

## Final Project Submission

Please fill out:

- ◆ Student name: Charity Nguru
- ◆ Student pace: part time
- ◆ Scheduled project review date/time: 21/11/24
- ◆ Instructor name: NOAH KANDIEBlog post
- ◆ URL:

# AVIATION DATA PROJECT

## **Business Overview:**

For this project, I will use data cleaning, imputation, analysis, and visualization to generate insights for a business stakeholder.

## **Business Problem:**

The company is expanding in to new industries to diversify its portfolio. Specifically, they are interested in purchasing and operating airplanes for commercial and private enterprises, but do not know anything about the potential risks of aircraft. You are charged with determining which aircraft are the lowest risk for the company to start this new business endeavor. You must then translate your findings into actionable insights that the head of the new aviation division can use to help decide which aircraft to purchase.

## **Dataset:**

In the `data` folder is a [dataset](https://www.kaggle.com/datasets/khsamaha/aviation-accident-database-synopses) from the National Transportation Safety Board that includes aviation accident data from 1962 to 2023 about civil aviation accidents and selected incidents in the United States and international waters.

## **Goal:**

Recommend aircraft types and safety measures based on data analysis.

## **Business Understanding**

### **Stakeholder Needs:**

The aviation division head requires actionable insights to minimize risk when selecting aircraft for operations. These insights must address safety, reliability, and potential hazards associated with specific aircraft types, flight conditions, or operational factors. Additionally, other stakeholders, such as safety officers and insurers, benefit from understanding these risks for policy-making and risk mitigation strategies.

### **Statement of the Problem:**

The company seeks to identify aircraft and operational conditions with the lowest risk to ensure a safe and profitable entry into the aviation industry. This involves analyzing historical aviation data to determine factors influencing safety, such as injury trends, weather conditions, and flight phases. Without such analysis, the company risks making uninformed decisions, which could lead to financial losses, operational challenges, and compromised safety.

Approach:

1. Data Analysis;
  - i) Investigate trends in accident frequency over time.
  - ii) Examine relationships between aircraft specifications and safety records.
  - iii) Assess the impact of external factors (e.g., weather, flightpurpose) on safety outcomes.

### **outcome ...**

Weather conditions strongly correlate with higher fatalities, especially adverse conditions like storms or fog. . The landing and takeoff phases have the most accidents. .

A general decline in fatalities is observed after the year 2000, potentially due to better technology and regulations

### 1. Data Cleaning

Removed irrelevant columns (e.g., redundant identifiers, report status). . Addressed missing values by imputing or replacing them with median values or 'Unknown'. . Extracted key insights from cleaned data.

## 2. Visualization

Used visual storytelling (e.g., bar charts) to highlight findings.

Include the three charts:

I) Fatalities by Weather Condition (Bar Chart)

II) Fatalities by Phase of Flight(Bar Chart)

III) Injury Severity Distribution (Pie Chart)

### 1. Fatalities by Weather Condition Objective:

- **Purpose:**

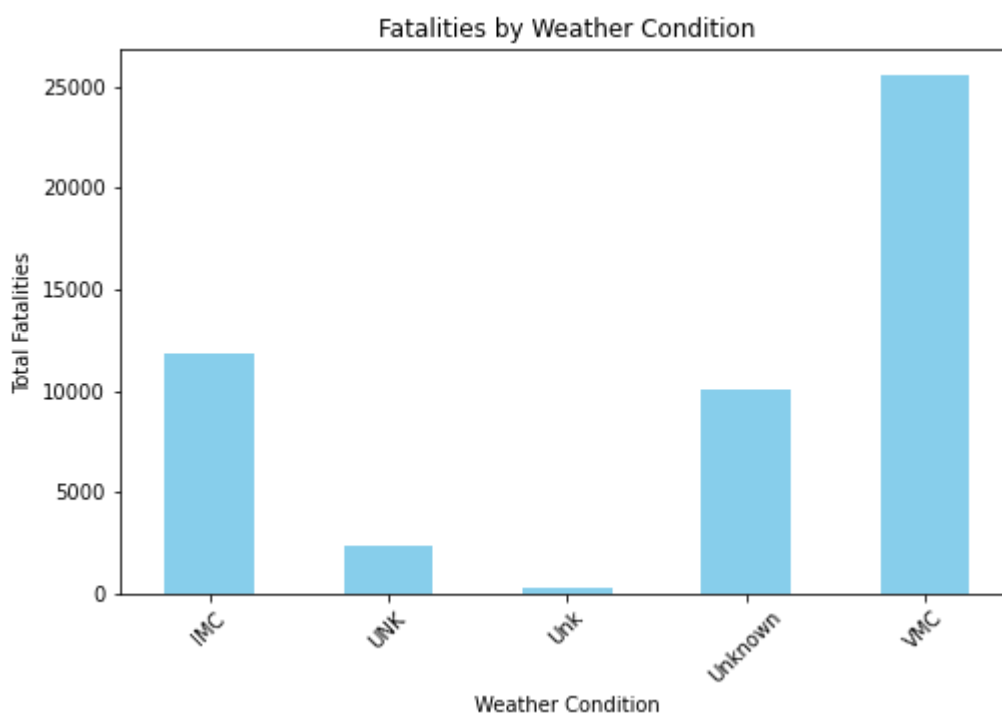
Demonstrate the impact of weather conditions on fatalities.

- **Findings:**

- ✓ Higher fatalities are linked to adverse weather conditions (e.g., storms or fog).
- ✓ Clear weather still shows a significant number of fatalities, which may highlight operational or mechanical issues during otherwise safe conditions.

- **Business Implication:** Focus on acquiring aircraft equipped with advanced technology for adverse weather handling. Prioritize pilot training for operations in challenging weather.

Visualization Type: Bar Chart



### 2. Fatalities by Phase of Flight Objective:

- **Purpose:** Identify the riskiest phases of a flight.

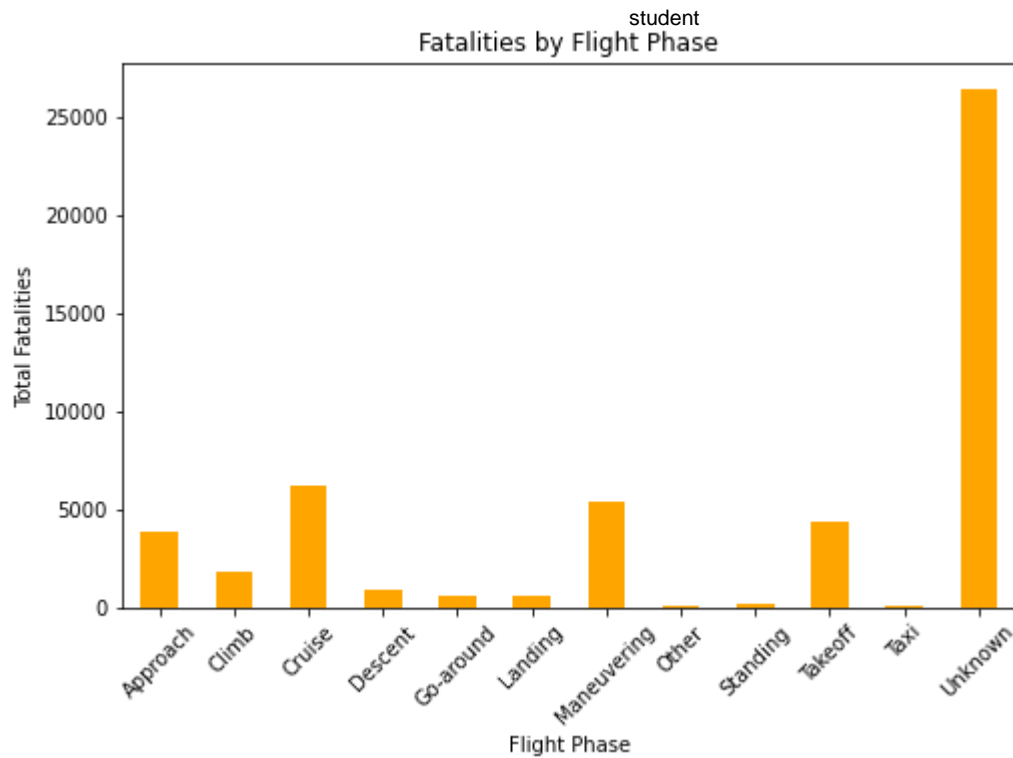
- **Findings:**

- Takeoff and landing phases have the highest fatalities, likely due to their technical complexity.
- Cruising shows relatively fewer incidents but often results in high fatalities due to high-speed impact.

- **Business Implication:**

Enhance safety protocols and maintenance checks for takeoff and landing. Consider investing in planes with advanced stabilization and landing systems.

Visualization Type: Bar Chart



### 3) Injury Severity Distribution

• **Purpose:** Highlight proportions of different injury severity across all incidents.

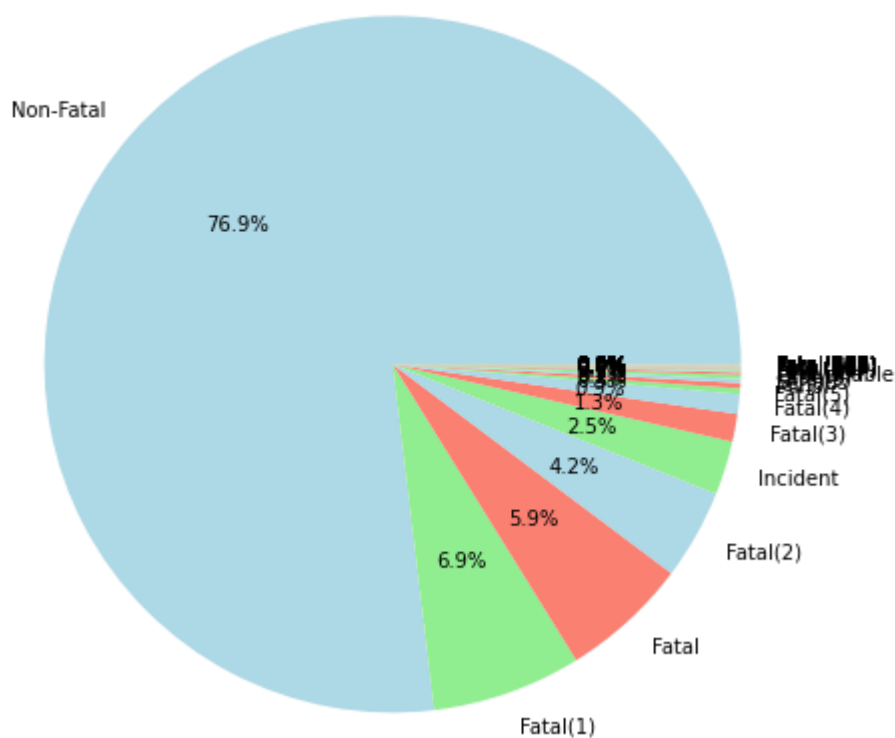
• **Findings:**

- Severe injuries and fatalities form a significant portion, underlining the risks involved.
- Uninjured cases indicate areas where safety systems or conditions were adequate to protect lives.

• **Business Implication:** Look into incidents with minor or no injuries to identify patterns of effective safety measures and replicate them.

Visualization Type: Pie Chart

### Injury Severity Distribution



**Recommendations** . (Actionable recommendations for aviation safety)**1.** Invest in Aircraft designed for Adverse Weather Conditions

- ✓ **Insight:** A significant proportion of fatalities occur during poor weather conditions.
- ✓ **Action:** Acquire aircraft with advanced weather-navigation systems, like radar and anti-icing technology.
- ✓ **Benefit:** Minimizes risks during poor weather and ensures safe operations year-round.

**2.** Enhance Safety Protocols for Takeoff and Landing

- ✓ **Insight:** These are the riskiest phases, contributing to most fatalities.
- ✓ **Action:** Focus on pilot training for handling emergencies during these phases.
- ✓ **Benefit:** Reduces incidents caused by human error and technical failures.

**3.** Adopt Aircraft Models from Recent Years

- ✓ **Insight:** Fatalities have declined significantly in recent years, likely due to technological advancements in newer aircraft.
- ✓ **Action:** Prioritize purchasing aircraft built after 2000 and maintain rigorous checks for older models.
- ✓ **Benefit:** Leverages modern safety features for reduced risks.

**4.** Implement Detailed Incident Review Practices

- ✓ **Insight:** Historical data shows recurring issues in specific scenarios (e.g., high-speed cruising).
- ✓ **Action:** Use predictive analytic to flag flights at higher risk based on historical trends.
- ✓ **Benefit:** Proactively prevents incidents through data-driven decision-making.

**NEXT STEPS:****Future Opportunities for Aviation Risk Management****1. Conduct a Comprehensive Analysis of Manufacturer Reliability**

- ✓ Investigate the performance of different manufacturers (e.g., Boeing, Airbus) over time.
- ✓ Choose suppliers with consistent safety records.

**2. Expand to Include Global Aviation Data**

- ✓ Broaden the data set to include international aviation incidents beyond the U.S.
- ✓ Gain a more diverse understanding of risks in different environments.

**3. Simulate Scenarios Using Predictive Models**

- ✓ Use machine learning models to simulate and predict high-risk scenarios.
- ✓ Tailor safety measures to address specific potential hazards.

**4. Collaborate with Aviation Experts**

- ✓ Engage with pilots, maintenance teams, and regulators for qualitative insights.
- ✓ Validate your findings against expert experience and knowledge.

**THANK YOU**

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- **Call to Action:**
  - "Do you have any questions or areas where you'd like deeper analysis?"



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