Analysis of Wildlife Strikes to Aircraft

Practicum I CS5200

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Database Connection

This code block establishes connection to the database so that we can make queries directly from R and retrieve the data from the freemysqlhosting database.

```
## [1] "Connection successful"
```

Creating the Database Schema

This creates tables that will hold all the database schema. The database schema has four main tables: - `flights table` : Records the flight details. It has unique fId, flight date, the origin airport, the airline name, the aircraft type, and a boolean indicating if it's a heavy aircraft type. It links to the `airports` table through the `originAirport` key. - `airports table` : Records airport details. It has a unique aID, name, state, and a default Airport code. - `conditions table` : Records sky conditions that can happen during flights and a text explanation for every sky condition. - `strikes table` : Records bird strike incidents. It has a unique sid, and fid linking to flights table, number of birds with a default value, impact on the flight, damage, altitude in ft and it also links to the conditions table using cid.

```
## [1] 0
```

```
## [1] 0
```

```
## [1] 0
```

```
## [1] 0
```

Database Table Testing

This code block checks the existence of the tables: `flights` , `conditions` , `strikes` , and `airports` . If it exists, print its structure to see the columns in it.

Checking the Flights Table

Check if the flights table exists and print the structure

Checking the Conditions Table

Check if the Conditions table exists and print the structure

Checking the Strikes Table

Check if the Strikes table exists and print the structure

Checking the Airports Table

Check if the Airports table exists and print the structure

Loading Bird Strike Data

This code block will load the bird strike data from a CSV file which has records of bird strike incidents like the date, location, airline, and impact of each incident. The CSV data is loaded into the dataframe `bds.raw`.

```
## [1] "CSV File loaded"
```

Inserting data into airports table

This code block inserts value into the `airports` table with data from CSV file. Each airport has a unique aid, name and state, and a default code 'ZZZ' for the airport code.

Inserting data into conditions table

This code block inserts values into conditions table which has a list of sky conditions. It only adds unique values into the database.

Preparing and Inserting Flight Data

The next two code blocks involve adding data from the CSV files and formatting date strings for SQL compatibility.

Formatting Dates for SQL

This code block converts the date format directly compatible with SQL database. It takes a date string, attempts to parse it into a `Date` object and then format it into a string suitable for SQL.

Inserting Flight Records

The code block is used to insert the data into the flights table like the fId, date, origin airport, airline name, aircraft type, isHeavy Flag details.

Preparing and Inserting Strikes Data

The next three code blocks involve adding strikes data from the CSV files and retrieve the fId and cId from the flighst and conditions table.

Lookup Flight ID Function

This code block queries the database to find the flight ID (fid) associated with a given airport name to linking strike incidents to flights based on the airport's name.

Lookup Condition ID Function

This code block queries the database to find the condition ID (cid) based on sky conditions to link strike incidents with sky conditions recorded in the conditions table.

Inserting Data into Strikes Table

This code block uses the lookup_fid and lookup_cid functions and inserts bird strike incident data into the strikes table.

Function calls for inserting Data into the Tables

This code block has the function calls from the above code chunks to insert data into the CSV file

Testing the loading of the data into tables

This code block tests if the loading of data into the tables was successful by displaying the ifrst five rows of every table

Top Airports with Strike

This code block gives the top 10 states with the greatest number of bird strike incidents

```
##    airportState numIncidents
## 1    California         2499
## 2         Texas         2445
## 3       Florida         2045
## 4      New York         1315
## 5      Illinois         1007
## 6  Pennsylvania          985
## 7      Missouri          956
## 8      Kentucky          806
## 9          Ohio          773
## 10       Hawaii          716
```

Analysis by Airline

This code block gives the top airlines that had an above average number bird strike incidents.

Displaying records 1 - 10

airlineName	NumberOfIncidents
BUSINESS	3419
AMERICAN AIRLINES	2961
US AIRWAYS	2421
SOUTHWEST AIRLINES	1368
UNITED AIRLINES	989
DELTA AIR LINES	977
NORTHWEST AIRLINES	969
AMERICAN EAGLE AIRLINES	863
TRANS WORLD AIRLINES	815
COMAIR AIRLINES	800

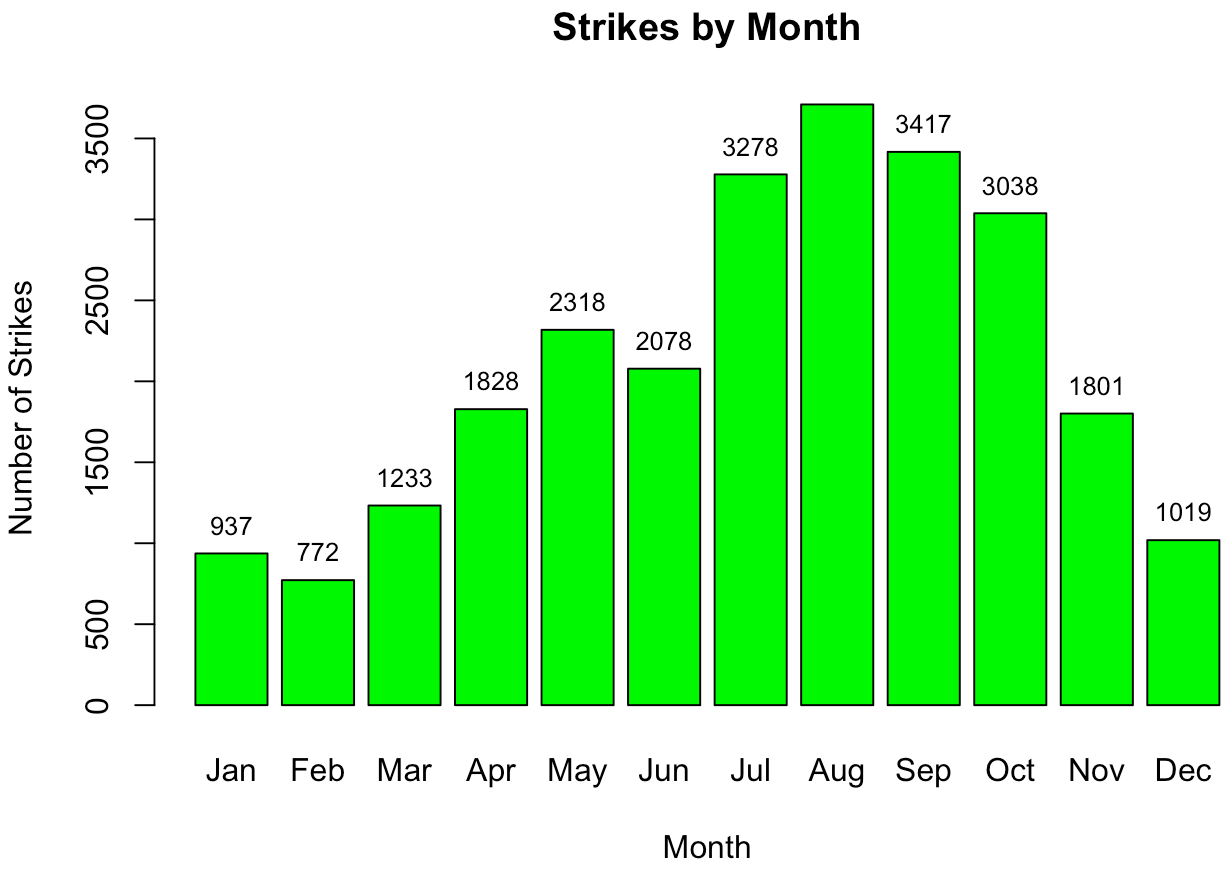
Analysis by month

This code block gives the total number of wildlife strikes by month.

```
##    month num_strikes
## 1    Jan         937
## 2    Feb         772
## 3    Mar        1233
## 4    Apr        1828
## 5    May        2318
## 6    Jun        2078
## 7    Jul        3278
## 8    Aug        3710
## 9    Sep        3417
## 10   Oct        3038
## 11   Nov        1801
## 12   Dec        1019
```

Trend by month

This code block gives how wildlife strikes vary by month



Audit Logging

This code block creates an audit_log table designed to track modifications within the database, specifically deletions from the strikes table.

```
## [1] 0
```

```
## [1] 0
```

```
## [1] 0
```

```
## [1] 0
```

```
##   id modification_type modified_table modification_timestamp record_id
## 1 47          Deletion        strikes    2024-03-13 03:39:02         1
## 2 46          Deletion        strikes    2024-03-13 03:38:41         1
## 3 45          Deletion        strikes    2024-03-13 03:17:22         1
## 4 44          Deletion        strikes    2024-03-13 03:16:53         1
## 5 43          Deletion        strikes    2024-03-13 02:27:34         1
##                description
## 1 Deleted strike with ID 1
## 2 Deleted strike with ID 1
## 3 Deleted strike with ID 1
## 4 Deleted strike with ID 1
## 5 Deleted strike with ID 1
```

```
## [1] id                    modification_type      modified_table
## [4] modification_timestamp record_id             description
## <0 rows> (or 0-length row.names)
```