IBM Developer
SKILLS NETWORK

Winning Space Race with Data Science

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Outline

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

Executive Summary

This capstone project aims to predict whether the Falcon 9 first stage will successfully land. SpaceX offers Falcon 9 launches at $62 million, significantly lower than competitors charging $165 million, primarily due to first-stage reusability. Accurately predicting landings helps estimate launch costs, which is valuable for competitors bidding against SpaceX. In this lab, you will collect and format data from an API to analyze launch success.

- Summary of methodologies
  - Data collection
  - Data Scraping
  - Data wrangling
  - Exploratory Data Analysis with Data Visualization
  - Exploratory Data Analysis with SQL
  - Building an interactive map with Folium
  - Building a Dashboard with Plotly Dash
  - Predictive analysis (Classification

- Summary of all results
  - Data Cleaned
  - Data Transformed
  - Sampling Train and Test Data
  - Exploratory Data Analysis results
  - Interactive analytics
  - Visual Dashboard
  - Predictive analysis results

Introduction

- Project background and context

  SpaceX is the most successful company of the commercial space age, making space travel affordable. The company advertises Falcon 9 rocket launches on its website, with a cost of 62 million dollars; other providers cost upward of 165 million dollars each, much of the savings is because SpaceX can reuse the first stage. Therefore, if we can determine if the first stage will land, we can determine the cost of a launch. Based on public information and machine learning models, we are going to predict if SpaceX will reuse the first stage.

- Problems you want to find answers
  - Predicting the first stage landing helps determine launch costs.
  - Useful for competitors bidding against SpaceX.
  - How do variables such as payload mass, launch site, number of flights, and orbits affect the success of the first stage landing?
  - Does the rate of successful landings increase over the years?
  - What is the best algorithm that can be used for binary classification in this case?

Section 1

Methodology

Methodology

Executive Summary

- Data collection methodology:
  - Using SpaceX Rest API
  - Using Web Scrapping from Wikipedi
- Perform data wrangling
  - Filtering the data
  - Dealing with missing values
  - Using One Hot Encoding to prepare the data to a binary classification
- Perform exploratory data analysis (EDA) using visualization and SQL
- Perform interactive visual analytics using Folium and Plotly Dash
- Perform predictive analysis using classification models
  - Building, tuning and evaluation of classification models to ensure the best results
  - Using GridSearchCV to find best fit mode

Data Collection

- **Describe how data sets were collected.**
    - Data collection process involved a combination of API requests from SpaceX REST API and Web Scraping data from a table in SpaceX's Wikipedia entry. We had to use both of these data collection methods in order to get complete information about the launches for a more detailed analysis. Data
- **Columns are obtained by using SpaceX REST API:**

  FlightNumber, Date, BoosterVersion, PayloadMass, Orbit, LaunchSite, Outcome, Flights, GridFins, Reused, Legs, LandingPad, Block, ReusedCount, Serial, Longitude, Latitude
- **Data Columns are obtained by using Wikipedia Web Scraping:**
    - Flight No., Launch site, Payload, PayloadMass, Orbit, Customer, Launch outcome, Version Booster, Booster landing, Date, Time

Data Collection
- <u>SpaceX API</u>
- Request to the SpaceX API
- Clean the requested data

Web Scraping
- <u>Wikipedia API</u>
- Extract a Falcon 9 launch records HTML table from Wikipedia
- Parse the table and convert it into a Pandas data frame

Data Wrangling
- Exploratory Data Analysis
- Determine Training Labels

Data Collection – SpaceX API

1. Request SpaceX API launch data using the GET request
2. Parse / Normalize JSON Response to Panda DataFrame
3. Request Get Booster Version (API) From Rocket ID
4. Request Get LaunchSite (API) From LaunchPad
5. Request mass of the payload and the orbit (API) From Payload
6. Request outcome of the landing, type of the landing, number of flights … From Cores
7.
   - Convert Launch Dictionary to Panda Data Frame
   - Filter the dataframe to only Falcon 9 launches
8. Replace missing PayloadMass with Mean
   Export Dataframe to CSV

[GitHub URL: Data Collection API]

Data Collection - Scraping

1. Request the Falcon9 Launch Wiki page from its URL
2. Parse the Response with Beautiful Soap Object by applying html parser
3. Extract tables on the wik page first using Beautiful Soap
4. Extract Column Name Iterate through <th> element
5. create an empty dictionary with keys from the extracted column names
6. Iterate Beatutful Soap Object on Table to extract Values and update dictionary
7. Convert Launch Dictionary to Panda Data Frame
8. Export Dataframe to CSV

GitHub URL: Data Collection with Web Scraping

Data Wrangling

- the objective is to perform **Exploratory Data Analysis (EDA)** to identify patterns in the dataset and determine appropriate labels for training supervised machine learning models. The dataset contains multiple cases related to booster landings, with both **successful and unsuccessful attempts**.
- **Understanding the Booster Landing Outcomes**
  - The dataset categorizes booster landings into different outcomes based on the location and success of the landing:

Successful Landings:

1. **True Ocean** – The booster successfully landed in a specific region of the ocean.
2. **True RTLS (Return to Launch Site)** – The booster successfully landed on a ground pad.
3. **True ASDS (Autonomous Spaceport Drone Ship)** – The booster successfully landed on a drone ship.

Unsuccessful Landings:

1. **False Ocean** – The booster attempted to land in a specific ocean region but failed.
2. **False RTLS** – The booster attempted to land on a ground pad but failed.
3. **False ASDS** – The booster attempted to land on a drone ship but failed.

Converting Outcomes into Training Labels

For training the supervised learning model, the mission outcomes are converted into **binary labels**:

- **1 (Success):** The booster landed successfully.
- **0 (Failure):** The booster failed to land.

This labeling process helps in building a model that can predict whether a booster will successfully land based on historical data and features

Purpose of EDA in the Lab

- Identify **patterns and correlations** in the dataset.
- Determine **key factors** affecting successful landings.
- Prepare **clean, structured data** for model training.

1 Check Null Values

2 Calculate Number of Launches in each site

3 Calculate Number of Occurrence in each Orbit

4 Calculate Number of Occurrence of mission Outcome column

5 Create a landing outcome label from Outcome column

6 Handle Null Values

[GitHub URL: Data Wrangling]

EDA with Data Visualization

- Scatter plots show the relationship between variables. If a relationship exists, they could be used in machine learning model.
  - To get relationship between variables, e.g.: FlightNumber vs. Orbit type, Payload vs. Orbit type, FlightNumber vs. PayloadMass, FlightNumber vs. Launch Site
- Bar charts show comparisons among discrete categories. The goal is to show the relationship between the specific categories being compared and a measured value.
  - visually check if there are any relationship between success rate and orbit type.
- Line charts show trends in data over time (time series)
  - To visualize Yearly average success rate

[GitHub URL: EDA with Data Visualization]

EDA with SQL

Performed SQL queries:

- Displaying the names of the unique launch sites in the space mission
- Displaying 5 records where launch sites begin with the string ‘CCA’
- Displaying the total payload mass carried by boosters launched by NASA (CRS)
- Displaying average payload mass carried by booster version F9 v1.1
- Listing the date when the first successful landing outcome in ground pad was achieved
- Listing the names of the boosters which have success in drone ship and have payload mass greater than 4000 but less than 6000
- Listing the total number of successful and failure mission outcomes
- Listing the names of the booster versions which have carried the maximum payload mass
- Listing the failed landing outcomes in drone ship, their booster versions and launch site names for the months in year 2015
- Ranking 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

[GitHub URL: EDA with SQL]()

Build an Interactive Map with Folium

Folium markers help identify specific locations on a map. The folium Marker class enables the addition of basic markers with customizable icons, popups, and tooltips.

Folium markers Cluster is to manage a large number of markers efficiently, marker clusters can be used. When zoomed out, nearby markers merge into a cluster, which expands into individual markers as the map zooms in.

Folium Circle function allows for adding a highlighted circular area with a text label at a specified coordinate. The radius is defined in meters, meaning it scales dynamically with zoom level. Conversely, **Circle Markers** have a fixed radius in pixels, ensuring their size remains constant regardless of zoom level.

Folium PolyLine feature enables drawing lines on maps by connecting a series of latitude and longitude points. This is useful for visualizing routes, boundaries, or other linear features.

Marker clusters simplifies a map containing many markers having the same coordinate.

Markers of all Launch Sites:

- Added Marker with Circle, Popup Label and Text Label of NASA Johnson Space Center using its latitude and longitude coordinates as a start location.
- Added Markers with Circle, Popup Label and Text Label of all Launch Sites using their latitude and longitude coordinates to show their geographical locations and proximity to Equator and coasts.

Colored Markers of the launch outcomes for each Launch Site:

- Added colored Markers of success (Green) and failed (Red) launches using Marker Cluster to identify which launch sites have relatively high success rates.

Distances between a Launch Site to its proximities:

- Added colored Lines to show distances between the Launch Site KSC LC-39A (as an example) and its proximities like Railway, Highway, Coastline and Closest City

[GitHub URL: Interactive Visual Analytics with Folium]()

Build a Dashboard with Plotly Dash

This dashboard application contains input components such as a dropdown list and a range slider to interact with a pie chart and a scatter point chart.

- **Launch Sites Dropdown List:**
  - Added a dropdown list to enable Launch Site selection.
- **Pie Chart showing Success Launches (All Sites/Certain Site):**
  - Added a pie chart to show the total successful launches count for all sites and the Success vs. Failed counts for the site, if a specific Launch Site was selected.
- **Slider of Payload Mass Range:**
  - Added a slider to select Payload range.
- **Scatter Chart of Payload Mass vs. Success Rate for the different Booster Versions:**
  - Added a scatter chart to show the correlation between Payload and Launch Success

GitHub URL: SpaceX Dash App

Predictive Analysis (Classification)

Load Data
Load our dataset into NumPy and Pandas
1

Prepare / Transform
Standardizing the data with StandardScaler, then fitting and transforming it
2

Sample Train / Test
Splitting the data into training and testing sets with train_test_split function
3

Select Parameter to Train
Creating a GridSearchCV object with cv = 10 to find the best parameters
4

Training
Applying GridSearchCV on LogReg, SVM, Decision Tree, and KNN models
5

Evaluation
Calculating the accuracy on the test data using the method .score() for all models
6

Analyze and Improve
Examining the confusion matrix for all models
7

Best Model Select
Finding the method performs best by examining the Jaccard_score and F1_score metrics
8

GitHub URL: **Machine Learning Prediction**

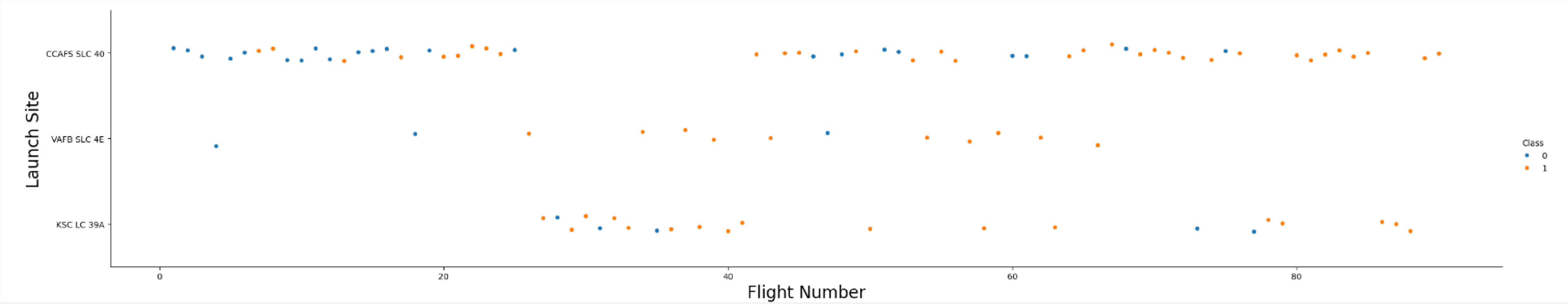
Results

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

Section 2

Insights drawn from EDA

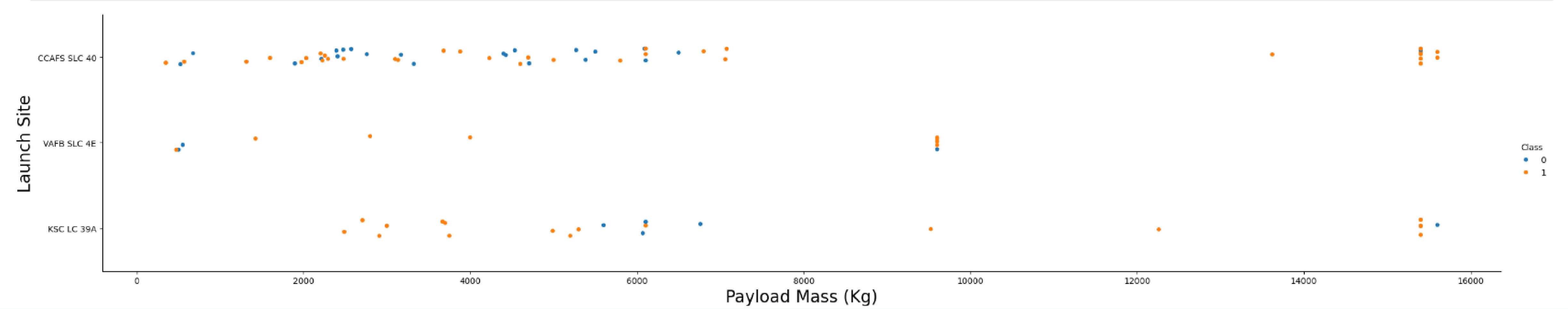
Flight Number vs. Launch Site



Explanation:

- The earliest flights all failed while the latest flights all succeeded.
- The CCAFS SLC 40 launch site has about a half of all launches.
- VAFB SLC 4E and KSC LC 39A have higher success rates.
- It can be assumed that each new launch has a higher rate of success

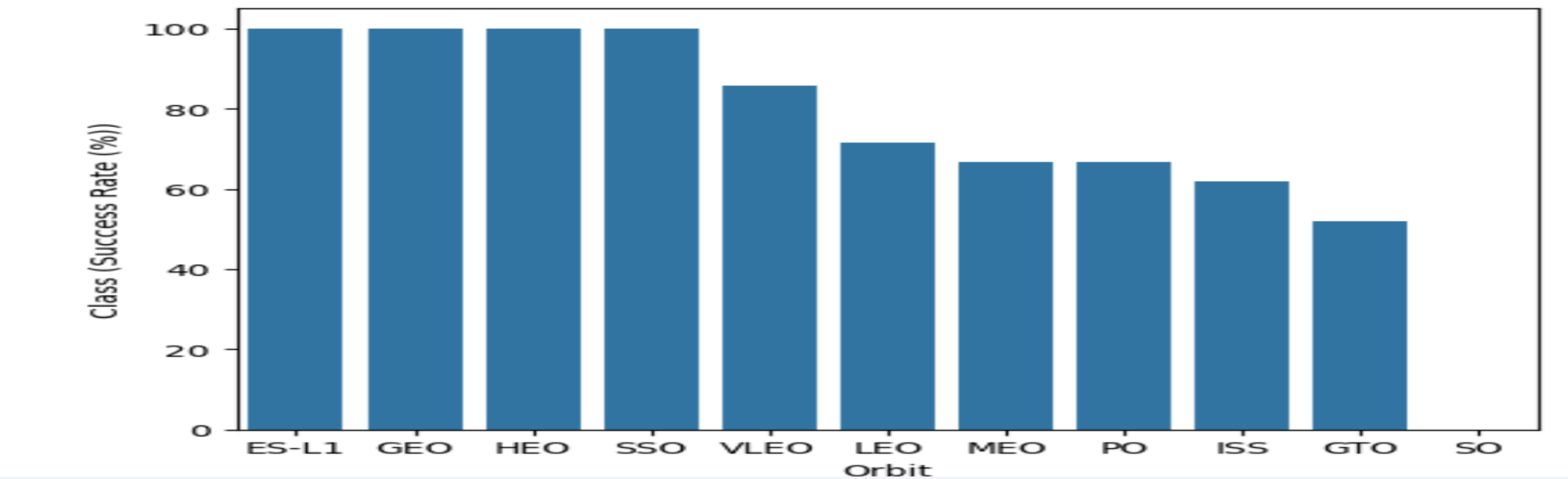
Payload vs. Launch Site



Explanation:

- For every launch site the higher the payload mass, the higher the success rate.
- Most of the launches with payload mass over 7000 kg were successful.
- KSC LC 39A has a 100% success rate for payload mass under 5500 kg too.

Success Rate vs. Orbit Type

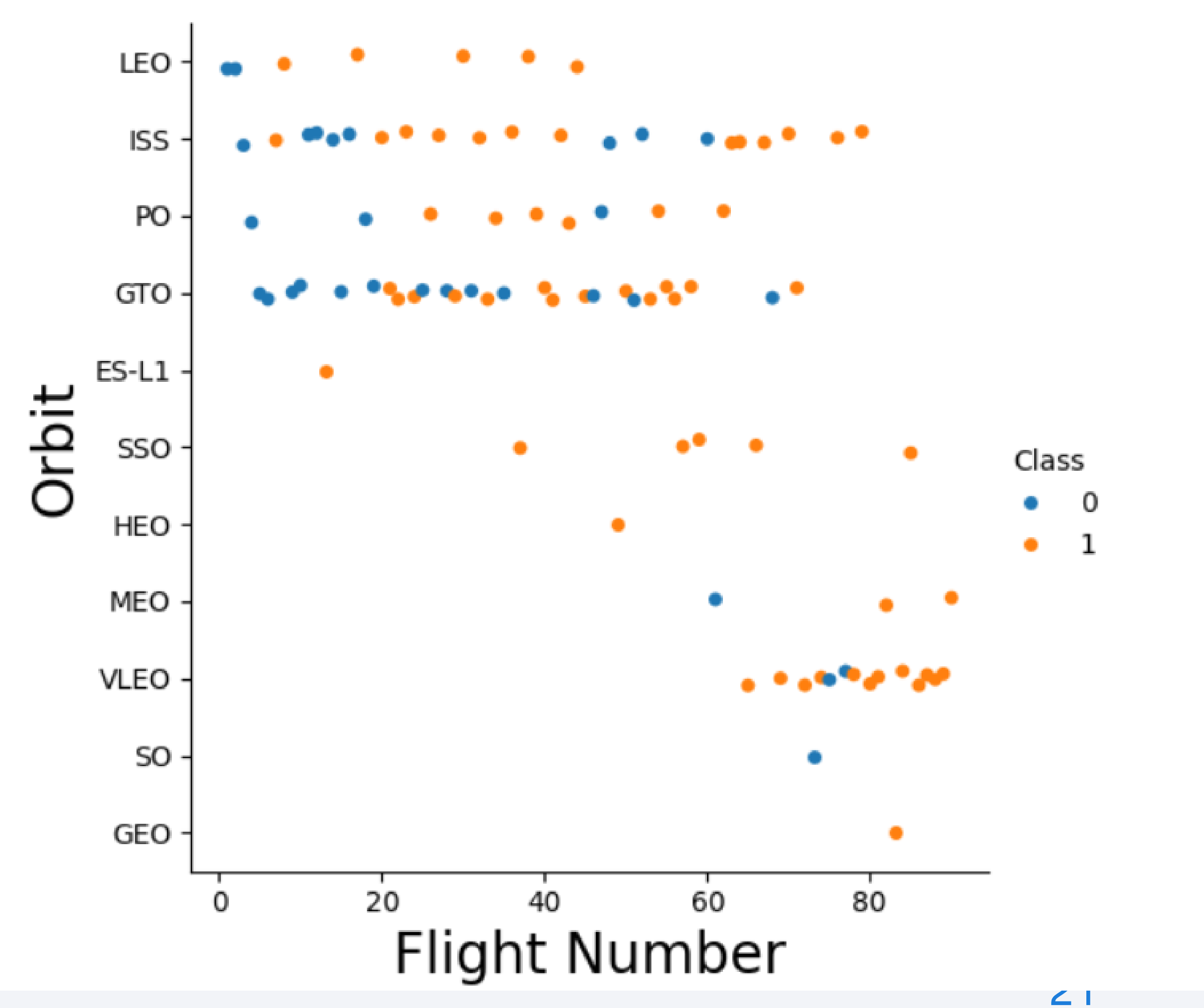


- Explanation:
  - Orbits with 100% success rate:
    - ES-L1, GEO, HEO, SSO
  - Orbits with 0% success rate:
    - SO
  - Orbits with success rate between 50% and 85%:
    - GTO, ISS, LEO, MEO, PO

Flight Number vs. Orbit Type

Explanation:

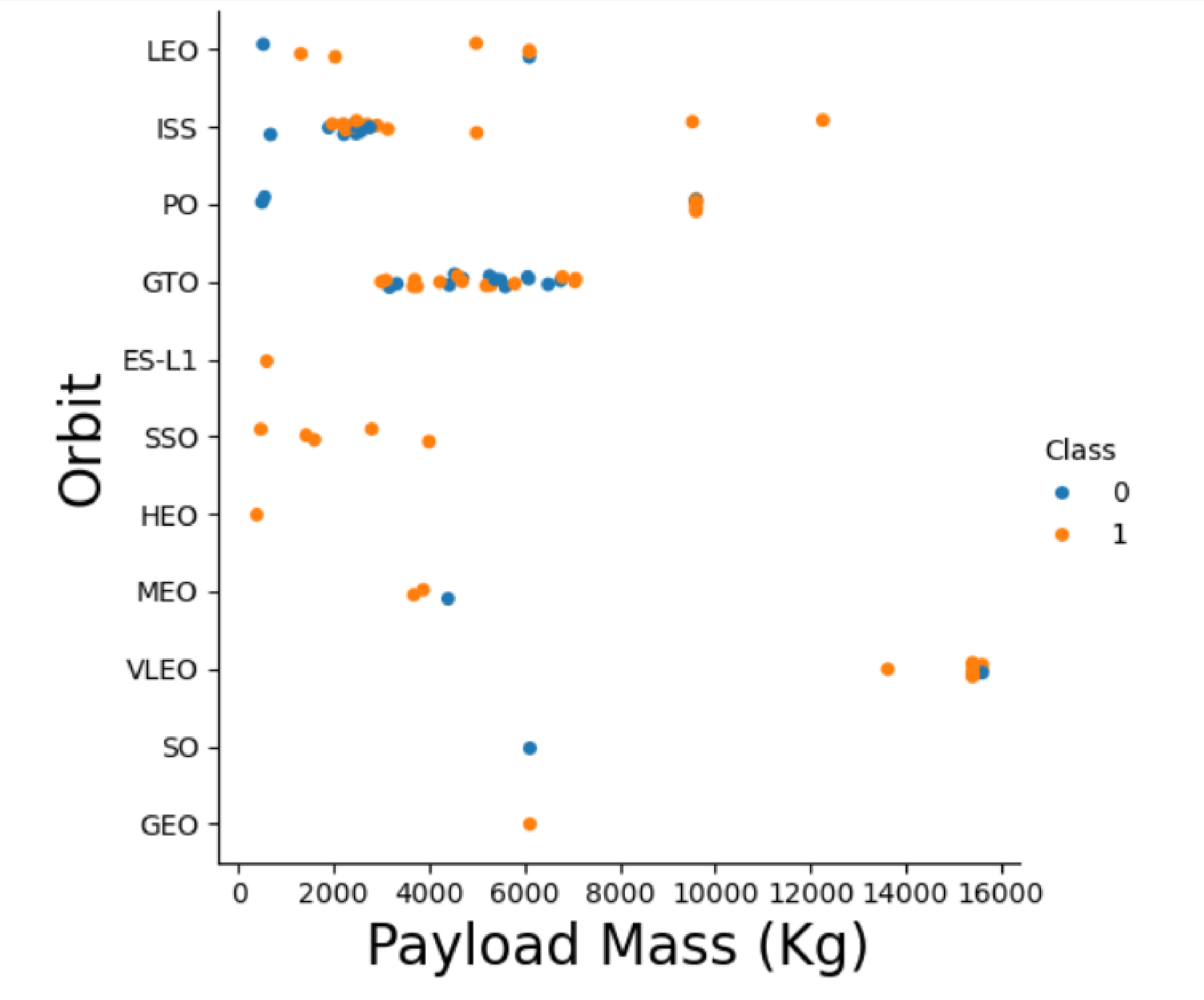
- In ES-L1, GEO, HEO and SSO orbits , all launches are successful. There is clear relationship between flight number and success rate in LEO orbit since as flightnumber increases, the success rate increases. In contrast, there is no such obvious relationship in GTO orbit.



Payload vs. Orbit Type

Explanation:

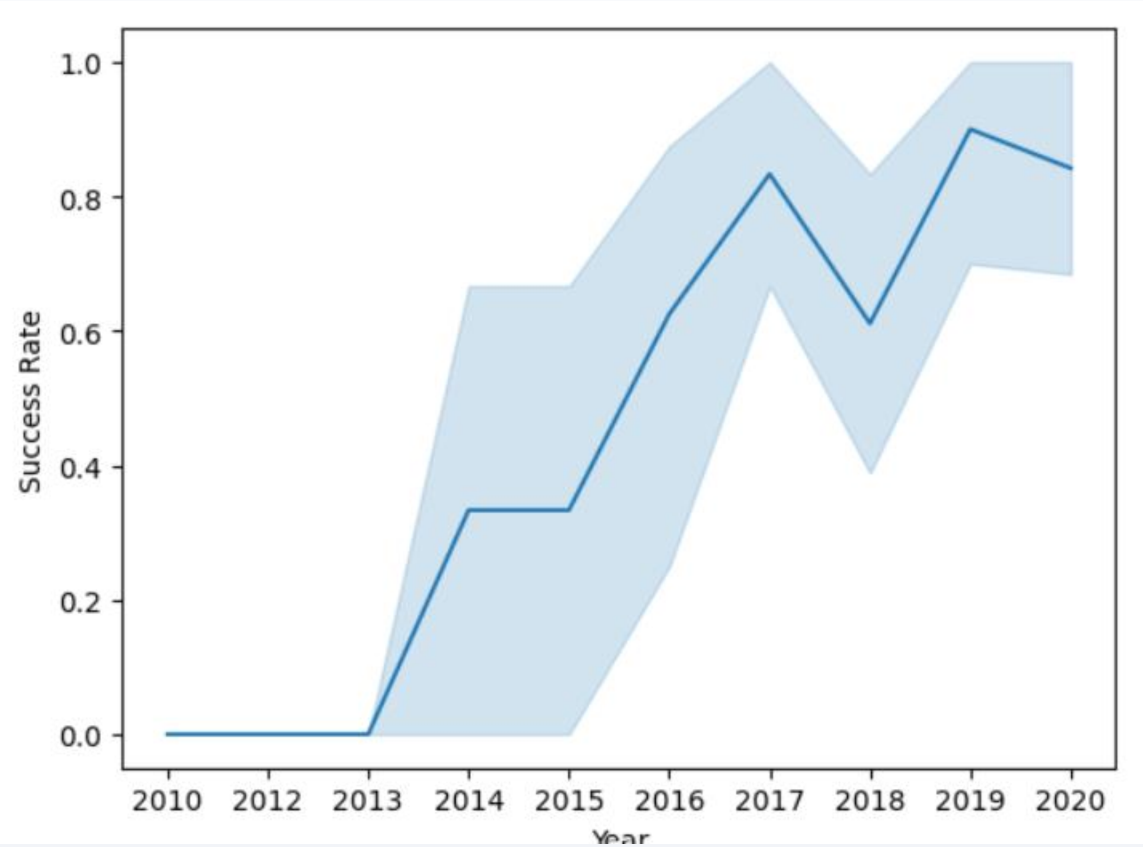
- With Heavy payloads the successful landing or positive landing rate are more for Polar, LEO and ISS
- However, for GTO we cannot distinguish the well as both positive landing rate and negative landing (unsuccessful mission) are both there here
- Heavy payloads have a negative influence on GTO orbits and positive on GTO and Polar LEO (ISS) orbits



Launch Success Yearly Trend

Explanation:

- The success rate since 2013 kept increasing till 2020.



All Launch Site Names

[10]:
```
%sql SELECT DISTINCT LAUNCH_SITE as Launch_Sites FROM SPACEXTABLE
```

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

[10]:

Launch_Sites
CCAFS LC-40
VAFB SLC-4E
KSC LC-39A
CCAFS SLC-40

Explanation:

- Displaying the names of the unique launch sites in the space mission.

Launch Site Names Begin with 'CCA'

```
[11]: %sql SELECT * FROM SPACEXTABLE where LAUNCH_SITE like 'CCA%' limit 5

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

[11]:

Date	Time (UTC)	Booster_Version	Launch_Site	Payload	PAYLOAD_MASS__KG_	Orbit	Customer	Mission_Outcome	Landing_Outcome
2010-06-04	18:45:00	F9 v1.0 B0003	CCAFS LC-40	Dragon Spacecraft Qualification Unit	0	LEO	SpaceX	Success	Failure (parachute)
2010-12-08	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)
2012-05-22	7:44:00	F9 v1.0 B0005	CCAFS LC-40	Dragon demo flight C2	525	LEO (ISS)	NASA (COTS)	Success	No attempt
2012-10-08	0:35:00	F9 v1.0 B0006	CCAFS LC-40	SpaceX CRS-1	500	LEO (ISS)	NASA (CRS)	Success	No attempt
2013-03-01	15:10:00	F9 v1.0 B0007	CCAFS LC-40	SpaceX CRS-2	677	LEO (ISS)	NASA (CRS)	Success	No attempt

Explanation:

- Displaying 5 records where launch sites begin with the string 'CCA'

Total Payload Mass

```
[12]: %sql SELECT sum(PAYLOAD_MASS__KG_) as Total_Mass_kg FROM SPACEXTABLE where Customer='NASA (CRS)'

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

[12]:

Total_Mass_kg
45596

Explanation:

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

Average Payload Mass by F9 v1.1

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

```
[13]: %sql SELECT avg(PAYLOAD_MASS__KG_) as Avg_Mass_kg FROM SPACEXTABLE where Booster_Version Like 'F9 v1.1%'

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

[13]:

Avg_Mass_kg
2534.6666666666665

Explanation:

- Displaying average payload mass carried by booster version F9 v1.1

First Successful Ground Landing Date

```
[14]: %sql SELECT MIN(Date) FROM SPACEXTABLE where Landing_Outcome = "Success (ground pad)"

 * sqlite:///my_data1.db
Done.
[14]:
```

MIN(Date)
2015-12-22

Explanation:

- Listing the date when the first successful landing outcome in ground pad was achieved

Successful Drone Ship Landing with Payload between 4000 and 6000

```
[15]: %sql SELECT DISTINCT Booster_Version, Payload FROM SPACEXTABLE where Landing_Outcome = "Success (drone ship)" AND PAYLOAD_MASS__KG_ > 4000 AND PAYLOAD_MASS__KG_ < 6000;

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

[15]:

Booster_Version	Payload
F9 FT B1022	JCSAT-14
F9 FT B1026	JCSAT-16
F9 FT B1021.2	SES-10
F9 FT B1031.2	SES-11 / EchoStar 105

Explanation:

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

Total Number of Successful and Failure Mission Outcomes

```
[16]: %sql SELECT Mission_Outcome, count(Mission_Outcome) as Mission_outcome_count FROM SPACEXTABLE group by Mission_outcome

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

[16]:

Mission_Outcome	Mission_outcome_count
Failure (in flight)	1
Success	98
Success	1
Success (payload status unclear)	1

- Explanation:
  - Listing the total number of successful and failure mission outcomes

Boosters Carried Maximum Payload

```
[17]: %sql SELECT Booster_Version ,Payload, PAYLOAD_MASS__KG_ FROM SPACEXTBL WHERE PAYLOAD_MASS__KG_ = (SELECT MAX(PAYLOAD_MASS__KG_) FROM SPACEXTBL);

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

[17]:

Booster_Version	Payload	PAYLOAD_MASS__KG_
F9 B5 B1048.4	Starlink 1 v1.0, SpaceX CRS-19	15600
F9 B5 B1049.4	Starlink 2 v1.0, Crew Dragon in-flight abort test	15600
F9 B5 B1051.3	Starlink 3 v1.0, Starlink 4 v1.0	15600
F9 B5 B1056.4	Starlink 4 v1.0, SpaceX CRS-20	15600
F9 B5 B1048.5	Starlink 5 v1.0, Starlink 6 v1.0	15600
F9 B5 B1051.4	Starlink 6 v1.0, Crew Dragon Demo-2	15600
F9 B5 B1049.5	Starlink 7 v1.0, Starlink 8 v1.0	15600
F9 B5 B1060.2	Starlink 11 v1.0, Starlink 12 v1.0	15600
F9 B5 B1058.3	Starlink 12 v1.0, Starlink 13 v1.0	15600
F9 B5 B1051.6	Starlink 13 v1.0, Starlink 14 v1.0	15600
F9 B5 B1060.3	Starlink 14 v1.0, GPS III-04	15600
F9 B5 B1049.7	Starlink 15 v1.0, SpaceX CRS-21	15600

- Explanation:
  - Listing the names of the booster versions which have carried the maximum payload mass

2015 Launch Records

```
[18]: %sql SELECT substr(Date,7,4), substr(Date, 6, 2),Booster_Version, Launch_Site, Payload, PAYLOAD_MASS__KG_, Mission_Outcome, Landing_Outcome FROM SPACEXTBL WHERE substr(Date,0,5)='2015' AND Landing_Outcome = 'Fail
```

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

[18]:

substr(Date,7,4)	substr(Date, 6, 2)	Booster_Version	Launch_Site	Payload	PAYLOAD_MASS__KG_	Mission_Outcome	Landing_Outcome
1-10	01	F9 v1.1 B1012	CCAFS LC-40	SpaceX CRS-5	2395	Success	Failure (drone ship)
4-14	04	F9 v1.1 B1015	CCAFS LC-40	SpaceX CRS-6	1898	Success	Failure (drone ship)

Explanation:

- Listing the failed landing outcomes in drone ship, their booster versions and launch site names for the months in year 2015

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

```
[19]: %sql SELECT * FROM SPACEXTBL WHERE Landing_Outcome LIKE 'Success%' AND (Date BETWEEN '2010-06-04' AND '2017-03-20') ORDER BY Date DESC;
```

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

[19]:

Date	Time (UTC)	Booster_Version	Launch_Site	Payload	PAYLOAD_MASS__KG_	Orbit	Customer	Mission_Outcome	Landing_Outcome
2017-02-19	14:39:00	F9 FT B1031.1	KSC LC-39A	SpaceX CRS-10	2490	LEO (ISS)	NASA (CRS)	Success	Success (ground pad)
2017-01-14	17:54:00	F9 FT B1029.1	VAFB SLC-4E	Iridium NEXT 1	9600	Polar LEO	Iridium Communications	Success	Success (drone ship)
2016-08-14	5:26:00	F9 FT B1026	CCAFS LC-40	JCSAT-16	4600	GTO	SKY Perfect JSAT Group	Success	Success (drone ship)
2016-07-18	4:45:00	F9 FT B1025.1	CCAFS LC-40	SpaceX CRS-9	2257	LEO (ISS)	NASA (CRS)	Success	Success (ground pad)
2016-05-27	21:39:00	F9 FT B1023.1	CCAFS LC-40	Thaicom 8	3100	GTO	Thaicom	Success	Success (drone ship)
2016-05-06	5:21:00	F9 FT B1022	CCAFS LC-40	JCSAT-14	4696	GTO	SKY Perfect JSAT Group	Success	Success (drone ship)
2016-04-08	20:43:00	F9 FT B1021.1	CCAFS LC-40	SpaceX CRS-8	3136	LEO (ISS)	NASA (CRS)	Success	Success (drone ship)
2015-12-22	1:29:00	F9 FT B1019	CCAFS LC-40	OG2 Mission 2 11 Orbcomm-OG2 satellites	2034	LEO	Orbcomm	Success	Success (ground pad)

Explanation:

- Ranking 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

Section 3

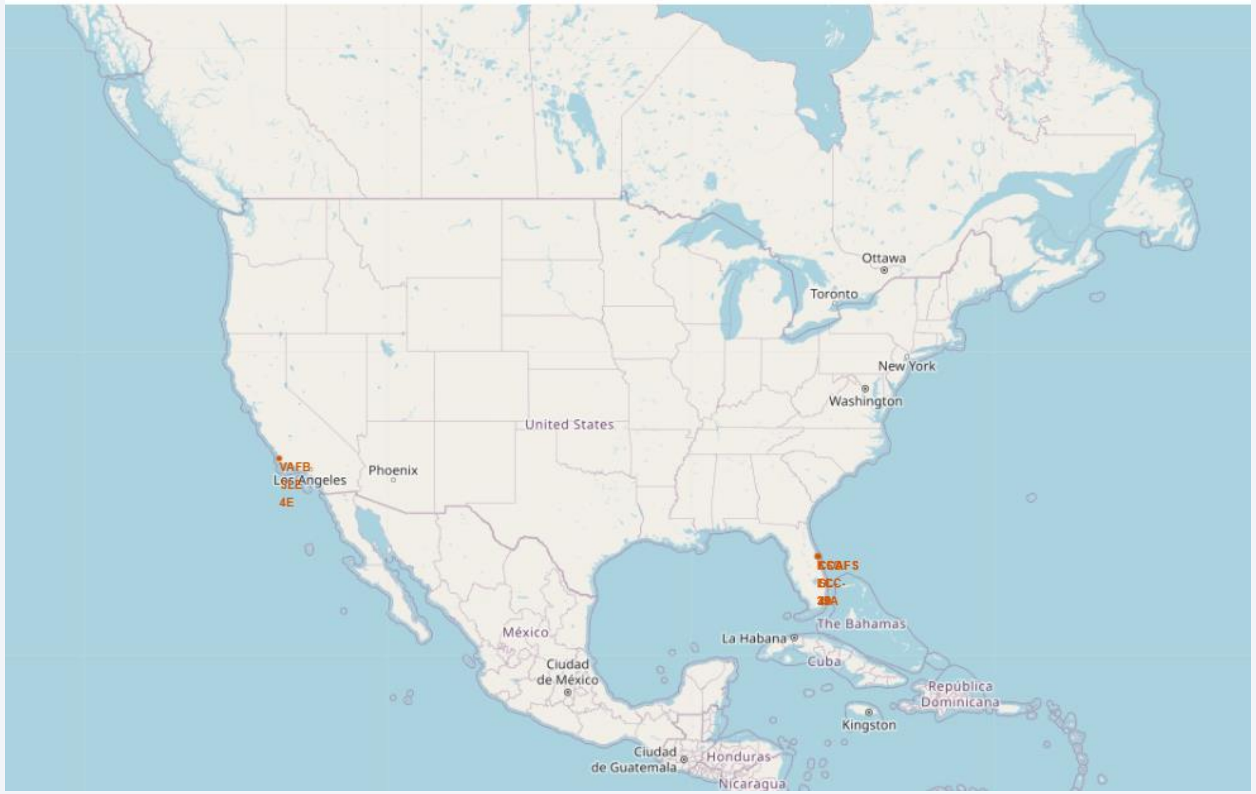
Launch Sites Proximities Analysis

All launch sites' location markers on a global map

Explanation:

- Most launch sites are strategically located near the equator because the Earth's surface moves fastest there, at approximately 1,670 km/h due to its rotation.
- When a spacecraft is launched from the equator, it retains this rotational speed, giving it an initial velocity boost.
- This extra speed reduces the amount of energy required for the spacecraft to reach orbit, making launches more fuel-efficient and cost-effective.
- The principle of inertia ensures that the spacecraft continues moving around the Earth at the same speed after launch, aiding in maintaining its trajectory.
- Launch sites are predominantly situated near coastlines to ensure that rockets are launched over open waters.
- This minimizes the risk to human populations in case of rocket failures, debris falls, or mid-air explosions.

The generated map with marked launch



Color-labeled launch records on the map

Explanation:

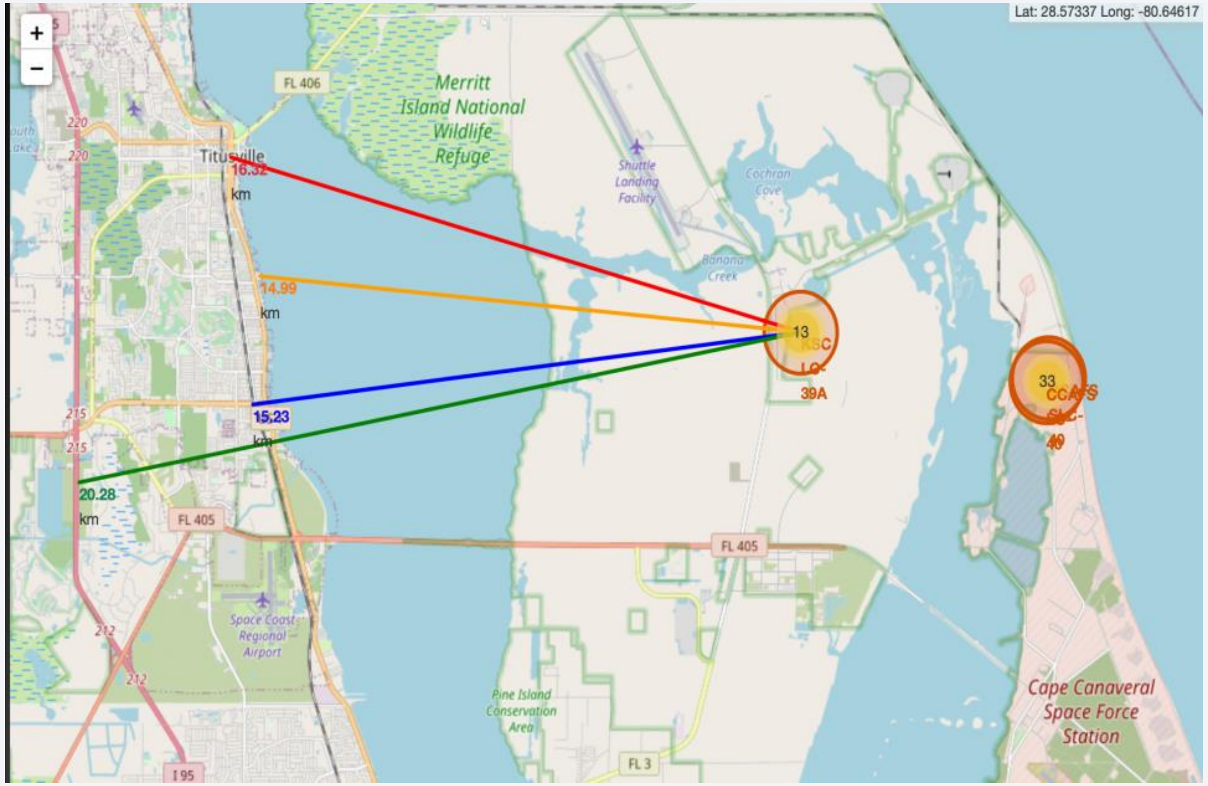
- From the color-labeled markers we should be able to easily identify which launch sites have relatively high success rates.
    - Green Marker = Successful Launch
    - Red Marker = Failed Launch
- Launch Site KSC LC-39A has a very high Success Rate

Color-labeled markers in marker clusters

Distance from the launch site KSC LC-39A to its proximities

Explanation:

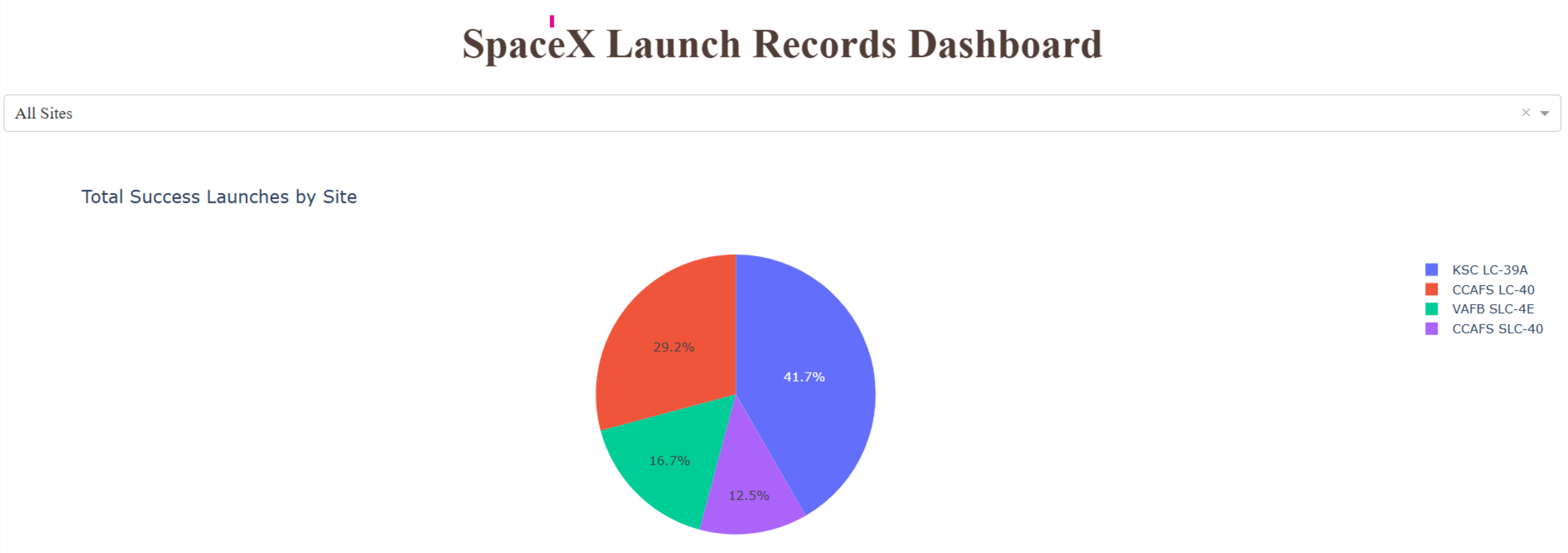
- From the visual analysis of the launch site KSC LC-39A we can clearly see that it is:
  - relative close to railway (15.23 km)
  - relative close to highway (20.28 km)
  - relative close to coastline (14.99 km)
- Also the launch site KSC LC-39A is relative close to its closest city Titusville (16.32 km).
- Failed rocket with its high speed can cover distances like 15-20 km in few seconds. It could be potentially dangerous to populated areas.



Section 4

Build a Dashboard with Plotly Dash

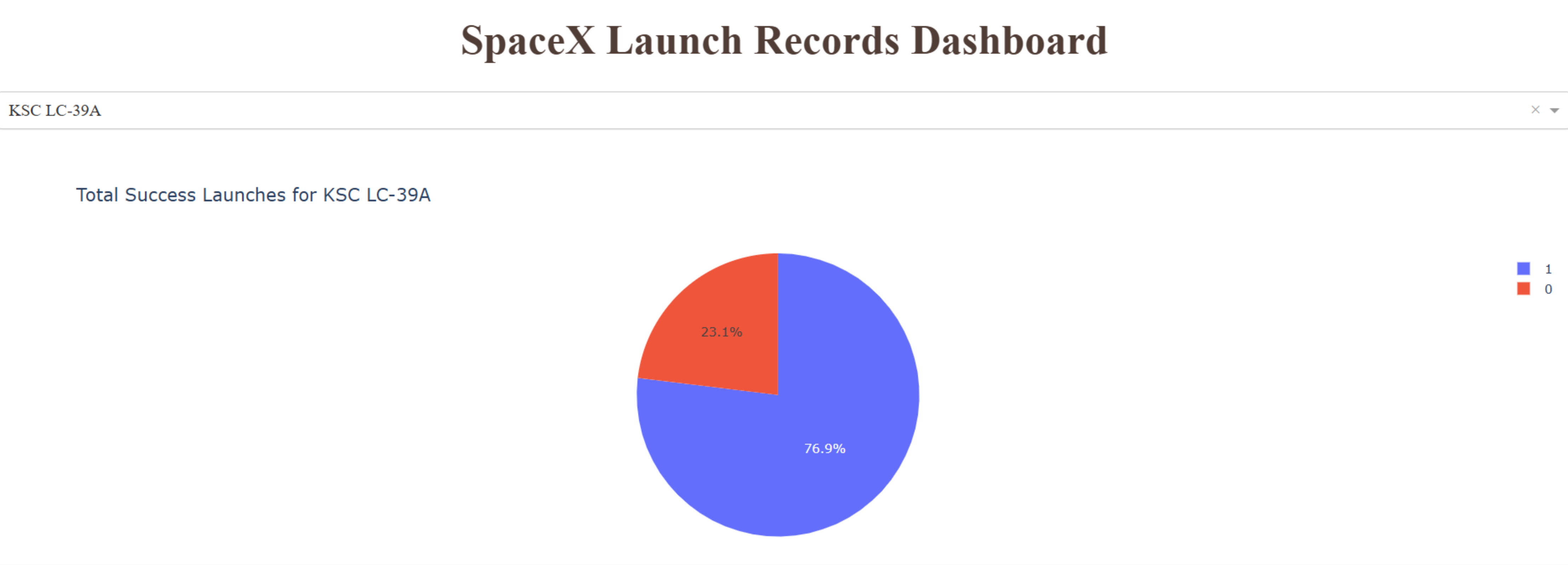
Launch success count for all sites



Explanation:

- The chart clearly shows that from all the sites, KSC LC-39A has the most successful launches

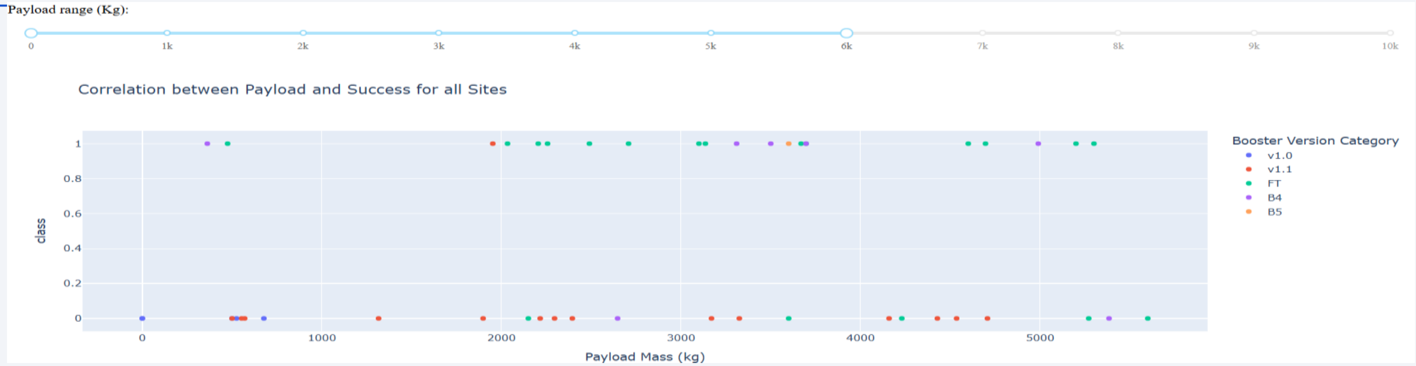
Launch site with highest launch success ratio

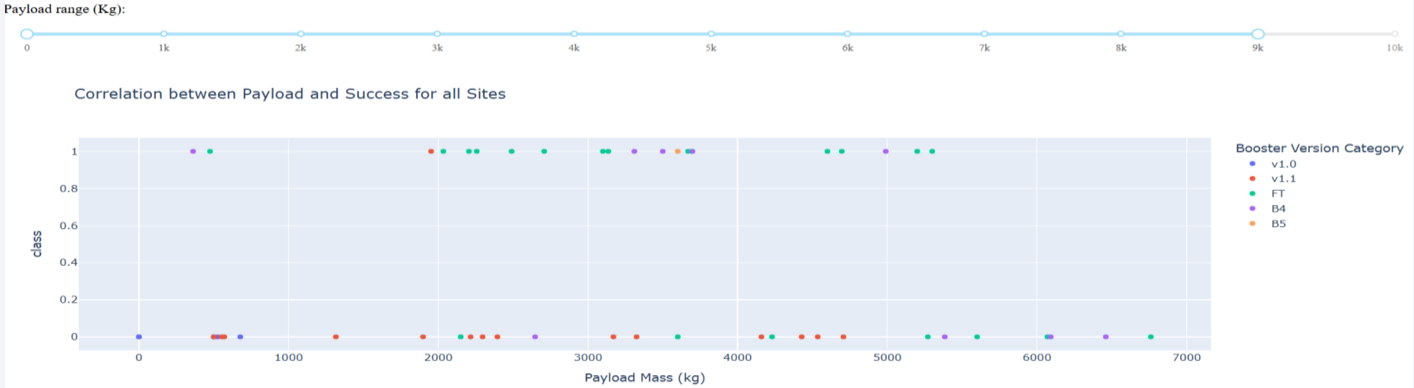


Explanation:

- KSC LC-39A has the highest launch success rate (76.9%) with 10 successful and only 3 failed landings.

Payload Mass vs. Launch Outcome for all sites





Explanation:

- The charts show that payloads between 2000 and 5500 kg have the highest success rate

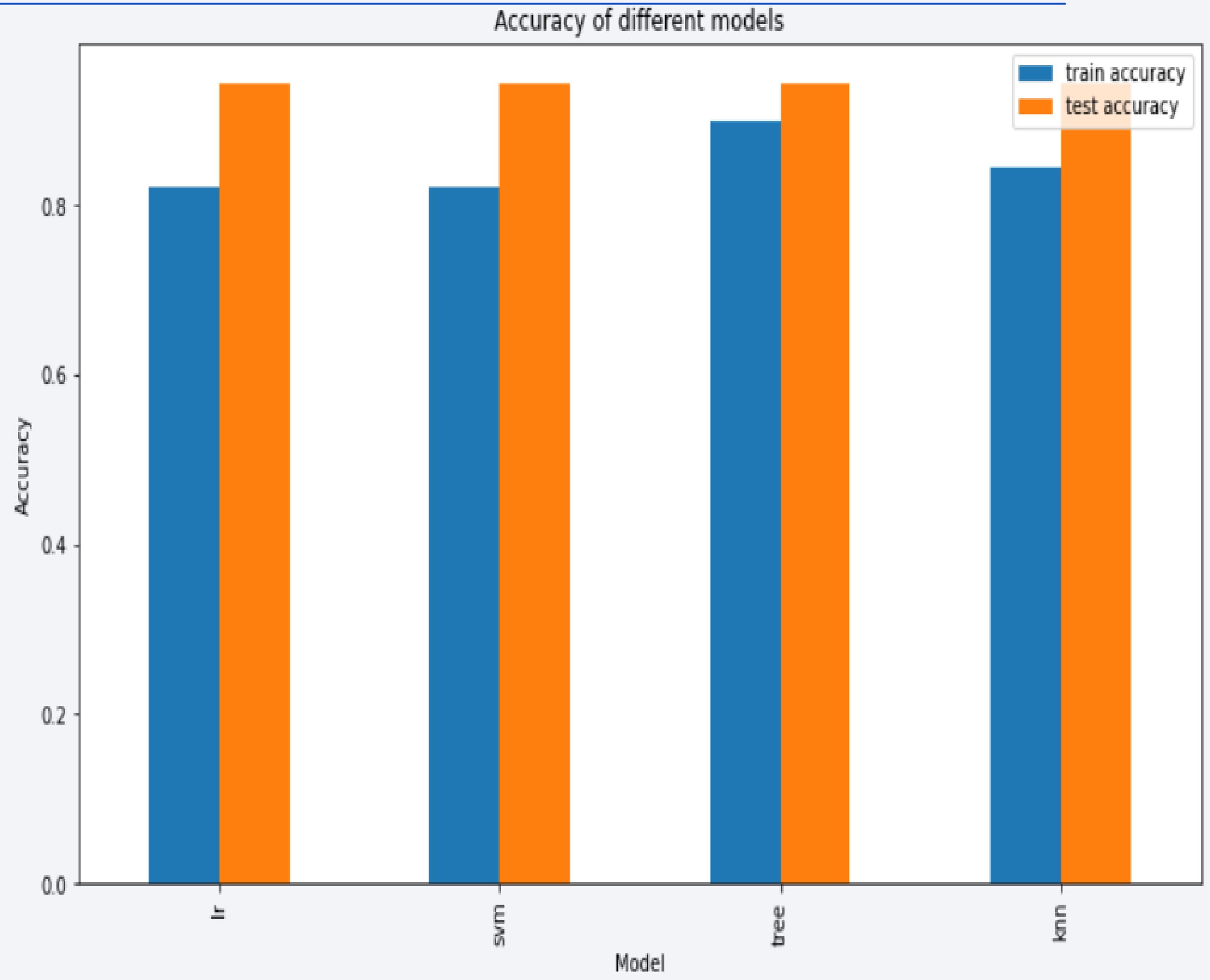
Section 5

Predictive Analysis (Classification)

Classification Accuracy

Explanation:

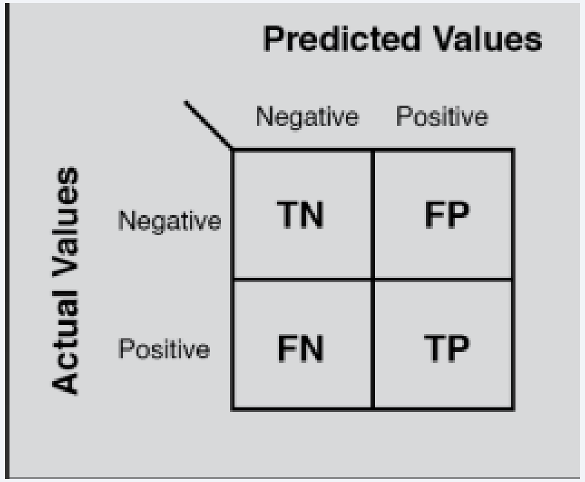
- Based on the scores of the Test Set, we can not confirm which method performs best.
- Same Test Set scores may be due to the small test sample size (18 samples). Therefore, we tested all methods based on the whole Dataset.
- The scores of the whole Dataset confirm that the best model is the Decision Tree Model. This model has not only higher scores, but also the highest accuracy

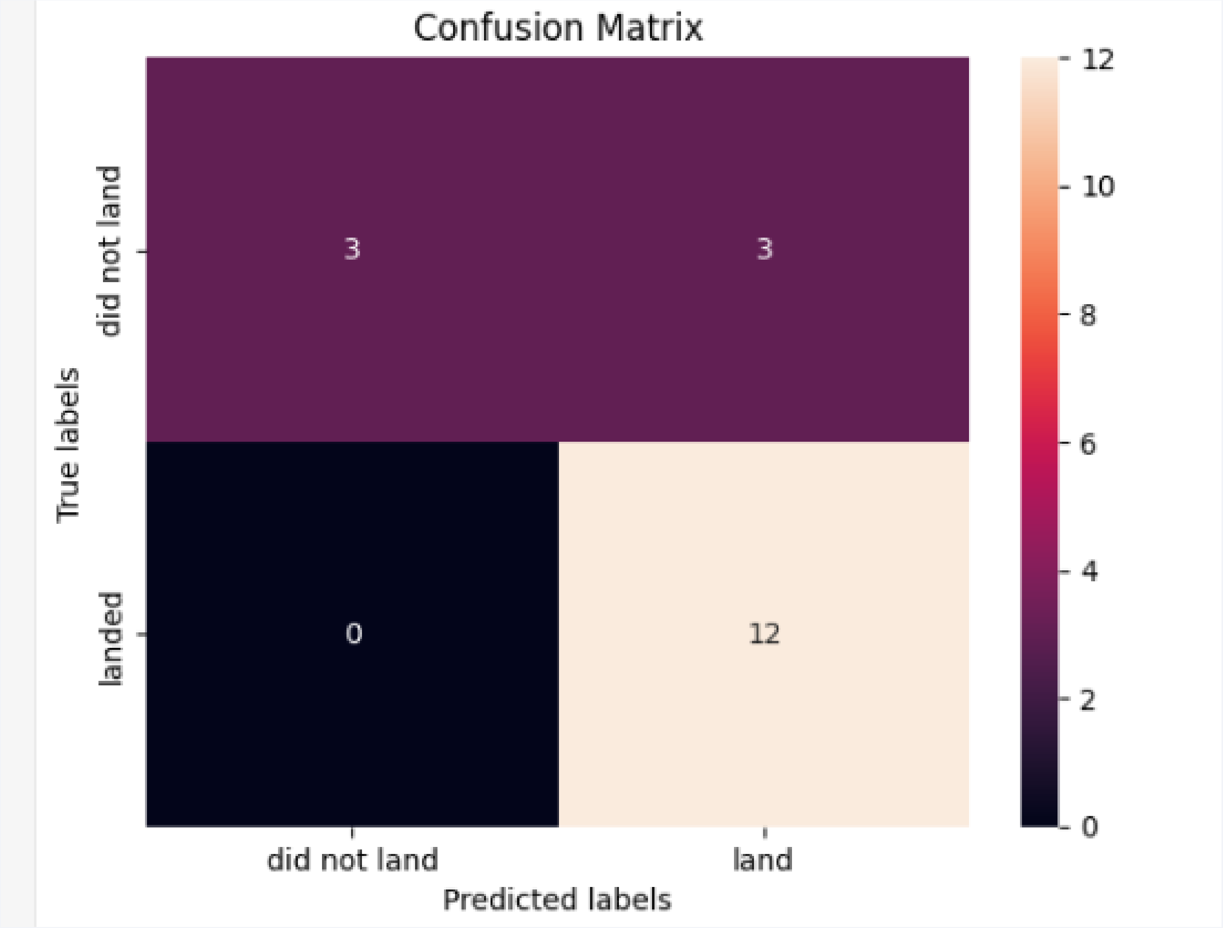


Confusion Matrix

Explanation

- Examining the confusion matrix, we see that Tree can distinguish between the different classes. We see that the major problem i s false positives.





Conclusions

- The Decision Tree Model is the most effective algorithm for machine learning with this dataset.
- Launches with lower payload masses tend to have higher success rates compared to heavier payloads.
- Most launch sites are located near the equator and coastlines, optimizing efficiency and minimizing risks.
- The success rate of SpaceX launches has improved over time, indicating continuous advancements in technology and precision.
- KSC LC-39A has recorded the highest number of successful launches among all sites.
- The ES-L1, GEO, HEO, and SSO orbits have demonstrated a 100% success rate, making them the most reliable orbital destinations....

Appendix

- Include any relevant assets like Python code snippets, SQL queries, charts, Notebook outputs, or data sets that you may have created during this project

Thank you!