3	14	Fernando Alonso	AT04	5	57	+38.637s	15
4	55	Carlos Sainz	SF-23	4	57	+48.052s	12
5	44	Lewis Hamilton	W14	7	57	+50.977s	10
6	18	Lance Stroll	AT04	8	57	+54.502s	8
7	63	George Russell	W14	6	57	+55.873s	6
8	77	Valtteri Bottas	C43	12	57	+72.647s	4
9	10	Pierre Gasly	A523	20	57	+73.753s	2
10	23	Alexander Albon	AT04	15	57	+89.774s	1
11	22	Yuki Tsunoda	AT04	14	57	+90.870s	0
12	2	Logan Sargeant	AT04	16	56	+1 lap	0
13	20	Kevin Magnussen	VF-23	17	56	+1 lap	0
14	21	Nyck DeVries	AT04	19	56	+1 lap	0
15	27	Nico Hulkenberg	VF-23	10	56	+1 lap	0
16	24	Zhou Guanyu	C43	13	56	+1 lap	0
17	4	Lando Norris	MCL60	11	55	+2 laps	0
	31	Esteban Ocon	A523	9	41	DNF	0
	16	Charles Leclerc	SF-23	3	39	DNF	0
	81	Oscar Piastri	MCL60	18	13	DNF	0

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Query to determines the highest difference between a driver's starting grid position and ending position.

SELECT driver, carno, model, grid, laps, time, points, pos - grid
AS position_difference
FROM 1bahrairaisakhir05march
ORDER BY position_difference
DESC LIMIT 1;

driver	carno	model	grid	laps	time	points	position_difference
Lando Norris	4	MCL60	11	55	+2 laps	0	6


```
SELECT *
FROM championships
```



season	driver	age	constructor	engine	points	margin
1950	Giuseppe Farina	44	Alfa Romeo	Alfa Romeo	30	10.000000
1951	Juan Manuel Fangio	40	Alfa Romeo	Alfa Romeo	31	19.355000
1952	Alberto Ascari	34	Ferrari	Ferrari	36	33.333000
1953	Alberto Ascari	35	Ferrari	Ferrari	35	18.841000
1954	Juan Manuel Fangio	43	Maserati	Maserati	42	40.136000
1955	Juan Manuel Fangio	44	Mercedes	Mercedes	40	41.250000
1956	Juan Manuel Fangio	45	Ferrari	Ferrari	30	10.000000
1957	Juan Manuel Fangio	46	Maserati	Maserati	40	37.500000
1958	Mike Hawthorn	29	Ferrari	Ferrari	42	2.381000
1959	Jack Brabham	33	Cooper	Climax	31	12.903000
1960	Jack Brabham	34	Cooper	Climax	43	20.930000
1961	Phil Hill	34	Ferrari	Ferrari	34	2.941000
1962	Graham Hill	33	BRM	BRM	42	28.571000
1963	Jim Clark	27	Lotus	Climax	54	38.889000
1964	John Surtees	30	Ferrari	Ferrari	40	2.500000
1965	Jim Clark	29	Lotus	Climax	54	25.926000
1966	Jack Brabham	40	Brabham	Repco	42	33.333000
1967	Denny Hulme	31	Brabham	Repco	51	9.804000
1968	Graham Hill	39	Lotus	Ford	48	25.000000
1969	Jackie Stewart	30	Matra	Ford	63	41.270000
1970	Jochen Rindt	28	Lotus	Ford	45	11.111000
1971	Jackie Stewart	32	Tyrrell	Ford	62	46.774000
1972	Emerson Fittipaldi	25	Lotus	Ford	61	26.230000
1973	Jackie Stewart	34	Tyrrell	Ford	71	22.535000
1974	Emerson Fittipaldi	27	McLaren	Ford	55	5.455000
1975	Niki Lauda	26	Ferrari	Ferrari	65	30.233000
1976	James Hunt	29	McLaren	Ford	69	1.449000
1977	Niki Lauda	28	Ferrari	Ferrari	72	23.611000
1978	Mario Andretti	38	Lotus	Ford	64	20.313000
1979	Jody Scheckter	29	Ferrari	Ferrari	51	7.843000
1980	Alan Jones	34	Williams	Ford	67	19.403000
1981	Nelson Piquet	34	Brabham	Ford	50	2.000000
1982	Keke Rosberg	34	Williams	Ford	44	11.364000
1983	Nelson Piquet	31	Brabham	BMW	59	3.990000
1984	Niki Lauda	35	McLaren	TAG	72	0.694000

Write query to determine which drivers have won the most championships?

```
SELECT driver, COUNT(*) AS championships
FROM
  championships
GROUP BY
  driver
ORDER BY
  championships DESC;
```



driver	championships
Lewis Hamilton	7
Michael Schumacher	7
Juan Manuel Fangio	5
Alain Prost	4
Sebastian Vettel	4
Niki Lauda	3
Jack Brabham	3
Nelson Piquet	3
Ayrton Senna	3
Jackie Stewart	3
Graham Hill	2
Fernando Alonso	2
Alberto Ascari	2
Jim Clark	2
Emerson Fittipaldi	2
Mika Hakkinen	2
Max Verstappen	2
Nigel Mansell	1
Jochen Rindt	1
Denny Hulme	1
Jacques Villeneuve	1
Giuseppe Farina	1
Jody Scheckter	1
Nico Rosberg	1
James Hunt	1
Jenson Button	1
Phil Hill	1
Kimi Raikkonen	1
Mike Hawthorn	1
Keke Rosberg	1
Alan Jones	1
John Surtees	1
Damon Hill	1
Mario Andretti	1

Write SQL query to fetch the driver's name and their corresponding team principal's name using the "drivers" and "constructor" tables having a parent-child relationship.

```
SELECT d.carno, d.name AS driver_name, d.nationality, d.constructor_name,
       d.wins, d.podiums, d.poles, c.principal, c.hq
FROM   drivers AS d
JOIN   constructor AS c
ON     d.constructor_name = c.name;
```

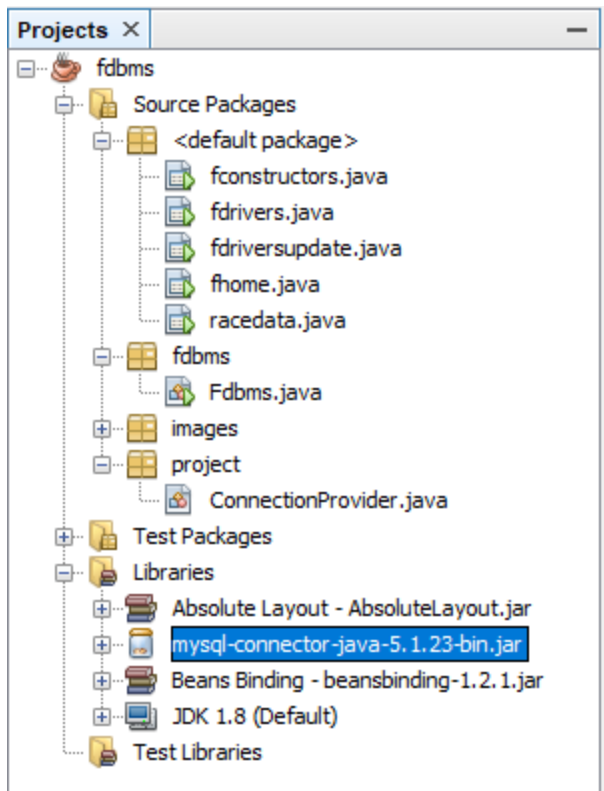


carno	name	nationality	constructor_name	wins	podiums	poles	principal	hq
3	Daniel Ricciardo	Australian	Renault	2	2	0	Cyril Abiteboul	Enstone, UK
5	Sebastian Vettel	German	Scuderia Ferrari	0	1	0	Mattia Binotto	Maranello, Italy
6	Nicholas Latifi	Canadian	Williams	0	0	0	Claire Williams	Grove, UK
8	Romain Grosjean	French	Haas F1 Team	0	0	0	Guenther Steiner	Kannapolis, USA
10	Pierre Gasly	French	Scuderia AlphaTauri	1	2	0	Franz Tost	Faenza, Italy
11	Sergio Pérez	Mexico	Oracle Red Bull Racing	3	34	6	Christian Horner	Milton Keynes, UK
14	Fernando Alonso	Spain	Aston Martin Aramco	22	105	32	Mike Krack	Silverstone, United Kingdom
16	Charles Leclerc	Monégasque	Scuderia Ferrari	2	10	7	Mattia Binotto	Maranello, Italy
18	Lance Stroll	Canadian	Racing Point (now Aston Martin)	0	0	0	Lawrence Stroll	Silverstone, UK
20	Kevin Magnussen	Danish	Haas F1 Team	0	0	0	Guenther Steiner	Kannapolis, USA
23	Alexander Albon	Thai	Red Bull Racing	0	2	0	Christian Horner	Milton Keynes, UK
26	Daniil Kvyat	Russian	Scuderia AlphaTauri	0	1	0	Franz Tost	Faenza, Italy
31	Esteban Ocon	French	Renault	0	0	0	Cyril Abiteboul	Enstone, UK
33	Max Verstappen	Dutch	Red Bull Racing	2	11	3	Christian Horner	Milton Keynes, UK
44	Lewis Hamilton	British	Mercedes-AMG Petronas	11	17	5	Toto Wolff	Brackley, UK
63	George Russell	British	Williams	0	0	0	Claire Williams	Grove, UK
77	Valtteri Bottas	Finnish	Mercedes-AMG Petronas	2	11	5	Toto Wolff	Brackley, UK

Database Connection

In order to establish a secure connection between the Java application and the MySQL database [fdbms], a dedicated 'ConnectionProvider' class is implemented. By importing essential Java SQL libraries, within the 'getConnection()' method of the 'ConnectionProvider' class, the MySQL JDBC driver is loaded, and a connection to the database is established. The connection details, including the database URL, username, and password, are configured to ensure secure access. In the event of any unforeseen exceptions, the exception handling mechanism handles errors and returns a 'null' value.

*The key to database connectivity is adding the 'mysql-connector-java-5.1.23-bin.jar' JAR file to the project libraries folder.



ConnectionProvider.java

```
package project;
import java.sql.*;

/**
 *
 * @author rashi
 */
public class ConnectionProvider {
    public static Connection getCon()
    {
        try
        {
            Class.forName("com.mysql.jdbc.Driver");
            Connection
con=DriverManager.getConnection("jdbc:mysql://localhost:3306/fdbms","root","
rashishetty");
            return con;
        }
        catch (Exception e)
        {
            return null;
        }
    }
}
```


Conclusion

In conclusion, the project successfully leverages Java and MySQL to create an efficient system by establishing secure database connections, implementing data manipulation logic, and data validations. The seamless integration of Java and MySQL, along with proper database design and connectivity, ensures the reliability and scalability of the software.

References

1. Stack Overflow. How to connect NetBeans to MySQL database?
2. Apache NetBeans. Connecting to a MySQL Database
3. MySQL Community Downloads