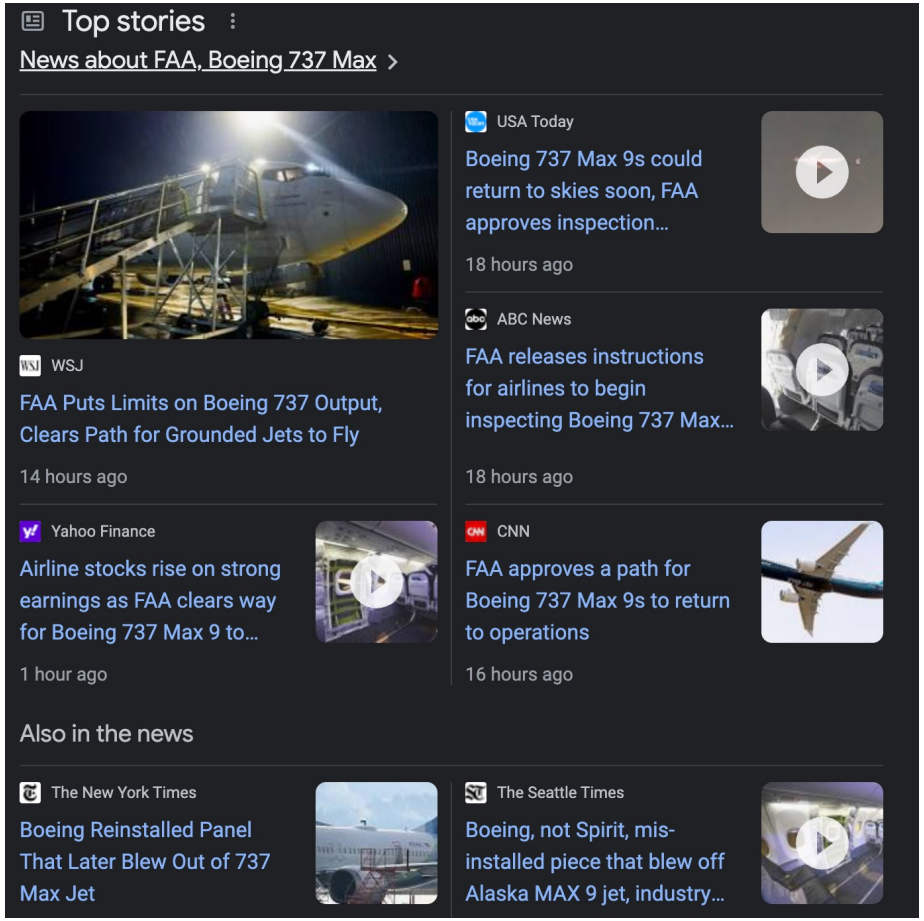
Data Science Flex 1 Project

Alexandra Yakovleva

Introduction.

- Aviation safety is defined as the study and practice of managing risks in aviation by preventing aviation accidents and incidents through research, educating air travel personnel, passengers and the general public, as well as the design of aircraft and aviation infrastructure.
- Air Transportation is relatively novel way of travelling (1920, Golden Age of Aviation) and transferring cargo (1960, Jet Era).
- Air Transportation is much safer (0.01 deaths/100 million miles) than any other form of transportation, however, it is as safe as the operator, the equipment, and the safety standards.
- The standards of the equipment maintenance have been rigorously updating over the decades by government safety boards and the introduction of air traffic control greatly reduced the number of serious aviation accidents.
- There is an increasing pressure to develop more efficient aircrafts, aircraft development is in the hands of private companies and is not governed by any standards.

Aircraft Safety in the News.



The news you don't want to be in.

Business Context.

- **Broad Task:** *Identify aircrafts with the lowest safety risks for commercial and private aviation enterprises.*

- **Subtasks**:

  - *What type of safety data is available for aviation transportation?*
    Explore sources of accident information for safety analysis.

  What is safety?
    Explore and establish the safety risk measures for aircrafts in context of the data available.

  - *What are the potential commercial and private aviation enterprises?*
    Explore the most common flight purposes and compare safety ratings for the most common aircraft makes, models.

Safety Data in Business Context.

- *Data:*

  For the analysis, we'll be using the National Transportation Safety Board's Aviation Accidents Dataset. The dataset is collected by a government entity (trusted source) and has no copyright, meaning that it can be used freely for commercial purposes.

- *Safety:*

  The International Air Transport Association (IATA) defines aircraft safety rating as total fatal occurrences per 1.000.000 miles flown. We have no access for the total miles flown but we can use the number of occurrences in database as normalizing factor.

- *Possible aviation enterprises:*

  The dataset contains information about flight purpose and flight code to help us identify the most popular aviation enterprises.

Data Processing Steps.

1. *Identifying Informative Columns:*

   We identified key columns describing purpose of the flight, date of the accident, injuries, make and model. In addition, we identified columns that will be irrelevant for our analysis, as well as possibly relevant columns that contain missing information and might reduce the quality of the clean data.

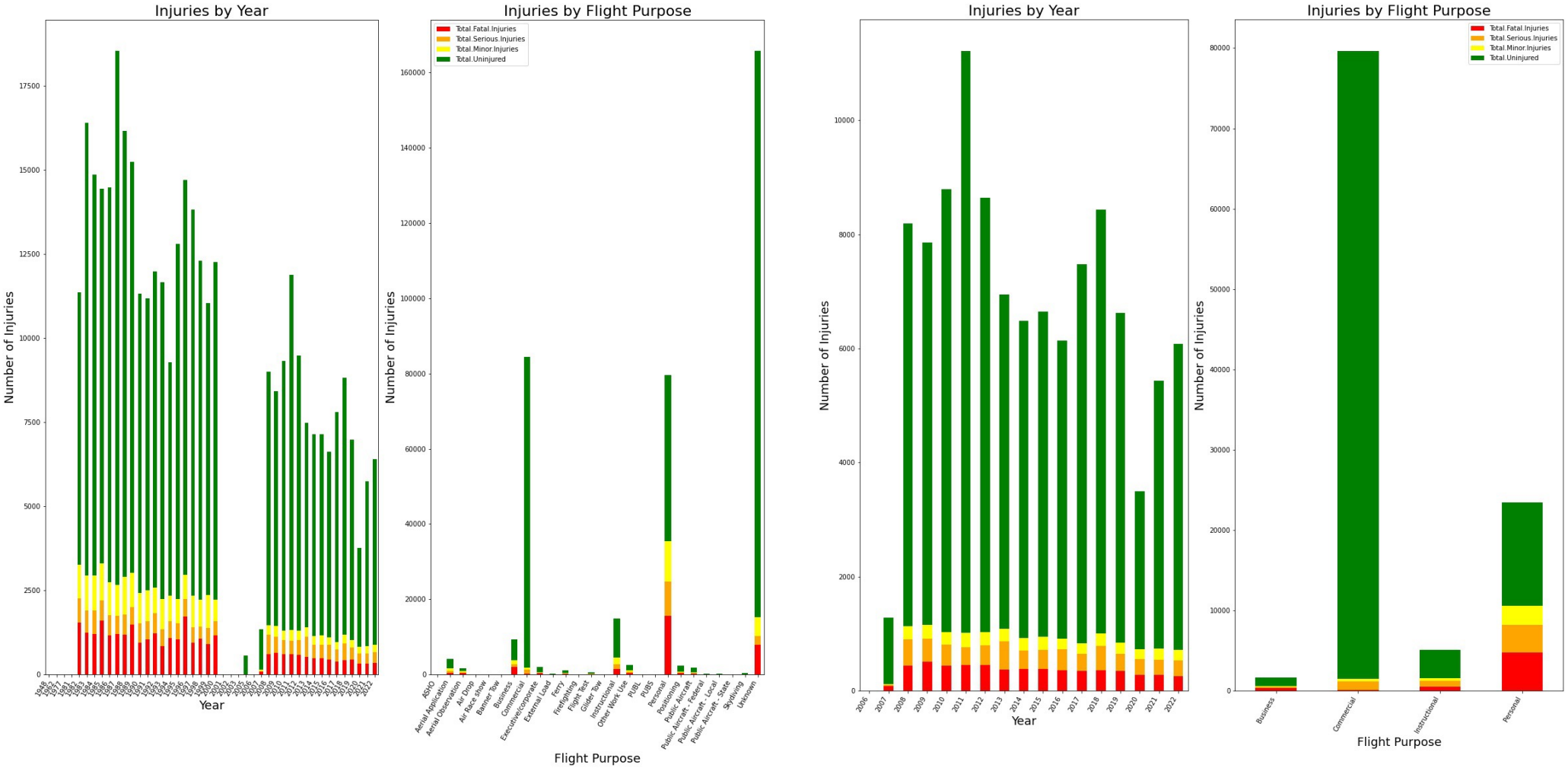
2. *Identifying Relevant Timeframe:*

   We performed initial visualization of accidents over time and identified the most informative and relevant timeframe for the future analysis.

3. *Dealing with Missing/Incomplete Information:*

   We utilized all available information about the Flight Type to fill in the missing categories and unified the information about Make and Manufacturers to remove duplicates.

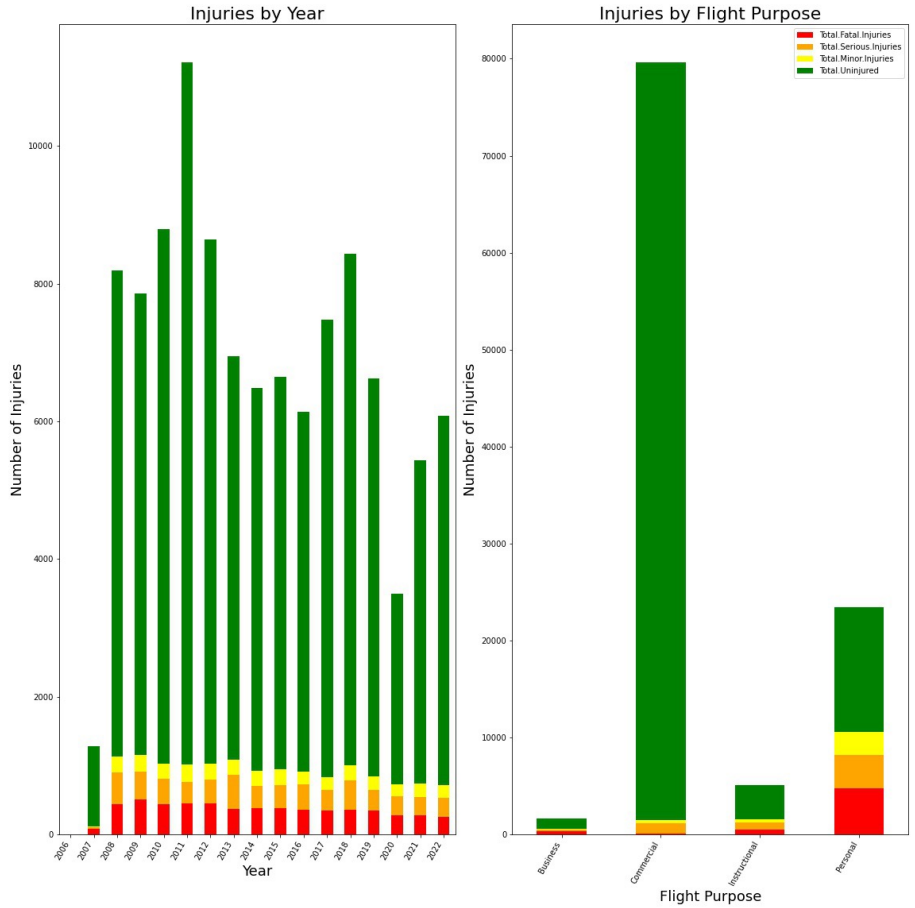
Data Processing.



Before (left) and after (right) time filtering.

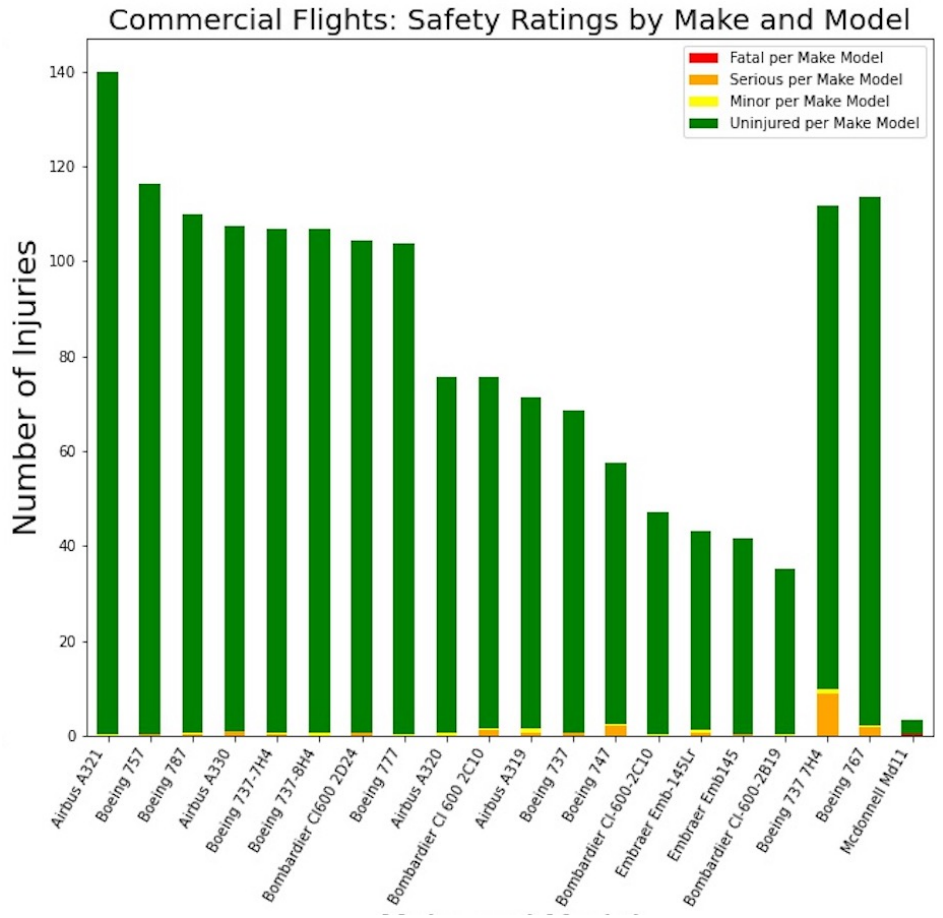
Identifying Four Most Common Flight Purpose Categories.

1. Commercial (least fatalities).
2. Personal (most fatalities and. injuries).
3. Instructional.
4. Business.



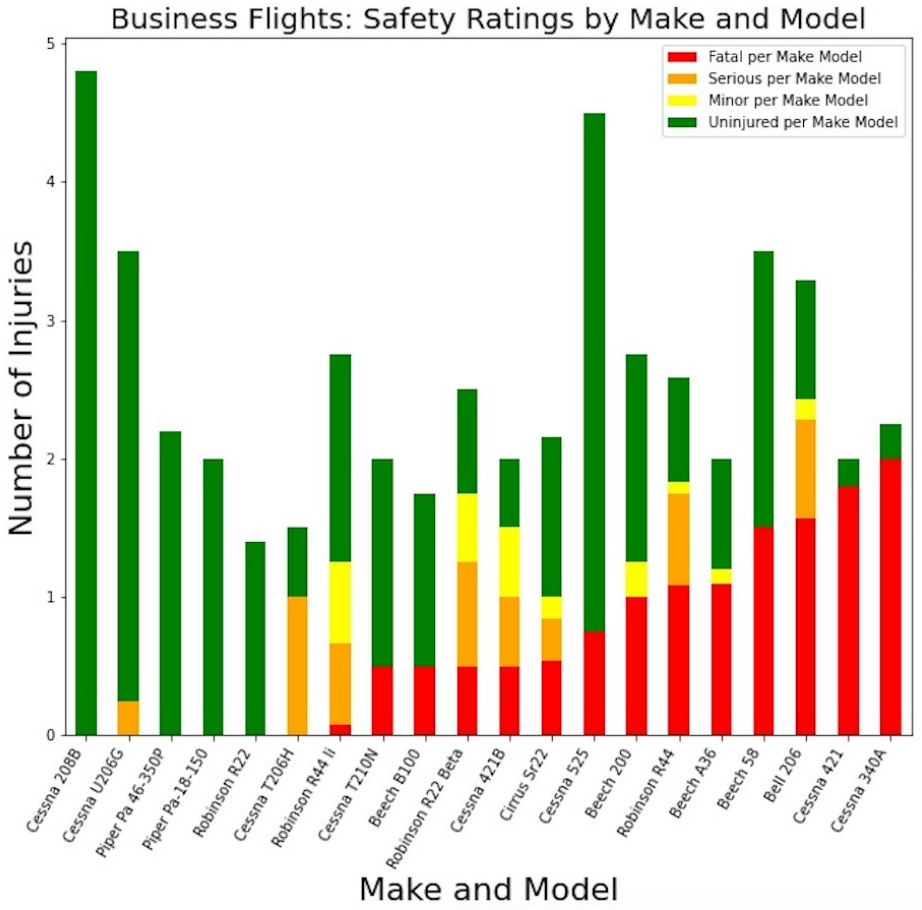
Identifying Safest Aircrafts For Commercial Purposes.

Aircraft	Safety Rating
Airbus A321	0
Boeing 737	0
Boeing 757	0
Boeing 787	0
Airbus A320	0



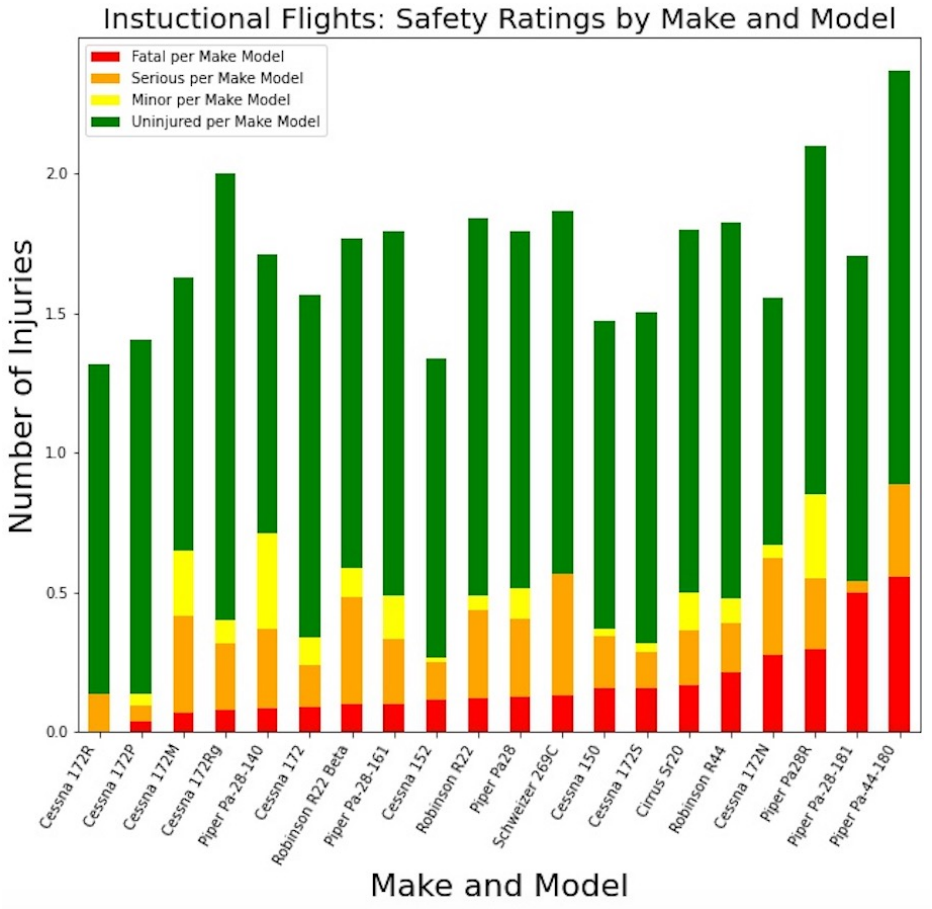
Identifying Safest Aircrafts For Business Purposes.

Aircraft	Safety Rating
Cessna 208B	0
Cessna U206G	0
Piper Pa 46-350P	0
Piper Pa 18-150	0
Robinson R22	0



Identifying Safest Aircrafts For Instructional Purposes.

Aircraft	Safety Rating
Cessna 172 R	0
Cessna 172 P	0.04
Cessna 172 M	0.07
Cessna 172 Rg	0.08
Piper Pa-28-140	0.085



Top Recommendations from Safety Perspective.

Commercial	Business	Instructional
Airbus A321	Cessna 208B	Cessna 172 R
Boeing 737	Cessna U206G	*Cessna 172 P**
Boeing 757	Piper Pa 46-350P	*Cessna 172 M**
Boeing 787	Piper Pa 18-150	*Cessna 172 Rg**
Airbus A320	Robinson R22	*Piper Pa-28-140**

Future Work.

- Align safety metrics with the IATA.
- Based on the accident description, perform text analysis to remove fatal accidents related to human error (number can be as high as 80%).
- Research aircraft Make and Model to further compact the accidents dataset (difference between Cessna 172 P and 172 N).

References.

- Fatality Rates on IATA.
- NTSB Aviation Accidents.

Contact Information.

- Reach me at leksea@gmail.com or linkedin:alex.yakovleva