Aviation Accident Risk Analysis

EXPLORING RISK FACTORS AND PATTERNS IN AVIATION ACCIDENTS

Project Overview

- **Goal**: Analyze aviation accident data to identify risk factors and recommend actionable insights.
- **Objective**: Provide data-driven recommendations for reducing risks in aviation operations.
- **Tools Used**: Python (Jupyter Notebook) and Excel.

Why This Analysis Matters

- **Industry Context**: Aviation safety is critical for reducing fatalities and maintaining public trust.
- **Business Need**: Identify operational patterns.
- **Stakeholder Goal**: Make informed decisions about aviation safety and investments.

Dataset Overview

Source: Kaggle.(National Transportation Safety Board)

Timeframe: 1962 - 2023

The key features include:

- **Event Date:** When the incident occurred.
- **Location and Country:** Where the event took place.
- **Investigation Type:** Whether it was an accident or an incident.
- **Make and Model:** The manufacturer and model of the aircraft involved.
- **Aircraft Category:** Type of aircraft (e.g., passenger, cargo, etc.).
- **Number of Engines:** Indicates the aircraft's configuration.
- **Total Fatal Injuries:** Number of deaths.
- **Total Serious/Minor Injuries:** Extent of non-fatal injuries.
- **Total Uninjured:** Number of people who escaped unscathed.
- **Purpose of Flight:** Purpose such as private, commercial, or military use.
- **Weather Condition:** Conditions at the time of the incident (e.g., visual or instrument meteorological conditions).
- **Broad Phase of Flight:** Stage of flight (e.g., takeoff, cruise, landing).
- **Airport Code and Name:** Details if the event occurred near an airport.
- **Latitude and Longitude:** Geographic coordinates of the incident.

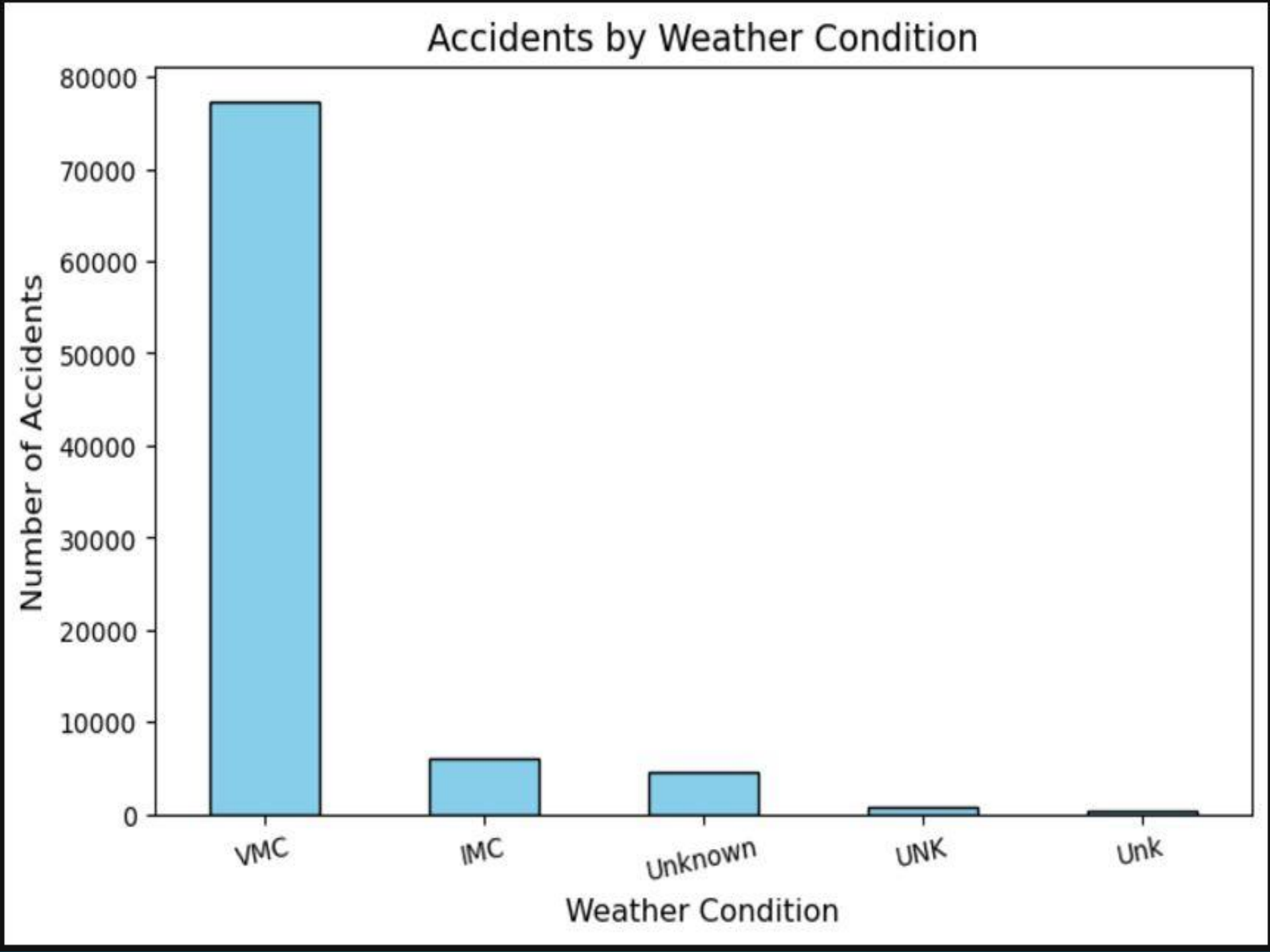
Data Cleaning Process

Steps Taken:

- Data analysis.
- Standardized column names.
- Handled missing values (e.g., replaced unknown weather with 'Unknown').
- Visualization with cleaned data.

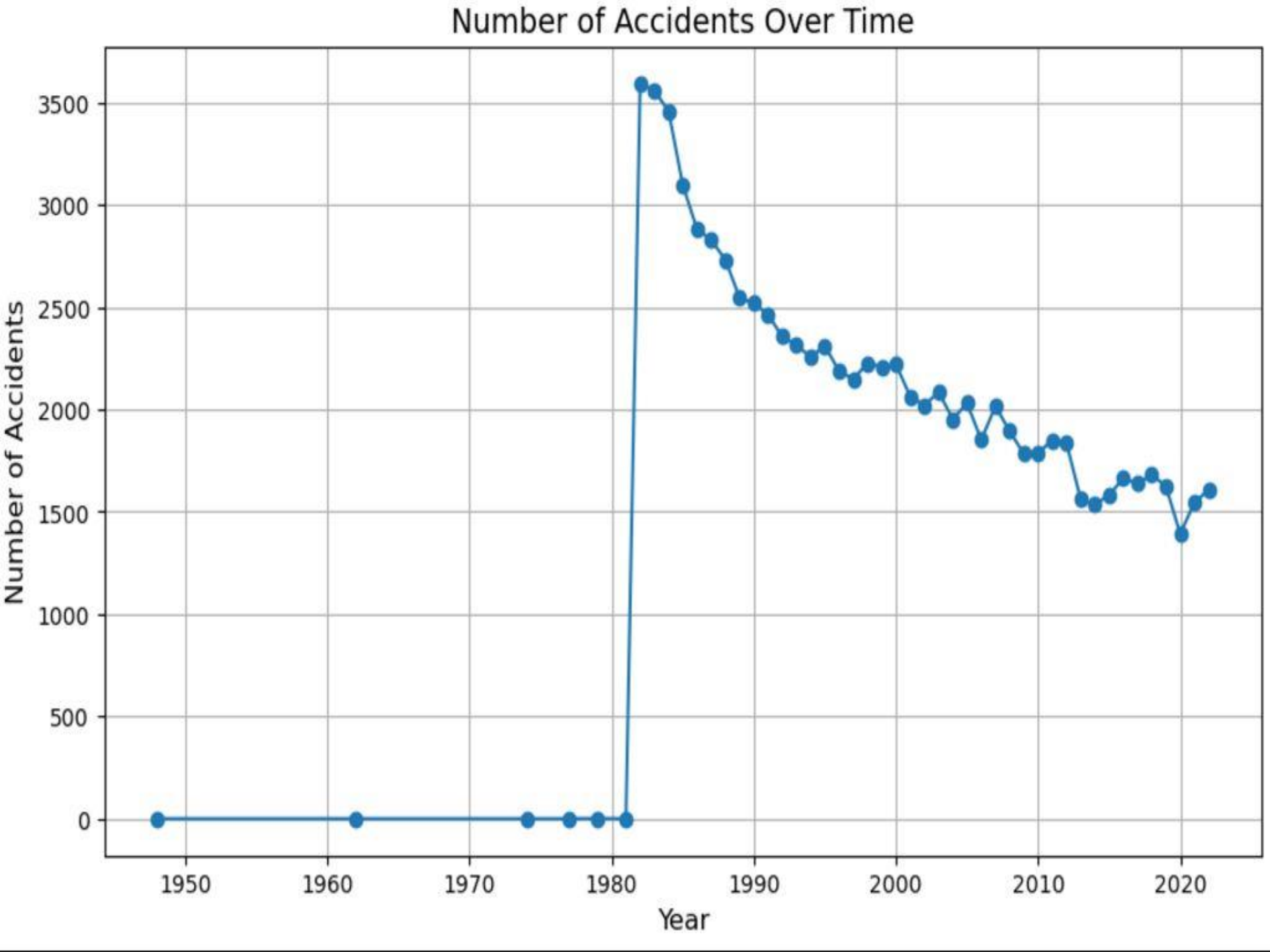
Insight 1: Risk by Weather Conditions

- Weather plays a critical role in accident occurrences.
- Clear weather accounts for 70% of accidents but tends to have lower fatalities.
- Severe weather significantly increases the likelihood of major injuries or fatalities.


Accidents by Weather Condition
Number of Accidents
80000
70000
60000
50000
40000
30000
20000
10000
0
VMC
IMC
Unknown
UNK
Unk
Weather Condition

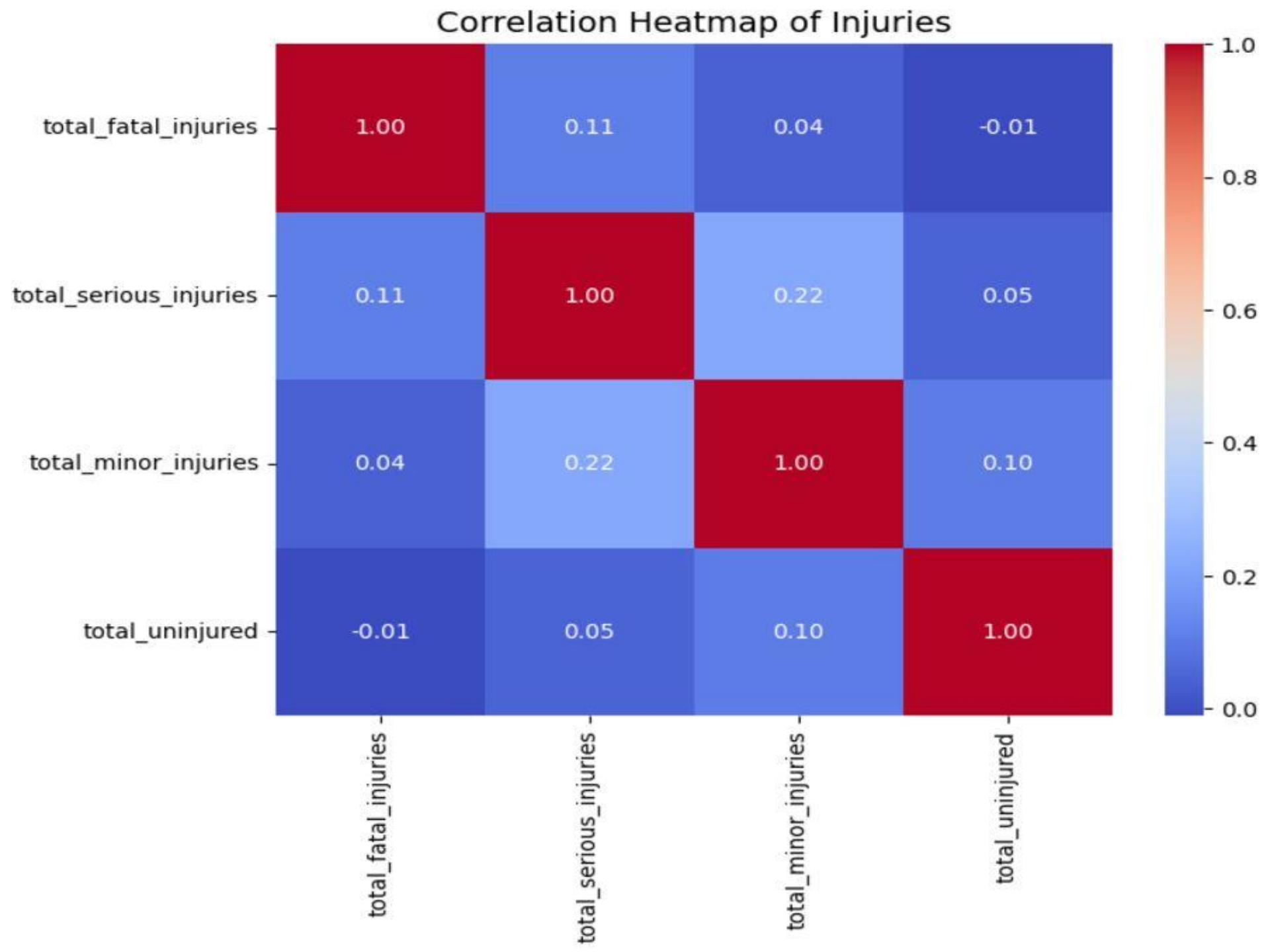
Insight 2: Trends over time

- Accidents have shown decrease over the years.
- Notable spikes in certain years(1981-1982) may indicate specific events or issues in the aviation industry.


Number of Accidents Over Time
Number of Accidents
Year
0
500
1000
1500
2000
2500
3000
3500
1950
1960
1970
1980
1990
2000
2010
2020

Insight 3: Correlation between injury types.

- High correlations between fatal, serious, and minor injuries indicate that accidents with one type of injury often involve others.


Correlation Heatmap of Injuries
total_fatal_injuries
total_serious_injuries
total_minor_injuries
total_uninjured
1.00
0.11
0.04
-0.01
0.11
1.00
0.22
0.05
0.04
0.22
1.00
0.10
-0.01
0.05
0.10
1.00
total_fatal_injuries
total_serious_injuries
total_minor_injuries
total_uninjured
1.0
0.8
0.6
0.4
0.2
0.0

Actionable Recommendations

- Invest in Weather Monitoring Systems: Focus on mitigating severe weather risks.
- Prioritize pilot training and operational procedures for high-risk weather scenarios.
- Investigate the causes behind these spikes to mitigate future risks.
- Use injury corellation insight to predict the potential impact of accidents and allocate resources for emergency response.

Next Steps.

- **Develop an action plan** - Break down recommendations into specific, actionable tasks.
- **Allocate Resources** - Ensure necessary resources, such as budgets, personnel, and tools, are available to implement the recommendations.
- **Monitor and Evaluate**

Thank you for your time!

I appreciate the opportunity to present these insights and recommendations. Please feel free to reach out if you have follow-up queries or need additional information.

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