
# Winning Space Race with Data Science

<Name>
<Date>

# Outline

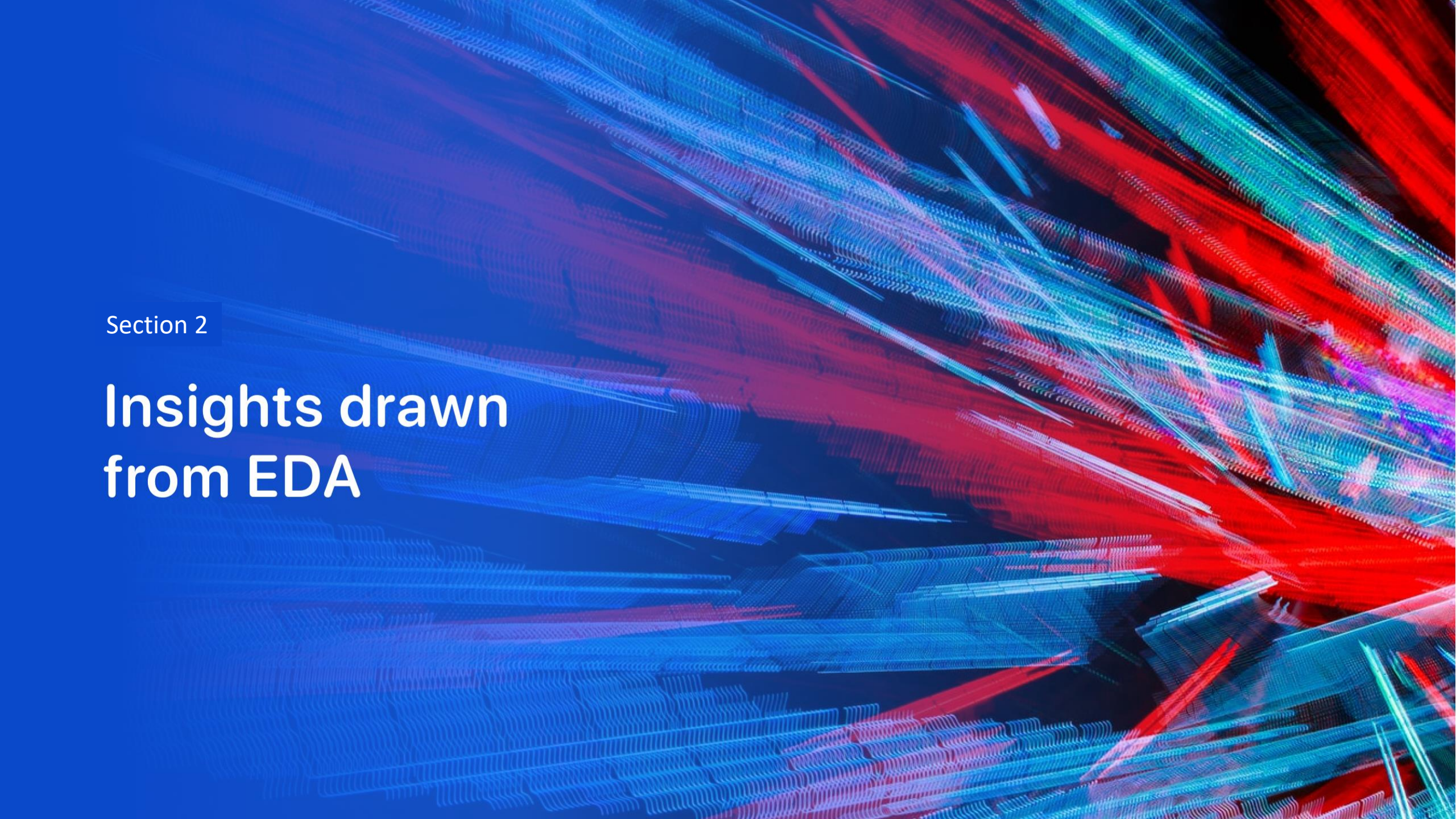
- Executive Summary
- Introduction
- Methodology
- Results
- Conclusion
- Appendix

# Executive Summary

- Summary of methodologies

Based on IBM instructions → I performed dashboard, visualization, classification and so on ´.

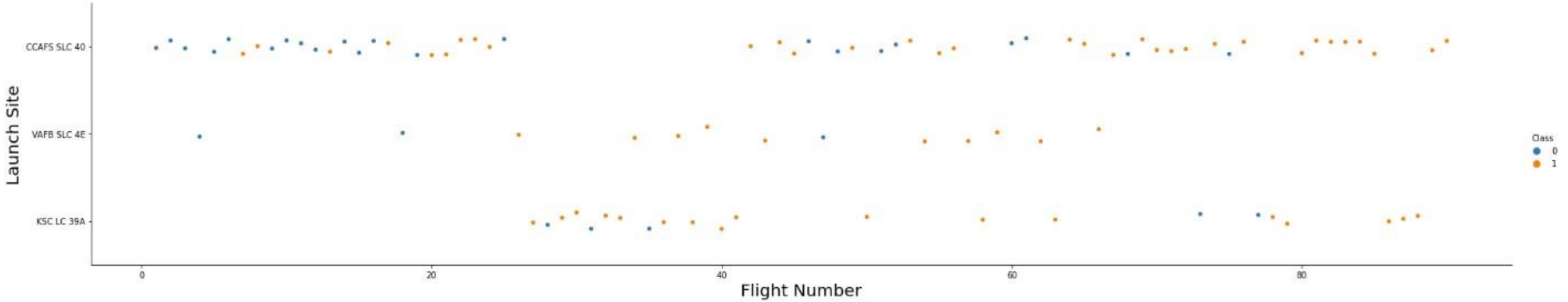
- Summary of all results I tried to organize and wrangle the data.


Section 2
Insights drawn from EDA

# Flight Number vs. Launch Site

- Show a scatter plot of Flight Number vs. Launch Site

```
[8]: # Plot a scatter point chart with x axis to be Flight Number and y axis to be the launch site, and hue to be the class value
sns.catplot(y="LaunchSite", x="FlightNumber", hue="Class", data=df, aspect = 5)
plt.xlabel("Flight Number",fontsize=20)
plt.ylabel("Launch Site",fontsize=20)
plt.show()
```

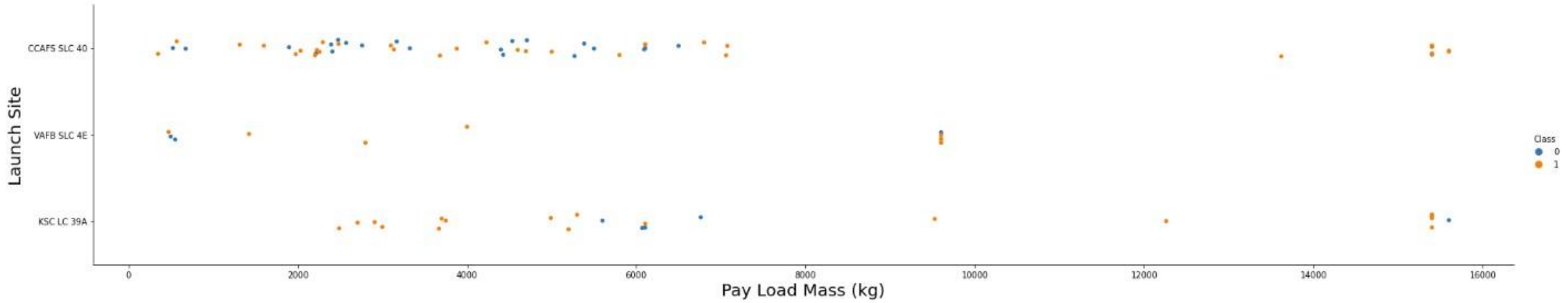



- Show the screenshot of the scatter plot with explanations

# Payload vs. Launch Site

- Show a scatter plot of Payload vs. Launch Site

```
[9]: # Plot a scatter point chart with x axis to be Pay Load Mass (kg) and y axis to be the Launch site, and hue to be the class value
sns.catplot(y="LaunchSite", x="PayloadMass", hue="Class", data=df, aspect = 5)
plt.xlabel("Pay Load Mass (kg)",fontsize=20)
plt.ylabel("Launch Site",fontsize=20)
plt.show()
```



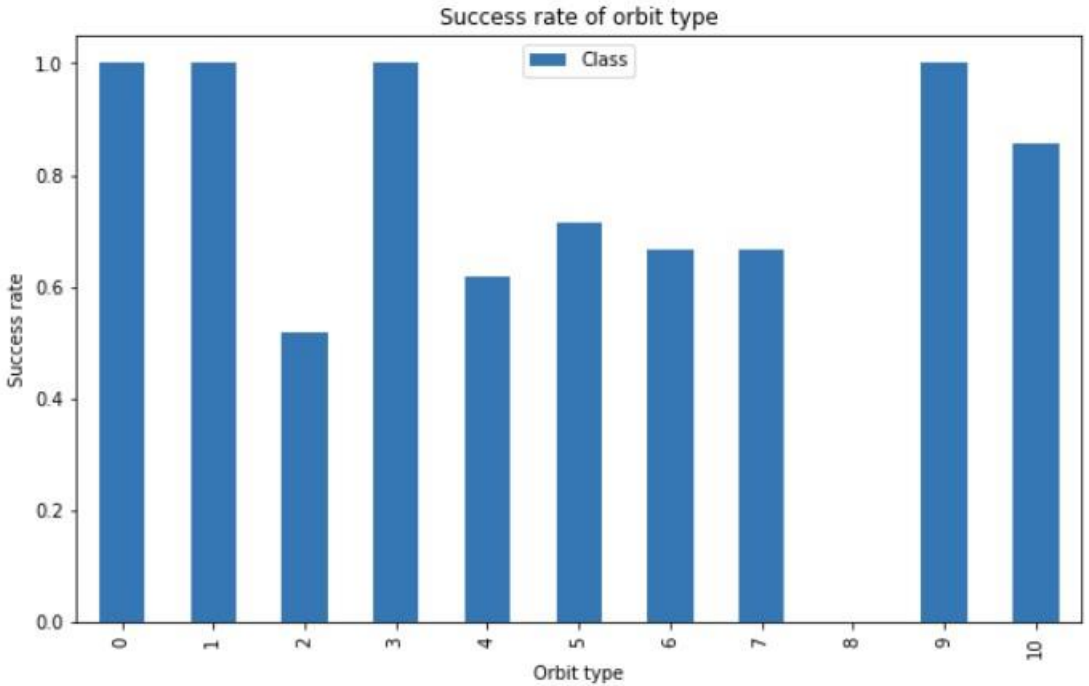

- Show the screenshot of the scatter plot with explanations

# Success Rate vs. Orbit Type

- Show a bar chart for the success rate of each orbit type

- Show the screenshot of the scatter plot with explanations

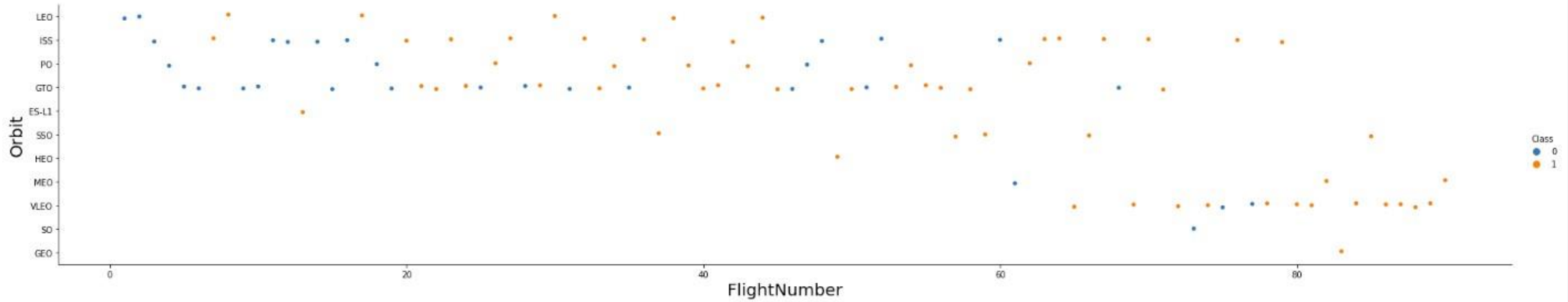
```
# HINT use groupby method on Orbit column and get the mean of Class column
bar_data = df.groupby('Orbit')['Class'].mean().reset_index()
bar_data.plot(kind='bar', figsize=(10, 6))

plt.xlabel('Orbit type') # add to x-label to the plot
plt.ylabel('Success rate') # add y-label to the plot
plt.title('Success rate of orbit type') # add title to the plot

plt.show()
```



# Flight Number vs. Orbit Type

- Show a scatter point of Flight number vs. Orbit type

```
[10]: # Plot a scatter point chart with x axis to be FlightNumber and y axis to be the Orbit, and hue to be the class value
sns.catplot(y="Orbit", x="FlightNumber", hue="Class", data=df, aspect = 5)
plt.xlabel("FlightNumber",fontsize=20)
plt.ylabel("Orbit",fontsize=20)
plt.show()
```

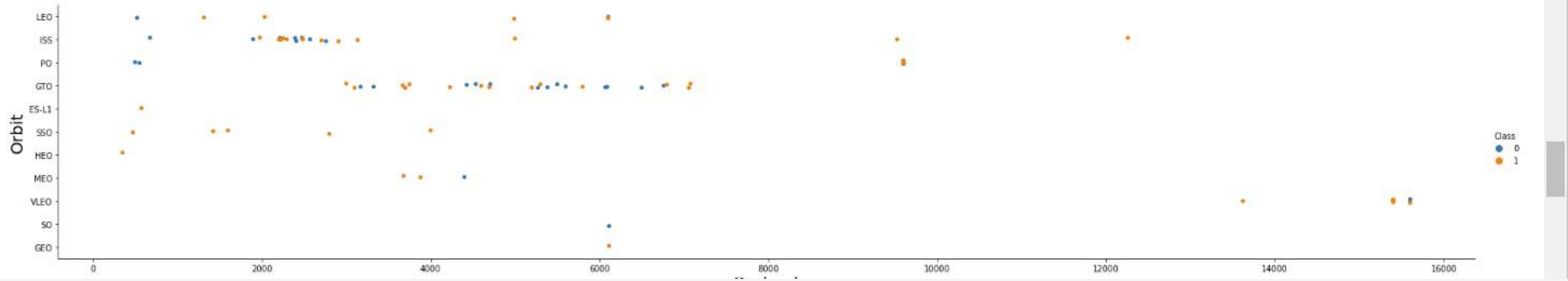



- Show the screenshot of the scatter plot with explanations

# Payload vs. Orbit Type

- Show a scatter point of payload vs. orbit type

```
[8]: # Plot a scatter point chart with x axis to be Payload and y axis to be the Orbit, and hue to be the class value
sns.catplot(y="Orbit", x="PayloadMass", hue="Class", data=df, aspect = 5)
plt.xlabel("Payload",fontsize=20)
plt.ylabel("Orbit",fontsize=20)
plt.show()
```

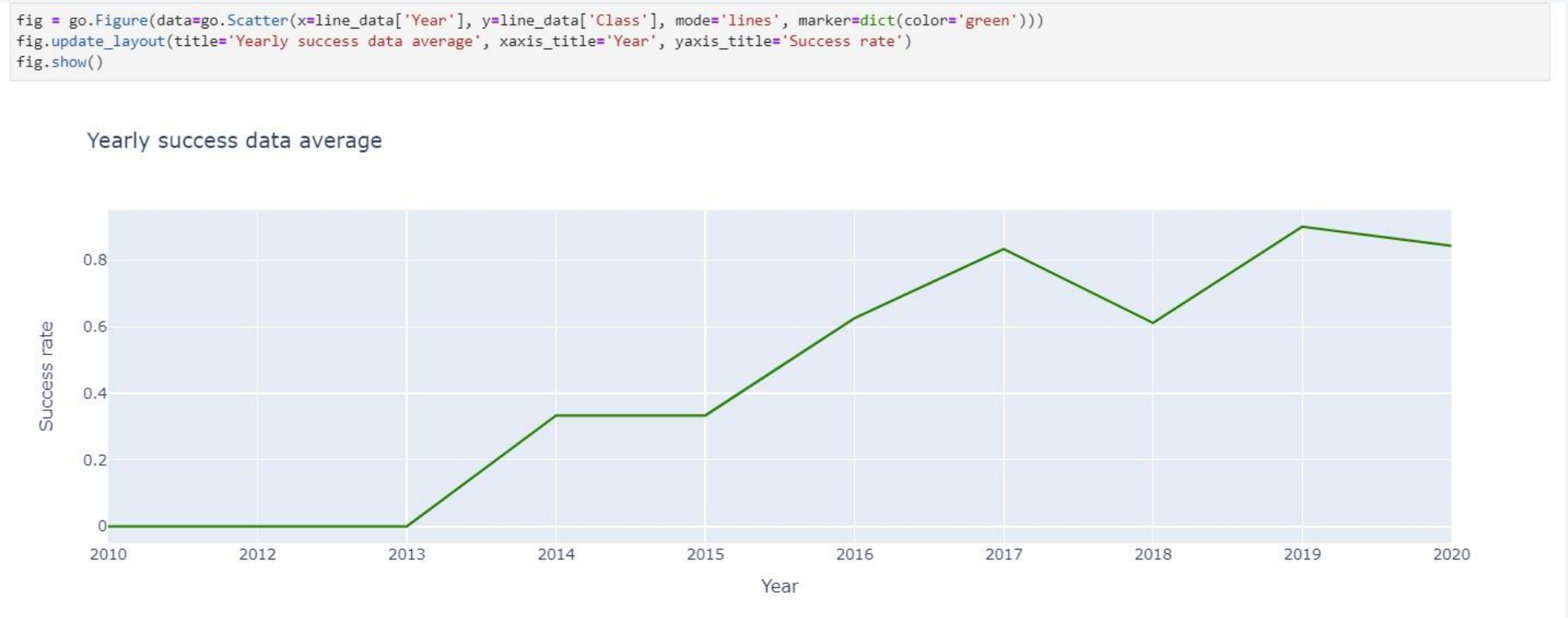



- Show the screenshot of the scatter plot with explanations

# Launch Success Yearly Trend

- Show a line chart of yearly average success rate

```
fig = go.Figure(data=go.Scatter(x=line_data['Year'], y=line_data['Class'], mode='lines', marker=dict(color='green')))
fig.update_layout(title='Yearly success data average', xaxis_title='Year', yaxis_title='Success rate')
fig.show()
```




- Show the screenshot of the scatter plot with explanations

# All Launch Site Names

- Find the names of the unique launch sites
- Present your query result with a short explanation here

### Task 1

Display the names of the unique launch sites in the space mission

```
[7]: %sql select distinct Launch_Site from SPACEXTBL
```

```
 * sqlite:///my_data1.db
Done.
```

[7]:

| Launch_Site |
|---|
| CCAFS LC-40 |
| VAFB SLC-4E |
| KSC LC-39A |
| CCAFS SLC-40 |

# Launch Site Names Begin with 'CCA'

- Find 5 records where launch sites begin with `CCA`
- Present your query result with a short explanation here

Task 2

Display 5 records where launch sites begin with the string 'CCA'

[12]:
```
%sql select * from SPACEXTBL where Launch_Site like 'CCA%' limit 5
```

```
 * sqlite:///my_data1.db
Done.
```

[12]:

| Date | Time (UTC) | Booster_Version | Launch_Site | Payload | PAYLOAD_MASS__KG_ | Orbit | Customer | Mission_Outcome | Landing _Outcome |
|---|---|---|---|---|---|---|---|---|---|
| 04-06-2010 | 18:45:00 | F9 v1.0 B0003 | CCAFS LC-40 | Dragon Spacecraft Qualification Unit | 0 | LEO | SpaceX | Success | Failure (parachute) |
| 08-12-2010 | 15:43:00 | F9 v1.0 B0004 | CCAFS LC-40 | Dragon demo flight C1, two CubeSats, barrel of Brouere cheese | 0 | LEO (ISS) | NASA (COTS) NRO | Success | Failure (parachute) |
| 22-05-2012 | 07:44:00 | F9 v1.0 B0005 | CCAFS LC-40 | Dragon demo flight C2 | 525 | LEO (ISS) | NASA (COTS) | Success | No attempt |
| 08-10-2012 | 00:35:00 | F9 v1.0 B0006 | CCAFS LC-40 | SpaceX CRS-1 | 500 | LEO (ISS) | NASA (CRS) | Success | No attempt |
| 01-03-2013 | 15:10:00 | F9 v1.0 B0007 | CCAFS LC-40 | SpaceX CRS-2 | 677 | LEO (ISS) | NASA (CRS) | Success | No attempt |

# Total Payload Mass

- Calculate the total payload carried by boosters from NASA
- Present your query result with a short explanation here

## Task 3

Display the total payload mass carried by boosters launched by NASA (CRS)

```
[14]: %sql select sum(PAYLOAD_MASS__KG_) from SPACEXTBL where Customer like '%NASA%';
```

```
 * sqlite:///my_data1.db
Done.
```

[14]:

| sum(PAYLOAD_MASS__KG_) |
|---|
| 107010 |

# Average Payload Mass by F9 v1.1

- Calculate the average payload mass carried by booster version F9 v1.1
- Present your query result with a short explanation here

## Task 4

Display average payload mass carried by booster version F9 v1.1

```
[16]: %sql select avg(PAYLOAD_MASS__KG_) from SPACEXTBL where Booster_Version='F9 v1.1'
```

```
 * sqlite:///my_data1.db
Done.
```

[16]:

| avg(PAYLOAD_MASS__KG_) |
|---|
| 2928.4 |

# First Successful Ground Landing Date

- Find the dates of the first successful landing outcome on ground pad
- Present your query result with a short explanation here

- %sql select min(Date) from SPACEXTBL where "Landing _Outcome"='Success (ground pad)'
- 22.12.2015

# Successful Drone Ship Landing with Payload between 4000 and 6000

- List the names of boosters which have successfully landed on drone ship and had payload mass greater than 4000 but less than 6000

- Present your query result with a short explanation here

Task 6

List the names of the boosters which have success in drone ship and have payload mass greater than 4000 but less than 6000

```
[36]: %sql select Booster_Version from SPACEXTBL where "Landing _Outcome"='Success (drone ship)'and PAYLOAD_MASS__KG_> 4000 and PAYLOAD_MASS__KG_> 6000
```

```
 * sqlite:///my_data1.db
Done.
```

[36]:

| Booster_Version |
|---|
| F9 FT B1029.1 |
| F9 FT B1036.1 |
| F9 B4 B1041.1 |

# Total Number of Successful and Failure Mission Outcomes

- Calculate the total number of successful and failure mission outcomes
- Present your query result with a short explanation here

### Task 7

List the total number of successful and failure mission outcomes

```
[38]: %sql SELECT Mission_Outcome, count(Mission_Outcome) FROM SPACEXTBL GROUP BY Mission_Outcome
 * sqlite:///my_data1.db
Done.
```

[38]:

| Mission_Outcome | count(Mission_Outcome) |
|---|---|
| Failure (in flight) | 1 |
| Success | 98 |
| Success | 1 |
| Success (payload status unclear) | 1 |

# Boosters Carried Maximum Payload

- List the names of the booster which have carried the maximum payload mass
- Present your query result with a short explanation here

# 2015 Launch Records

- List the failed landing_outcomes in drone ship, their booster versions, and launch site names for in year 2015

- Present your query result with a short explanation here

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

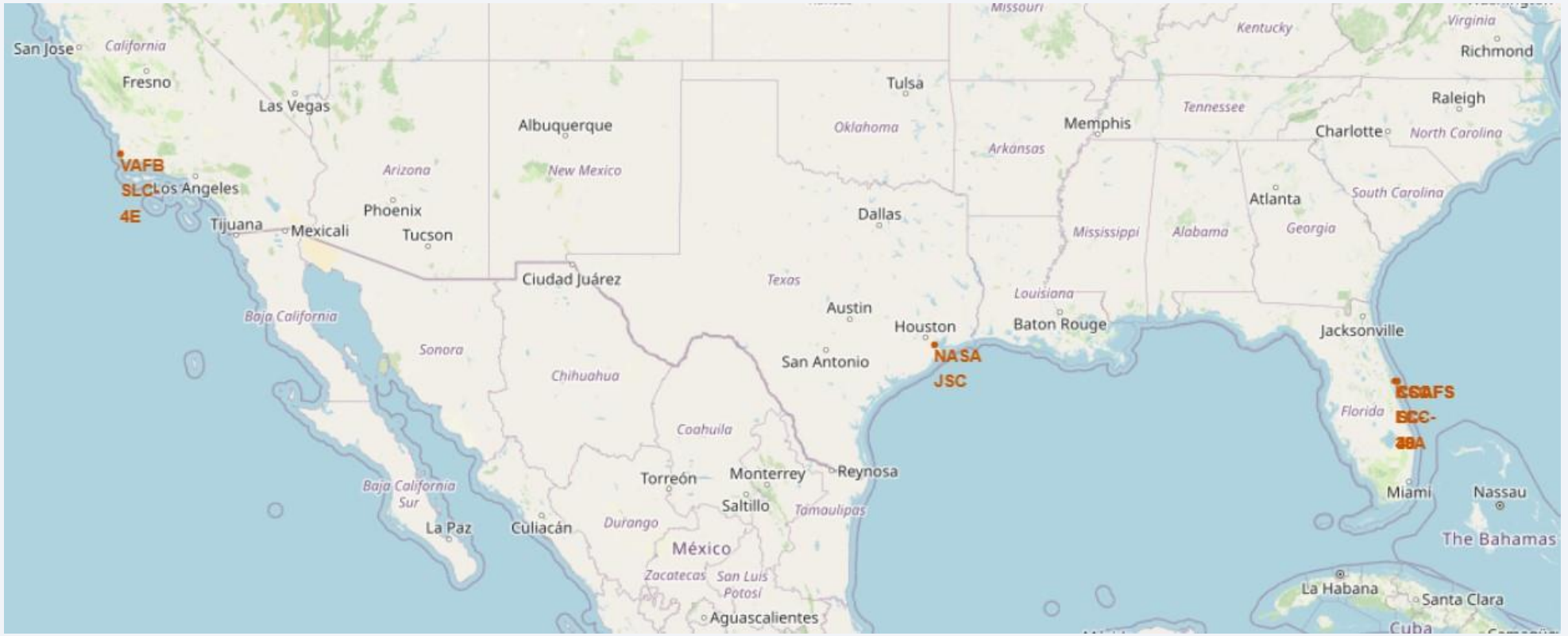
- Rank the count of landing outcomes (such as Failure (drone ship) or Success (ground pad)) between the date 2010-06-04 and 2017-03-20, in descending order

- Present your query result with a short explanation here


Section 3
Launch Sites
Proximities Analysis

# <Folium Map Screenshot 1>

- Replace <Folium map screenshot 1> title with an appropriate title

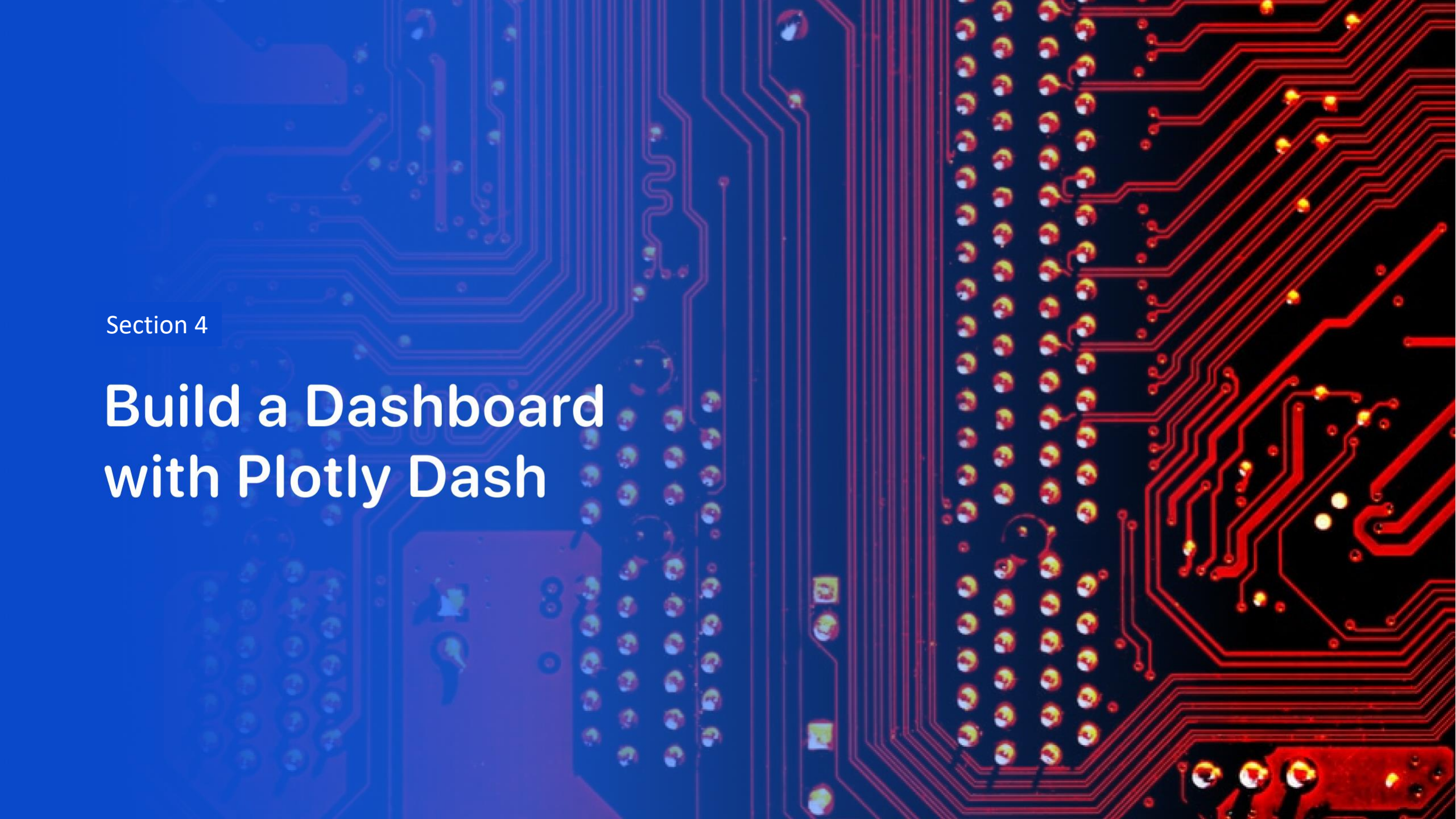


# <Folium Map Screenshot 2>

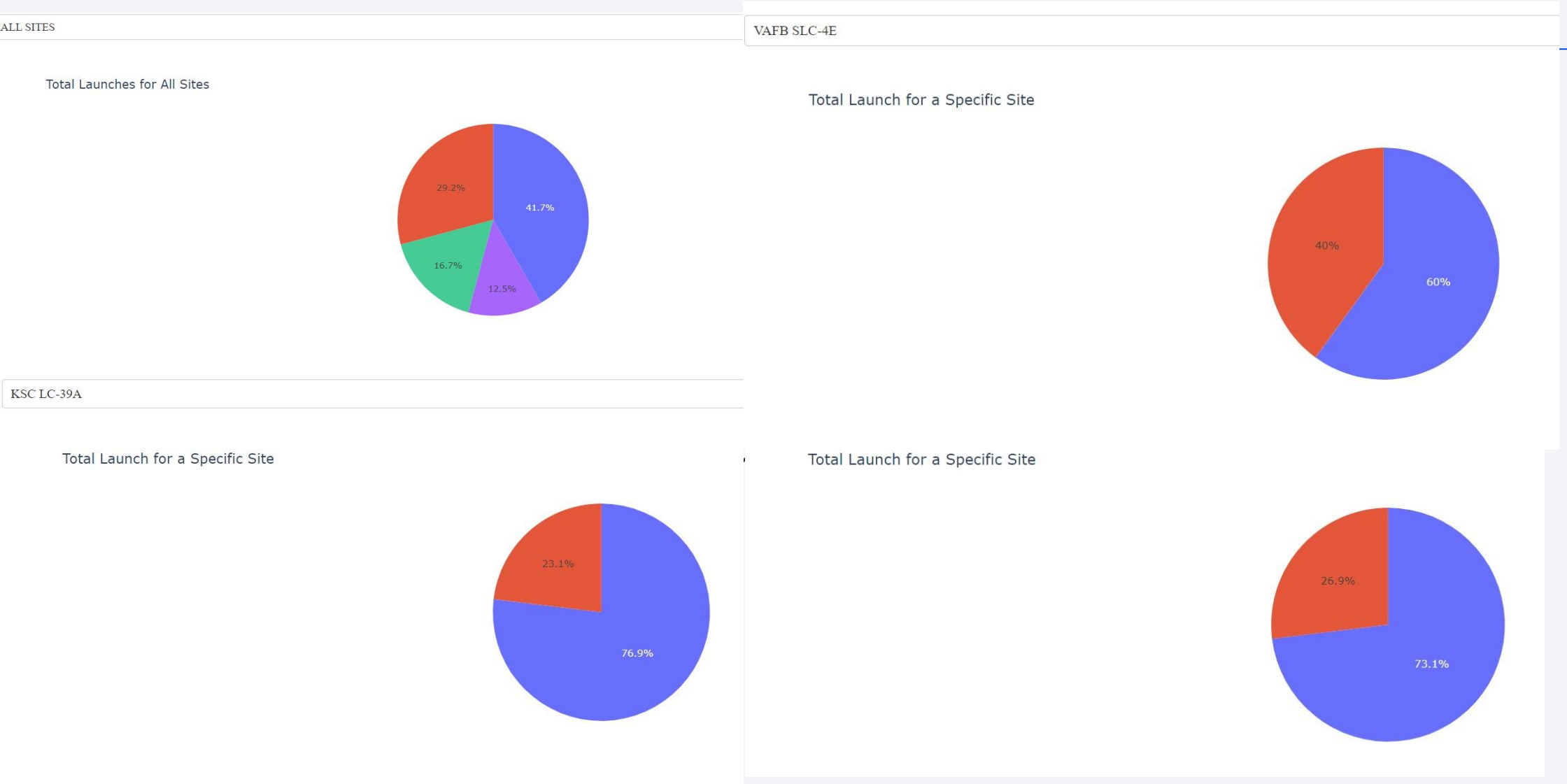
- Replace <Folium map screenshot 2> title with an appropriate title
- Explore the folium map and make a proper screenshot to show the color-labeled launch outcomes on the map
- Explain the important elements and findings on the screenshot

# <Folium Map Screenshot 3>

- Replace <Folium map screenshot 3> title with an appropriate title
- Explore the generated folium map and show the screenshot of a selected launch site to its proximities such as railway, highway, coastline, with distance calculated and displayed
- Explain the important elements and findings on the screenshot


Section 4
Build a Dashboard with Plotly Dash

# <Dashboard Screenshot 1>

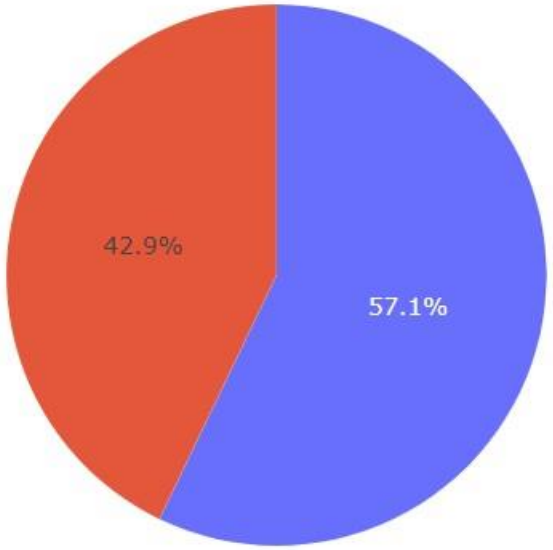


# <Dashboard Screenshot 2>

- CCAFS SLC-40

Total Launch for a Specific Site

- ch success

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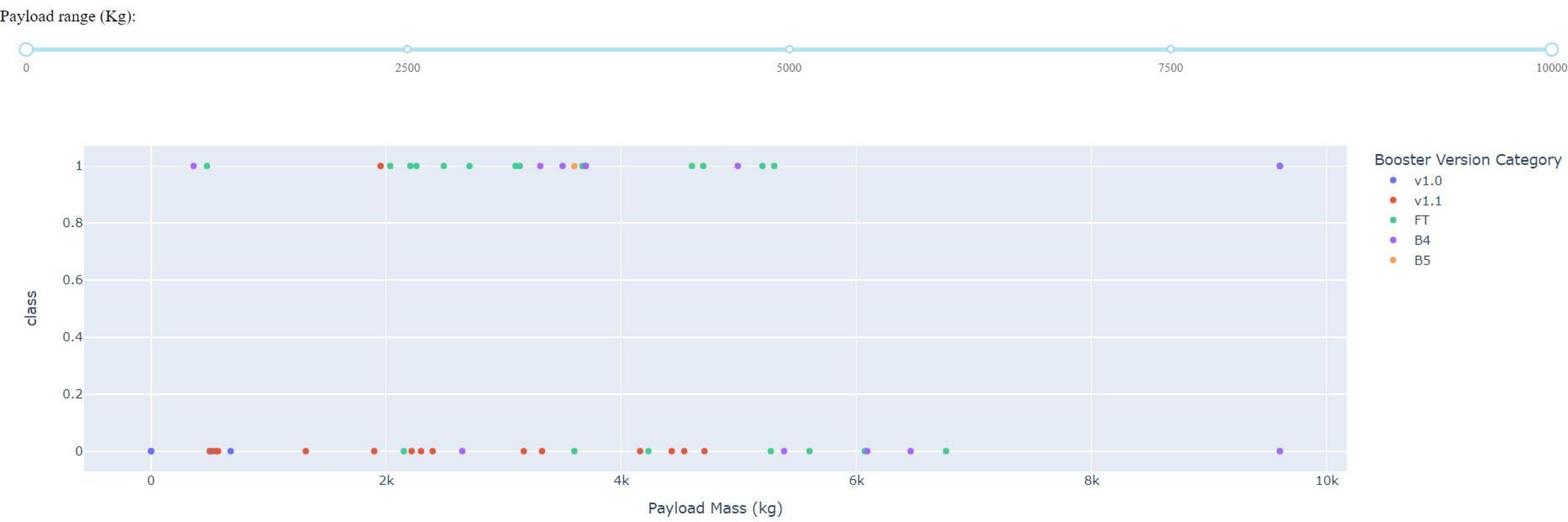
# <Dashboard Screenshot 3>

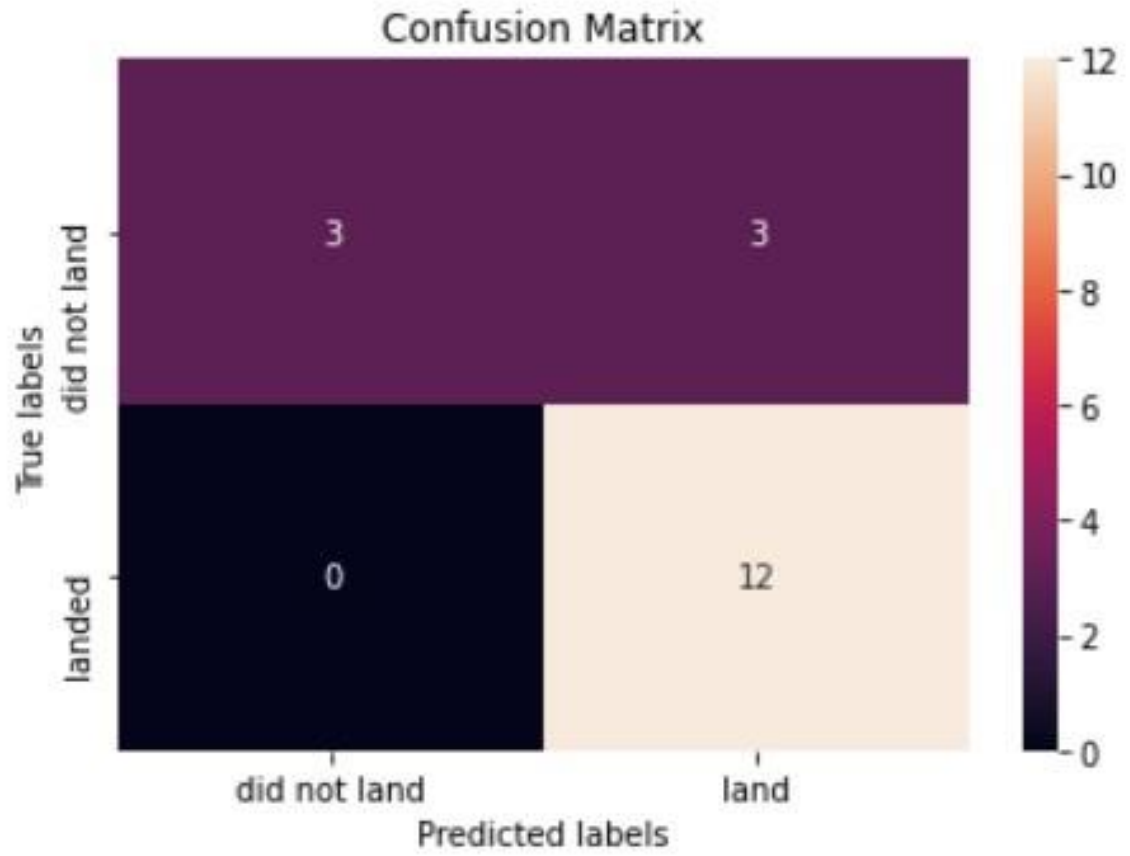


Section 5

# Predictive Analysis (Classification)

# Confusion Matrix

```
yhat = tree_cv.predict(X_test)
plot_confusion_matrix(Y_test,yhat)
```



# Thank you!