Low Level Design (LLD)

Data Visualization of Bird Strikes between 2000-2011

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Document Control

Date	Version	Description	Author
04/11/2022	1.0	Introduction, Problem Statement	Deepali
20/11/2022	1.1	Dataset Information, Architecture Description	Deepali
22/11/2022	1.2	Final Revision	Deepali

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1. Introduction

1.1 What is Low Level Design Document?

The goal of the Low-level design document (LLDD) is to give the internal logic design of the actual program code for the Heart Disease Diagnostic Analysis dashboard. LLDD describes the class diagrams with the methods and relations between classes and programs specs. It describes the modules so that the programmer can directly code the program from the document.

1.2 What is Scope?

Low-level design (LLD) is a component-level design process that follows a step-by-step refinement process. The process can be used for designing data structures, required software architecture, source code and ultimately, performance algorithms. Overall, the data organization may be defined during requirement analysis and then refined during data design work.

1.3 Project Introduction

A bird strike is strictly defined as a collision between a bird and an aircraft which is in flight or on a take-off or landing roll. The term is often expanded to cover other wildlife strikes - with bats or ground animals. Bird Strike is common and can be a significant threat to aircraft safety. For smaller aircraft, significant damage may be caused to the aircraft structure and all aircraft, especially jet-engine ones, are vulnerable to the loss of thrust which can follow the ingestion of birds into engine air intakes. This has resulted in several fatal accidents. Bird strikes may occur during any phase of flight, but are most likely during the take-off, initial climb, approach and landing phases due to the greater numbers of birds in flight at lower levels. To have a closer look the following document visually depicts the data collected on Bird Strikes by FAA between 2000-2011.,

2. Problem Statement

The goal of this project is to analyse the bird strike incidents happened between 2000-2011. To achieve the goal, we used a data set that is collected by FAA during 2000-2011. The objective of the project is to perform data visualization techniques to understand insights of the data. This project aims apply various Business Intelligence tools such as Tableau or Power BI to get a visual understanding of the data.

3. Dataset Information

Record Id: Unique Id for the incidents

Aircraft Type: Type of aircraft

Aircraft Name: Name of aircraft

Altitude Bin: Altitude of aircraft <1000 and >1000

Aircraft make Model: Model number of aircraft

Wildlife number struck: Number of wildlife struck in the aircraft

Wildlife number struck actual: Actual no. of wildlife struck

Effect impact to flight: Effect of impact on flight

Flight Date: Date of flight

Effect indicated damage: Whether damage is caused to aircraft or not

Aircraft no. of Engines: No. of engines in aircraft

Aircraft Airline Operator: Name of airline operator

Origin State: Origin state for the aircraft

When phase of flight: Phase of flight

Conditions Precipitation:

Remains of Wild Life Collected: Whether wild life remains collected or not

Remains of Wild life send to smitsonian: Whether wild life remains sent to Smithsonian

Wildlife Size: Size of the wildlife

Conditions Sky: Condition of the sky

Wildlife Species: Species of the wild life

Pilot warned of birds or wildlife: Whether the pilot is warned about the wildlife
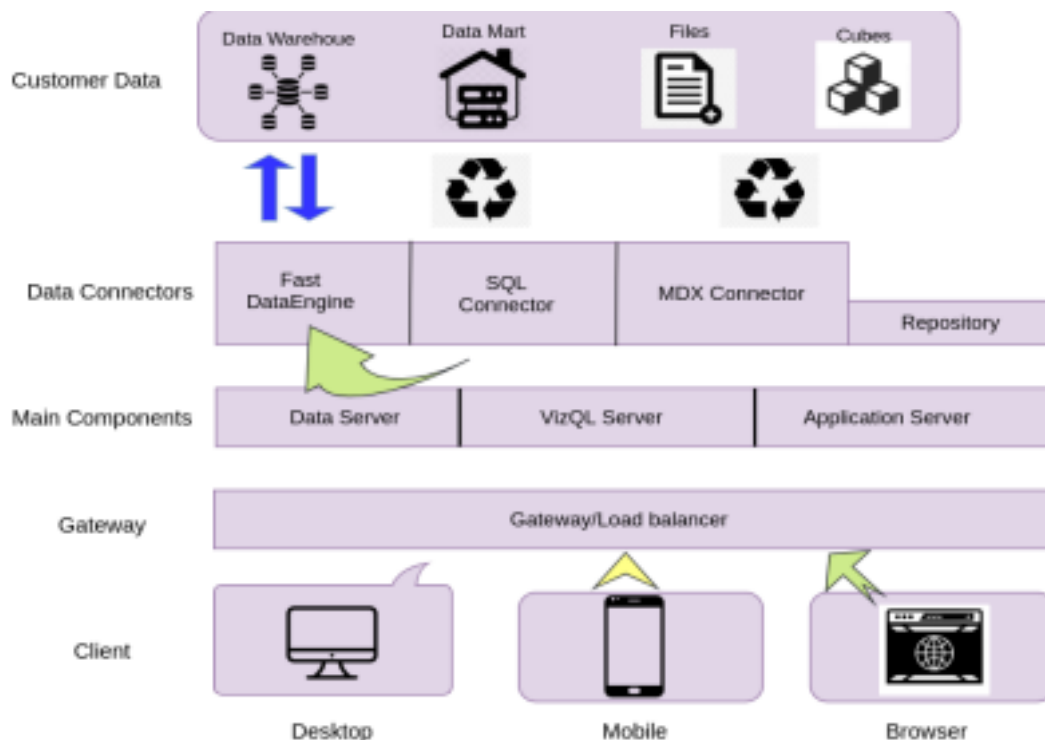
Cost Total: Total cost incurred due to bird strike incidents

Feet above ground: Height of the plane during the incidents

Number of people injured: No. of people injured during the incidents

Is Aircraft large : whether the aircraft is large or not

4. Architecture

4.1 Architecture Description

1. **Raw Data Collection** The Dataset was taken from iNeuron's Provided Project Description Doccument https://drive.google.com/drive/folders/1hLkL5HO4xG9rIjL8XeS6q-uAjwbTDSX6?usp=sharing

2. Data Pre-Processing

Before building any model, it is crucial to perform data pre-processing to feed the correct data to the model to learn and predict. Model performance depends on the quality of data feeded to the model to train.
This Process includes-
   a) Handling Null/Missing Values
   b) Handling Skewed Data
   c) Outliers Detection and Removal

3. Data Cleaning

Data cleaning is the process of fixing or removing incorrect, corrupted, incorrectly formatted, duplicate, or incomplete data within a dataset.
   a) Remove duplicate or irrelevant observations
   b) Filter unwanted outliers
   c) Renaming required attributes

4. Exploratory Data Analysis (EDA)

Exploratory Data Analysis refers to the critical process of performing initial investigations on data to discover patterns, spot anomalies, test hypothesis and to check assumptions with the help of summary statistics and graphical representations.

5. Reporting

Reporting is a most important and underrated skill of a data analytics field. Because being a Data Analyst you should be good in easy and self explanatory report because your model will be used by many stakeholders who are not from technical background.
   a) High Level Design Document (HLD)
   b) Low Level Design Document (LLD)
   c) Architecture
   d) Wireframe
   e) Detailed Project Report
   f) Power Point Presentation

6. Modelling

Data Modelling is the process of analysing the data objects and their relationship to the other objects. It is used to analyse the data requirements that are required for the business processes. The data models are created for the data to be stored in a database. The Data Model's main focus is on what data is needed and how we have to organize data rather than what operations we have to perform.

7. Deployment

We created a Power BI Dashboard
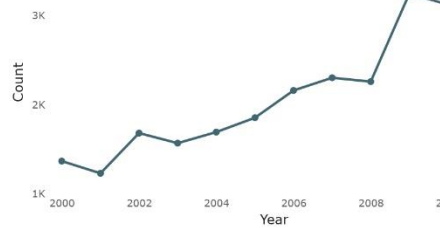
Bird Strikes
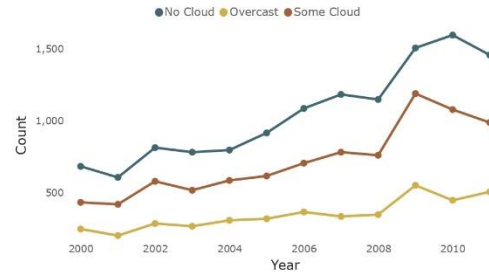
Total No. of Bird Strikes	Total Cost Incurred	Total No. of people injured
25.56K	$142.29M	27

Number of bird strikes incidents per year

Number of bird strikes incidents by Sky conditions
● No Cloud ● Overcast ● Some Cloud

Bird Strike incidents in US

Top 10 Airlines having encountered bird strikes incidents

SOUTHWEST AIRLIN... 4.6K
BUSINESS 3.1K
AMERICAN AIRLINES 2.1K
DELTA AIR LINES 1.3K
US AIRWAYS 1.3K
AMERICAN EAGLE AI... 0.9K
SKYWEST AIRLINES 0.9K
JETBLUE AIRWAYS 0.7K
UPS AIRLINES 0.6K
UNITED AIRLINES 0.5K

Cost Incurred due to bird strikes incidents

3.95% 16.34% 6.36% 9.26% 5.70% 4.94% 12.87% 7.61% 8.41% 6.72% 8.05% 9.26%
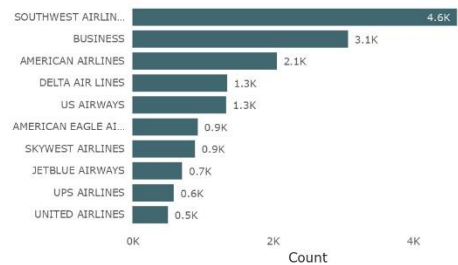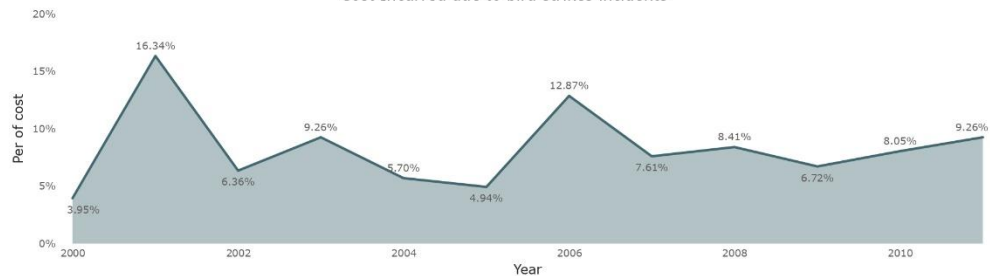
Percent of incidents in which flight is impacted

None
Precautionary Landing
Aborted Take-off
Other
Engine Shut Down
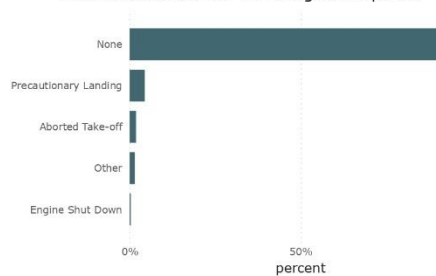
Percent of incidents by phase of flight
● Caused damage ● No damage

Approach
Landing Roll
Take-off run
Climb
Descent
Taxi
Parked

Indicated Damage
● No damage ● Caused damage

9.69%
90.31%

Altitude
● < 1000 ft ● > 1000 ft

19.16%
80.84%
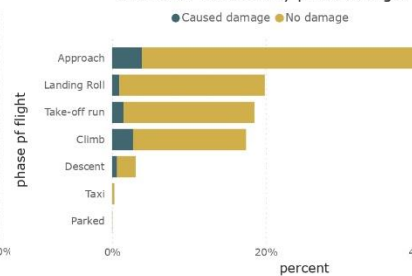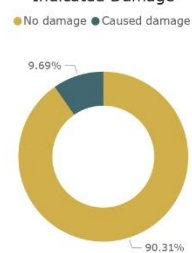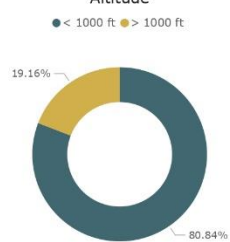
Is Pilot warned about birds
● N ● Y

42.72%
57.28%