

Winning Space Race with Data Science

Rogério Yamada
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Executive Summary

Introduction



Section 1

Methodology

- Data collection methodology
 - Data about rocket launches was obtained from a SpaceX API and web scraping Wikipedia pages
- Perform data wrangling
 - Missing data was handled, a preliminary Exploratory Data Analysis was performed, and the variable Outcome Class was defined for training the supervised models
- Perform Exploratory Data Analysis (EDA) using visualisation and SQL
- Perform interactive visual analysis using Folium and Plotly Dash
- Perform predictive analysis using classification models

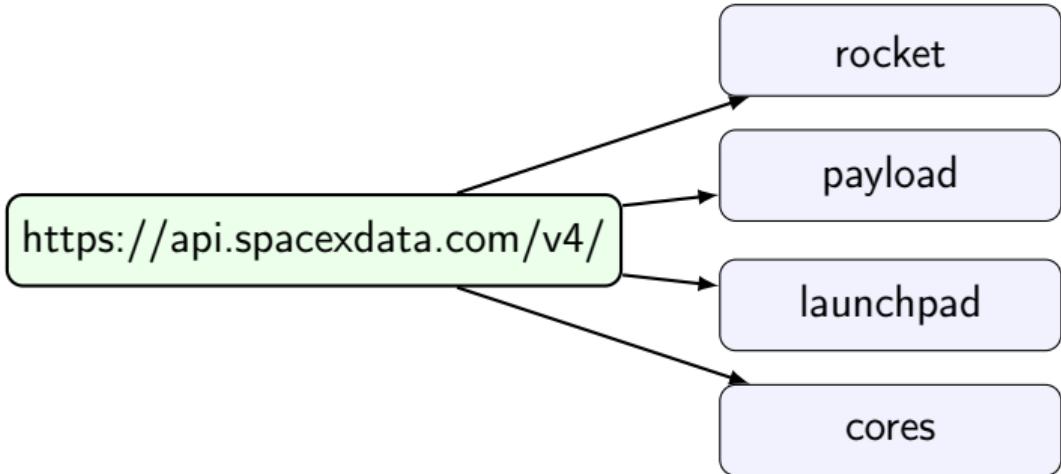
- SpaceX API data extraction and Wikipedia pages web scraping were combined to produce a dataset of SpaceX Falcon 9 landings information

11 rows ✓ 90 rows x 17 cols
[34]

| # | FlightNumber | Date | BoosterVersion | PayloadMass | Orbit | LaunchSite | Outcome | Flights | GridFins | Reused | Legs | LandingPad | Block | ReusedCount | Serial | Longitude | Latitude |
|-----|--------------|------------|----------------|--------------|-------|--------------|-------------|---------|----------|--------|-------|--------------------------|-------|-------------|--------|------------|-----------|
| 0 | 1 | 2010-06-04 | Falcon 9 | 6123.547647 | LEO | CCSFS SLC 40 | None None | 1 | False | False | False | None | 1.0 | 0 | B0003 | -80.577366 | 28.561857 |
| 1 | 2 | 2012-08-22 | Falcon 9 | 528.000000 | LEO | CCSFS SLC 40 | None None | 1 | False | False | False | None | 1.0 | 0 | B0005 | -80.577366 | 28.561857 |
| 2 | 3 | 2013-03-01 | Falcon 9 | 677.000000 | ISS | CCSFS SLC 40 | None None | 1 | False | False | False | None | 1.0 | 0 | B0007 | -80.577366 | 28.561857 |
| 3 | 4 | 2013-09-29 | Falcon 9 | 508.000000 | PO | VAFB SLC 4E | False Ocean | 1 | False | False | False | None | 1.0 | 0 | B1093 | -120.01829 | 34.632093 |
| 4 | 5 | 2013-12-03 | Falcon 9 | 3170.000000 | GTO | CCSFS SLC 40 | None None | 1 | False | False | False | None | 1.0 | 0 | B1004 | -80.577366 | 28.561857 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 85 | 86 | 2020-09-03 | Falcon 9 | 15600.000000 | VLEO | KSC LC 39A | True ASDS | 2 | True | True | True | Se9e3032383ecb6bb234e7ca | 5.0 | 12 | B1068 | -80.603956 | 28.608058 |
| 86 | 87 | 2020-10-06 | Falcon 9 | 15600.000000 | VLEO | KSC LC 39A | True ASDS | 3 | True | True | True | Se9e3032383ecb6bb234e7ca | 5.0 | 13 | B1058 | -80.603956 | 28.608058 |
| 87 | 88 | 2020-10-18 | Falcon 9 | 15600.000000 | VLEO | KSC LC 39A | True ASDS | 6 | True | True | True | Se9e3032383ecb6bb234e7ca | 5.0 | 12 | B1051 | -80.603956 | 28.608058 |
| 88 | 89 | 2020-10-24 | Falcon 9 | 15600.000000 | VLEO | CCSFS SLC 40 | True ASDS | 3 | True | True | True | Se9e3033583ecbb9e534e7cc | 5.0 | 12 | B1068 | -80.577366 | 28.561857 |
| 89 | 90 | 2020-11-05 | Falcon 9 | 3681.000000 | MEO | CCSFS SLC 40 | True ASDS | 1 | True | False | True | Se9e3032383ecb6bb234e7ca | 5.0 | 8 | B1062 | -80.577366 | 28.561857 |

Data Collection – SpaceX API

- From the SpaceX API endpoint <https://api.spacexdata.com/v4/> we probed the following data sources:
 - rocket
 - payload
 - launchpad
 - cores
- Jupyter Notebook's GitHub URL



Data Collection – Scraping

Data Wrangling

EDA with Data Visualisation

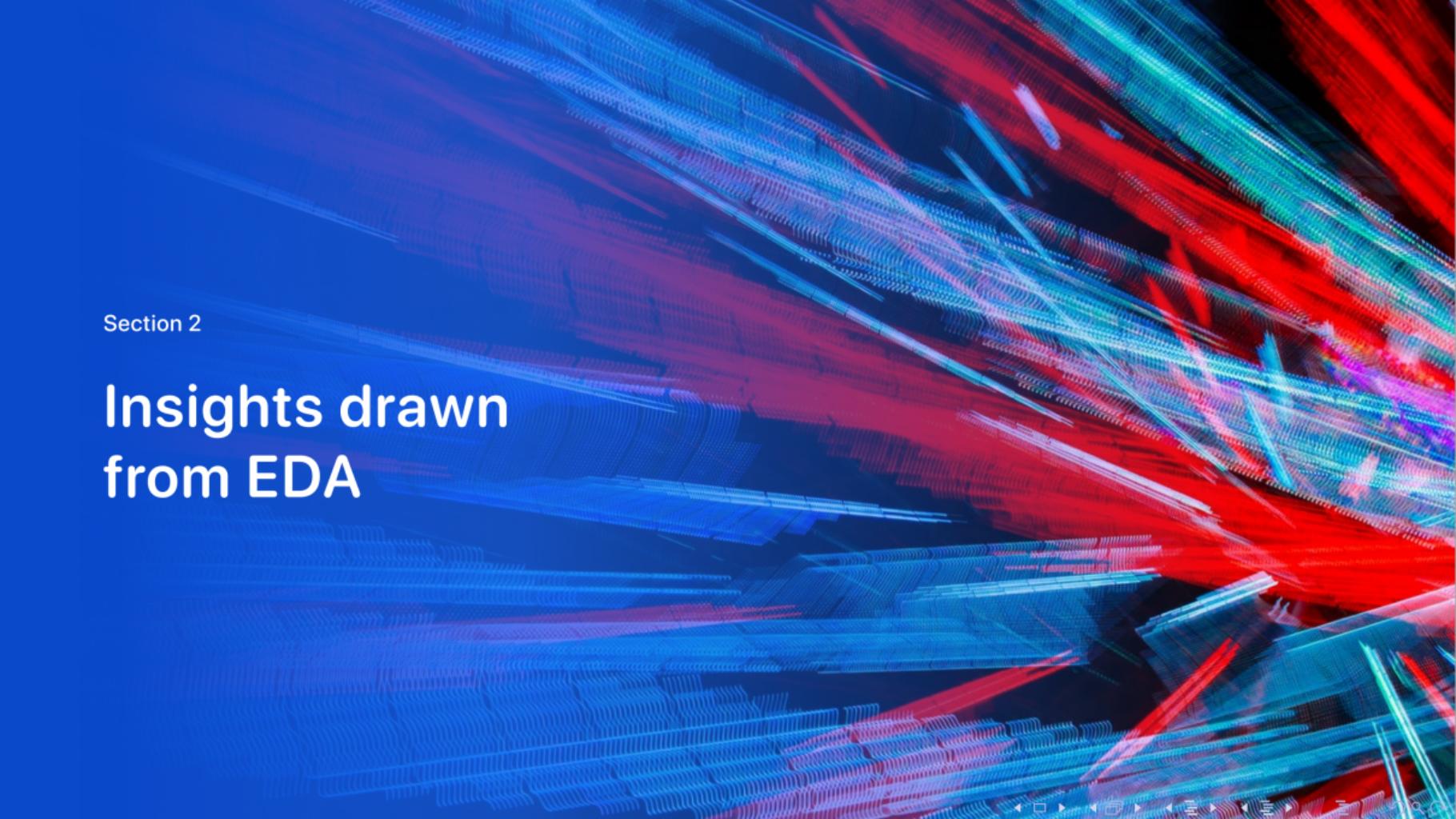
EDA with SQL

Build an Interactive Map with Folium

Build a Dashboard with Plotly Dash

Predictive Analysis (Classification)

- Exploratory data analysis results
- Interactive analytics demo in screenshots
- Predictive analysis results

The background of the slide features a complex, abstract pattern of glowing lines in shades of blue, red, and green. These lines are arranged in a way that suggests depth and motion, resembling a digital or quantum landscape. The overall effect is futuristic and dynamic.

Section 2

Insights drawn from EDA

Flight Number versus Launch Site

Payload versus Launch Site

Success Rate versus Orbit Type

Flight Number versus Orbit Type

Payload versus Orbit Type

Launch Success Yearly Trend

All Launch Site Names



Launch Site Names Begin with 'CCA'

Total Payload Mass

Average Payload Mass by F9 v1.1

First Successful Ground Landing Date

Successful Drone Ship Landing with Payload between 4000 and 60000

Total Number of Successful and Failure Mission Outcomes

Boosters Carried Maximum Payload

2015 Launch Records



Rank Landing Outcomes Between 2010-06-04 and 2017-03-20

The background of the slide is a photograph taken from space at night. It shows the curvature of the Earth against a dark blue-black void of space. City lights are visible as numerous small white and yellow dots, primarily concentrated in coastal and urban areas. In the upper right quadrant, there is a bright, horizontal band of light, likely the Aurora Borealis or Southern Lights. The overall atmosphere is dark and mysterious.

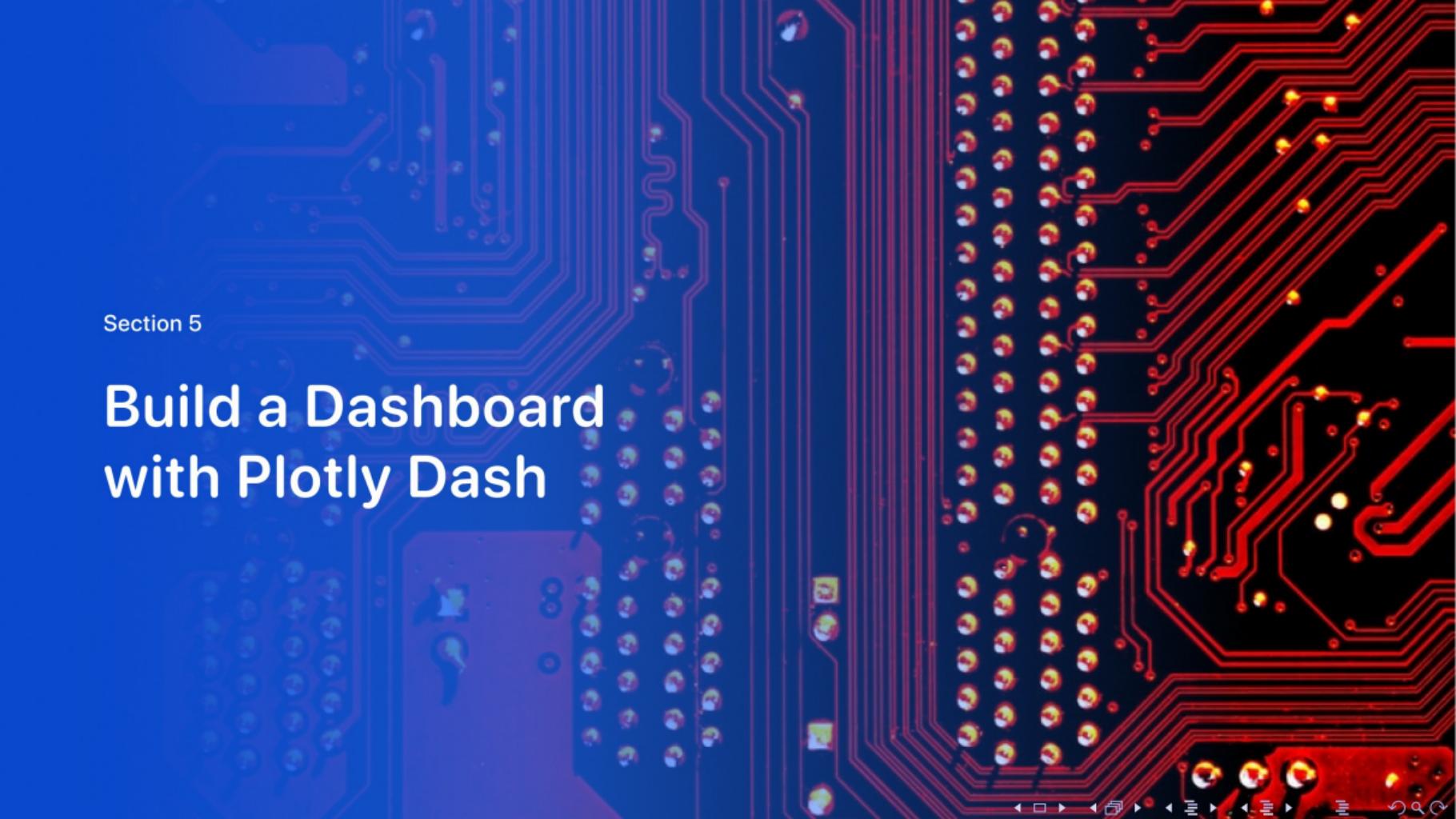
Section 4

Launch Sites Proximities Analysis

<Folium Map Screenshot 1>

<Folium Map Screenshot 2>

Folium Map Screenshot 3

The background of the slide features a close-up photograph of a printed circuit board (PCB). The board is primarily black, with intricate red and blue patterns of conductive traces and component pads. A vertical column of circular vias is visible on the left side. In the bottom right corner, there is a small navigation icon consisting of several small arrows and symbols.

Section 5

Build a Dashboard with Plotly Dash

Dashboard Screenshot 1

Dashboard Screenshot 2

Dashboard Screenshot 3

The background of the slide features a dynamic, abstract design composed of several thick, curved lines. These lines are primarily in shades of blue and yellow, creating a sense of motion and depth. The curves are smooth and organic, resembling the path of a train or a high-speed vehicle through a tunnel. The overall effect is modern and professional.

Section 6

Predictive Analysis (Classification)

Classification Accuracy

Confusion Matrix

Conclusions

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Appendix



Thank you!

