IBM Developer
SKILLS NETWORK

Winning Space Race with Data Science

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Instructions and guidelines (read carefully)

Instructions

1. Insert your name as it appears on your Online Campus learner profile in the file name. Save the file as: **First Name Last Name M10U4 Capstone Project** – **e.g., Lilly Smith M10U4 Capstone Project.**
2. Write all your answers and upload your screenshots in this PowerPoint presentation in the slides provided.
3. Convert your final presentation into **.pdf** format and submit this **PDF document**. No other file types will be accepted.

Note: Please ensure that you have checked your course calendar for the due date for this assignment.

Guidelines

Note: If you do not have a desktop version, follow the instructions from the previous lab to access PowerPoint online.

1. Complete the slides with relevant details (you are free to add additional slides, charts, and tables).
2. Add any additional unused charts or tables to the appendix that you think are relevant to your analysis.

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Outline

- Executive summary
- Introduction
- Methodology
- Results
- Conclusion
- Appendix

Executive summary

- This project focused on predicting the success of Falcon 9 first-stage landings, a key factor in SpaceX’s cost advantage through rocket reusability. Data was collected from the SpaceX API and enriched with information from Wikipedia, then cleaned and combined to create a target variable indicating landing success.
- Exploratory Data Analysis revealed patterns in success rates across payload ranges, orbit types, and launch sites, along with a clear improvement in reliability over time. Interactive visualizations built with Folium and Plotly Dash provided geographic and operational insights.
- Four machine learning models—Logistic Regression, SVM, Decision Tree, and KNN—were tested. While all achieved similar accuracy, the Support Vector Machine (SVM) delivered the best overall performance based on ROC–AUC, making it the most reliable choice for prediction.
- These findings demonstrate that landing success can be predicted with reasonable accuracy, supporting cost estimation and competitive bidding strategies.

Introduction

- Project background and context
  - SpaceX revolutionized space travel by reusing the Falcon 9 rocket's first stage, reducing launch costs.
  - Predicting landing success can help competitors estimate costs and make informed bidding decisions.

- Problem statement:
  - Can we accurately predict whether the Falcon 9 first stage will land successfully?
  - Can we make an accurate predictive model to support cost estimation and competitive strategies?

Section 1

Methodology

Methodology

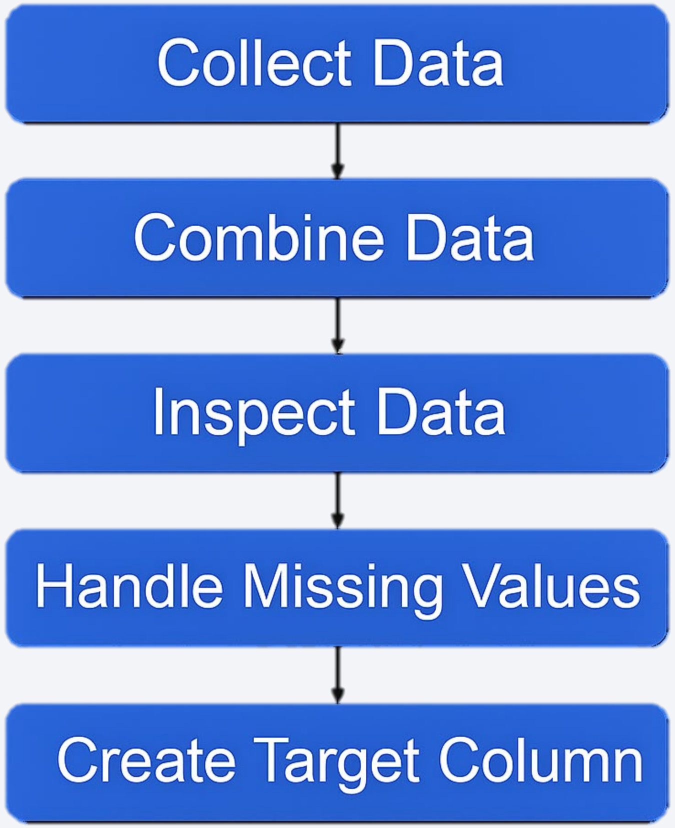
Executive summary

- Data collection methodology.
- Perform data wrangling.
- Perform exploratory data analysis (EDA) using visualization and SQL.
- Perform interactive visual analytics using Folium and Plotly Dash.
- Perform predictive analysis using classification models.

Data collection

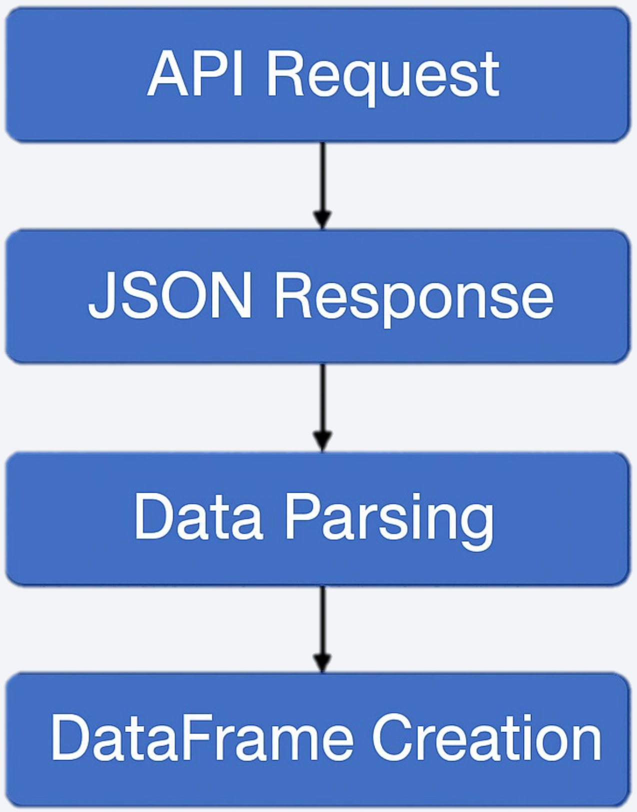
Process:

- Collect data, data sources used:
  - SpaceX API
  - Wikipedia
- Merge API and Wikipedia data into a single dataset
- Inspect dataset for consistency and completeness
- Handle missing payload values by imputing the average
- Create target column: 1 for successful launch, 0 for failed launch



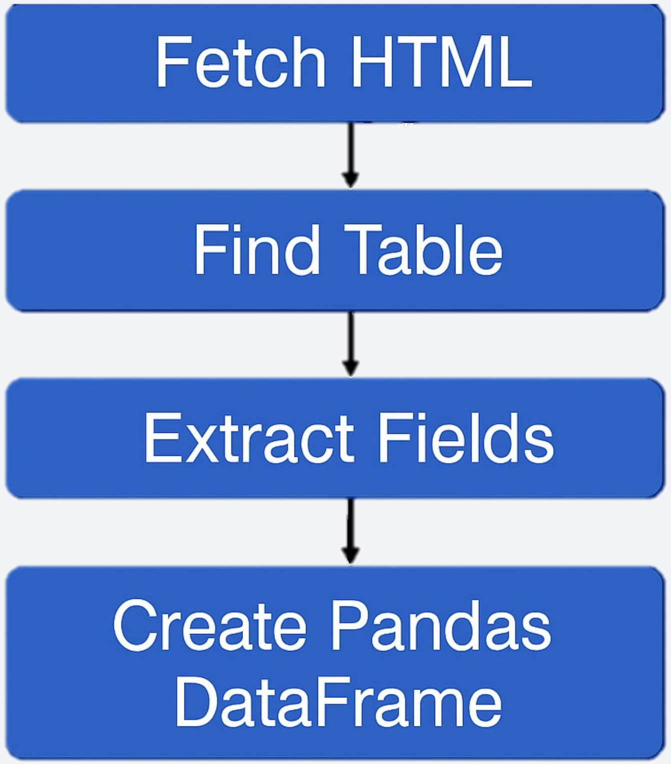
Data collection – SpaceX API

- Data source: SpaceX API (used links see appendix)
  All data available through Space X API: https://github.com/r-spacex/SpaceX-API/tree/master/docs
- Process:
  - GET request using Python requests library
  - Parse JSON response into Pandas DataFrame
  - Deal with missing values in the payload mass, by replacing with an average value
- Data retrieved:
  - Booster version
  - Launch details
  - Payload mass
  - Core data
  - Landing outcome
- Purpose: Build dataset for predictive modeling
- Resulting dataset see appendix
- Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.4/9.4.3%20jupyter-labs-spacex-data-collection-api.ipynb



Data collection – Scraping

- Data source: Table 'Past launches' from this Wikipedia page (see appendix)
- Process:
  - Send HTTP GET to target URL
  - Parse HTML and locate tables / structured blocks
  - Extract fields: date, launch site, vehicle/booster, payload mass, orbit, landing outcome
  - Assemble pandas DataFrame
- Data retrieved:
  - Booster version
  - Launch details
  - Payload mass
  - Landing outcome
- Purpose: Enrich dataset where API fields are missing or inconsistent
- Resulting dataset see appendix
- Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.4/9.4.4%20jupyter-labs-webscraping.ipynb



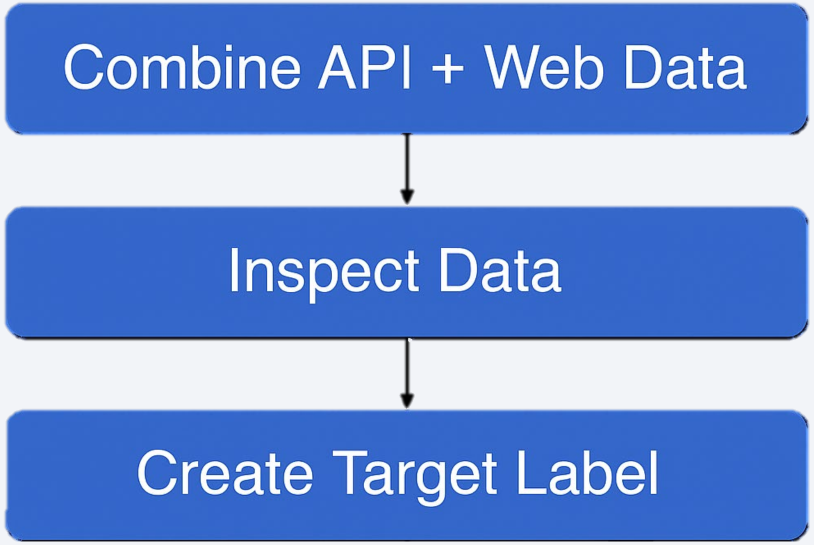
Data wrangling

- Process:

  - Combine datasets from SpaceX API and Web Scraping into a single Pandas DataFrame.

  - Select and inspect relevant columns (orbit, launch_site, landing_outcome)

  - Create target column: Class = 1 if landing success, else 0



- Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.4/9.4.8%20labs-jupyter-spacex-data%20wrangling_jupyterlite.ipynb

EDA with data visualization

All the charts made during EDA (part 1):

- Scatter plot of flight number vs. payload (see appendix)
  - use: to observe success of payload size through changes over time
- Scatter plot of flight number vs. launch site (see section 2)
  - use: to see success rate on different launch sites over time
- Scatter plot of payload vs. launch site (see section 2)
  - use: to compare success of payload capacities across different launch sites
- Bar chart for the success rate of each orbit type (see section 2)
  - use: to identify which orbit types have higher landing success rates.

- Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.5/9.5.4%20edadataviz.ipynb

EDA with data visualization

All the charts made during EDA (part 2):

- Scatter plot of flight number vs. orbit type (see section 2)
  - use: to analyze how successful landings vary with orbit types over time
- Scatter plot of payload vs. orbit type (see section 2)
  - use: to see if certain orbit types have more success with heavier payloads
- Line chart of the yearly average success rate (see section 2)
  - use: to visualize improvement in landing success over time

- Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.5/9.5.4%20edadataviz.ipynb

EDA with SQL

Summary of all the SQL queries performed (part 1):

- The names of the unique launch sites
- 5 records where launch sites' names start with "KSC"
- The total payload carried by boosters from NASA
- The average payload mass carried by booster version F9 v1.1
- The date of the first successful landing outcome on the drone ship
- The names of boosters that have successfully landed on a drone ship and had a payload mass greater than 4,000 but less than 6,000

Results see section 2

Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.5/9_5_2_jupyter_labs_eda_sql_edx_sqllite.ipynb

EDA with SQL

Summary of all the SQL queries performed (part 2):

- The total number of successful and failed mission outcomes
- The names of the boosters that have carried the maximum payload mass
- The months, booster versions and launch site for the successful landing outcomes on a ground pad in the year 2017
- The count of landing outcomes (such as Failure (drone ship) or Success (ground pad)) between 2010-06-04 and 2017-03-20 in descending order

Results see section 2

Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.5/9_5_2_jupyter_labs_eda_sql_edx_sqllite.ipynb

Build an interactive map with Folium

Summary of created map objects:

- A red circle and a marker for each launch site

  To visually identify the exact geographic location of every launch site

- Colored labels on each launch site to indicate a successful (green) launch or a failed (red) launch

  To quickly indicate the landing outcome for launches at each site

- Mouse position coordinates

  To determine the coordinates of the coastline, railway, highway and city close to launch site CCAFS CL-40

- A blue line and a marker with the distance to the closest coastline, railway, highway and city to CCAFS LC-40

  To analyze proximity factors that might influence launch logistics and safety, which will help determine potential locations for new launch sites

Results see section 3

Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/10.1/10.1.3%20lab_jupyter_launch_site_location.ipynb

Build a dashboard with Plotly Dash

Summary of the plots and interactions added to a dashboard:

- A filter to select or all or one specific launch site

    To allow users to focus on overall performance or drill down into a single site's results

- A slicer to select the payload range

    To analyze how payload size impacts landing success within a chosen range

- A pie chart displaying the launch success rate for all launch sites or the launch results of a specific launch site

    To provide a quick visual summary of success versus failure for all sites or a selected site.

- A scatterplot with success rate vs payload mass for different booster versions

    To explore the relationship between payload size and success across various booster types

Results see section 4

Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/10.1/10.1.4%20spacex-dash-app.py

Predictive analysis (classification)

Process of finding the best-performing classification model:

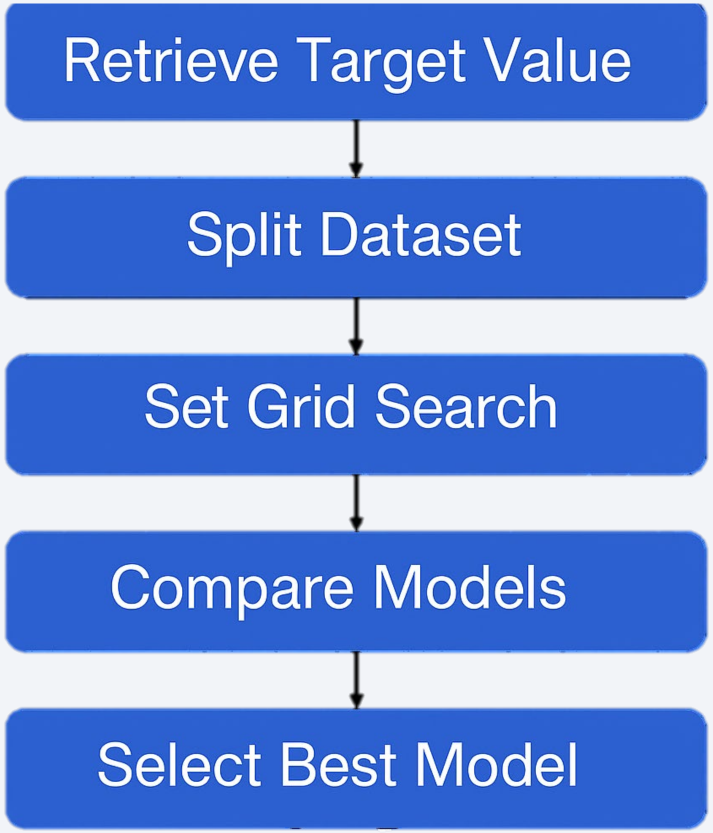
- Retrieve target value from the dataset and standardize the remaining dataset
- Split the dataset into a test and training set
- Set up the parameters for a grid search of selected model

  A grid search was performed on a logistic regression, a SVM, a decision tree and a KNN

- Compare the accuracy and the confusion matrix of the models with optimal parameters
- Select the best model

Results see section 5

Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/10.2/10.2.3%20SpaceX_Machine%20Learning%20Prediction_Part_5%20(2).ipynb



Results

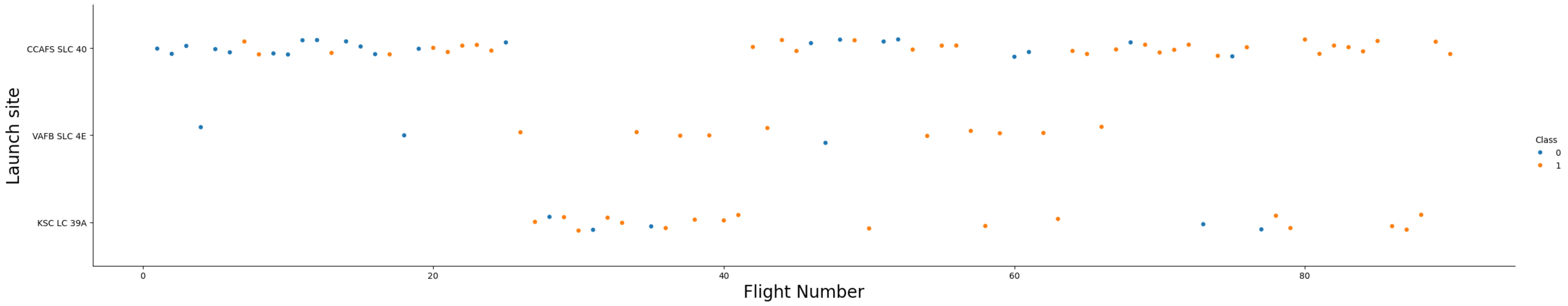
- Exploratory data analysis results
- Interactive analytics demo in screenshots
- Predictive analysis results

Section 2

Insights drawn from EDA

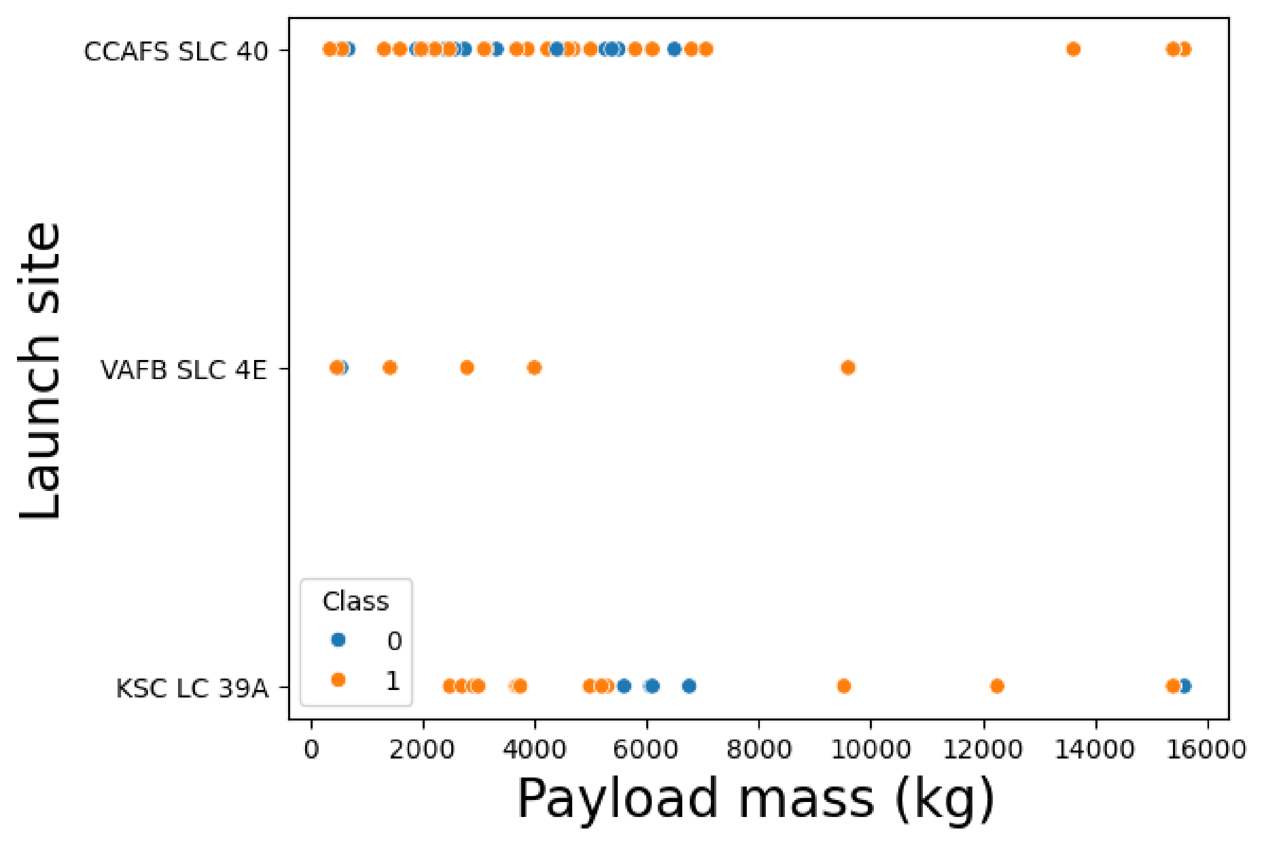
Flight number vs. launch site

- This scatter plot shows how different launch sites are distributed across the flight number. Higher flight numbers indicate later launches, so patterns here reveals which sites were used more frequently over time.
- The color shows mission success or failure.



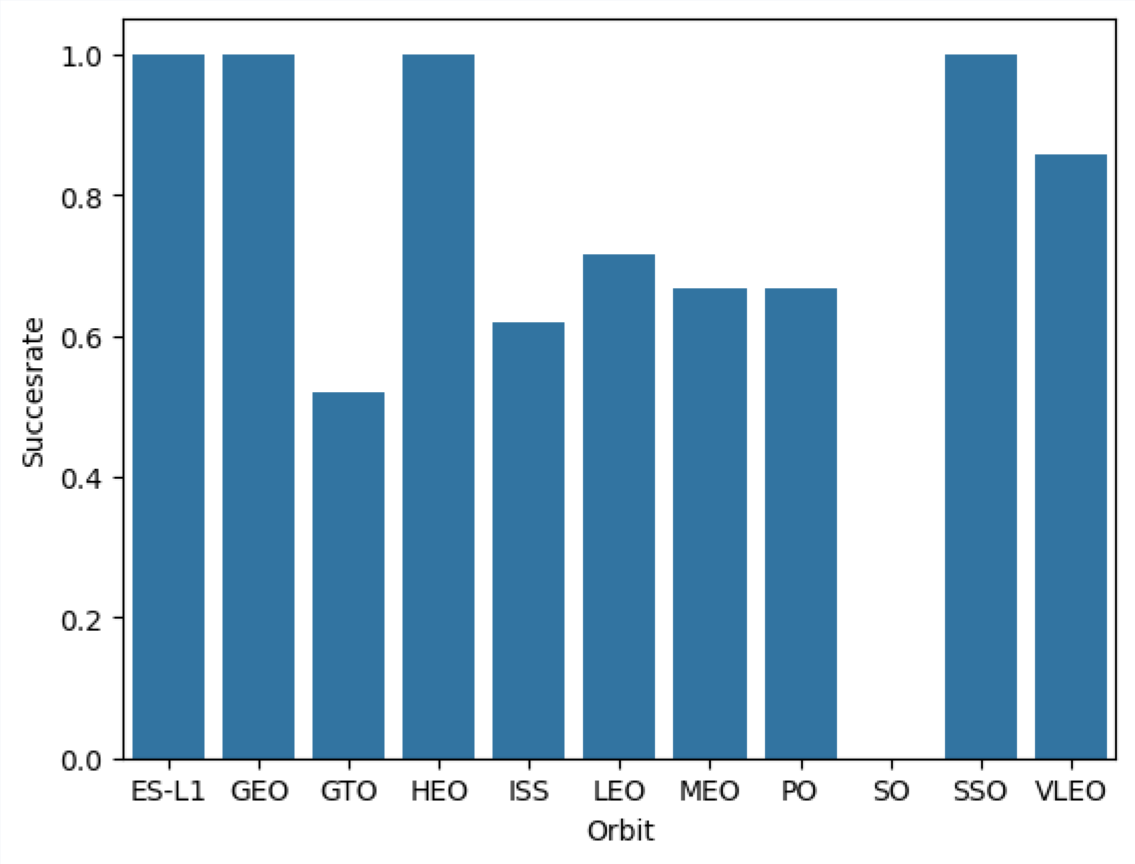
Payload vs. launch site

- This scatter plot compares payload mass with launch sites. It helps identify whether certain sites specialize in larger missions.
- The color shows mission success or failure. This shows which sites handled which payloads well.



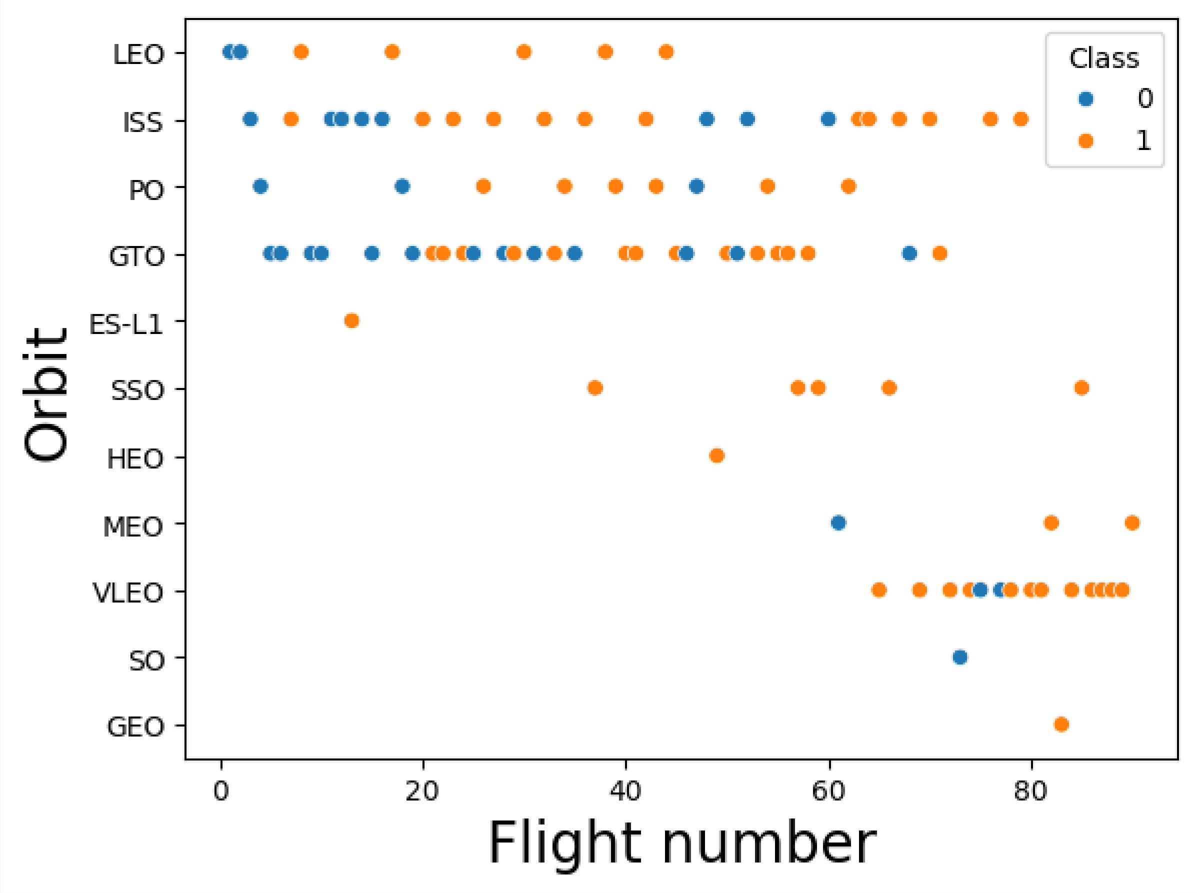
Success rate vs. orbit type

The bar chart illustrates success rates for different orbit types. Higher success rates for specific orbits suggest operational reliability and experience in those mission profiles.



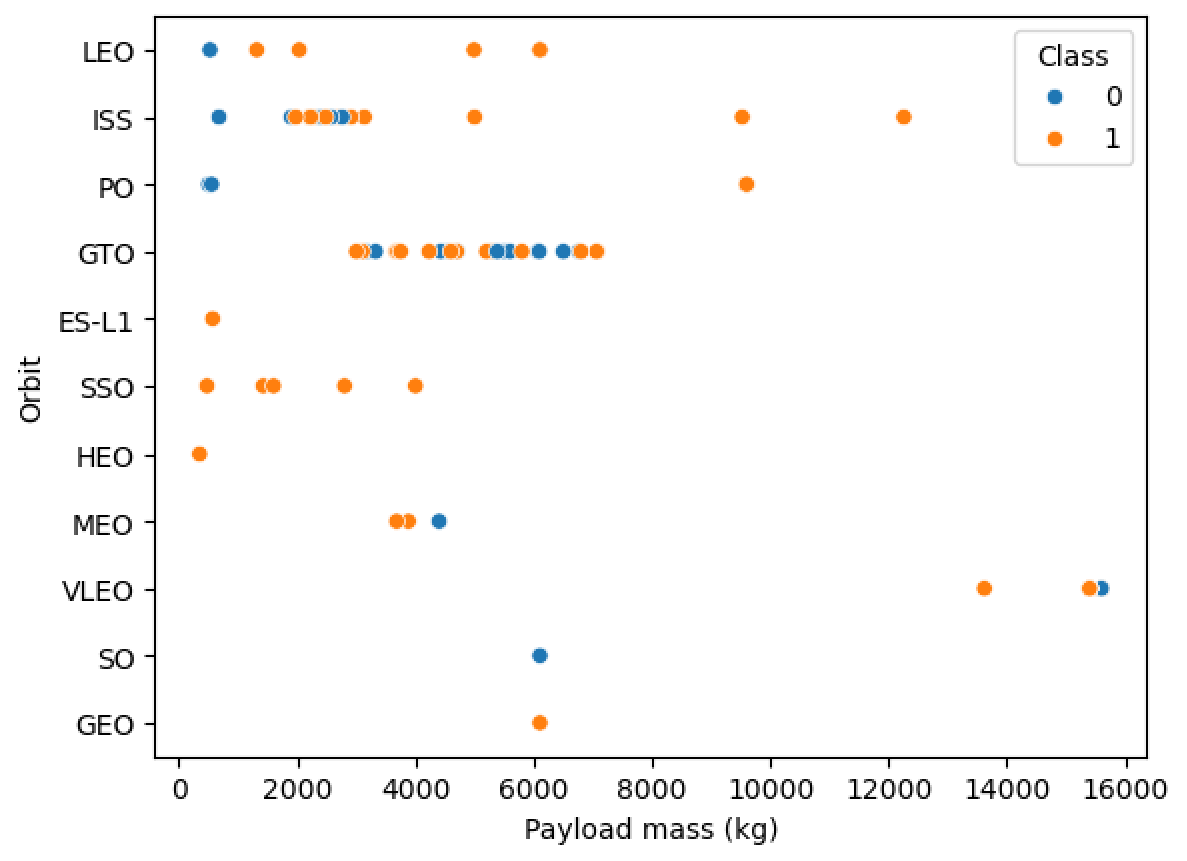
Flight number vs. orbit type

- This scatter plot shows the use of orbit types over time. The color shows mission success or failure.
- It can indicate trends, such as whether certain orbits were targeted more in later missions and whether they are more successful over time.



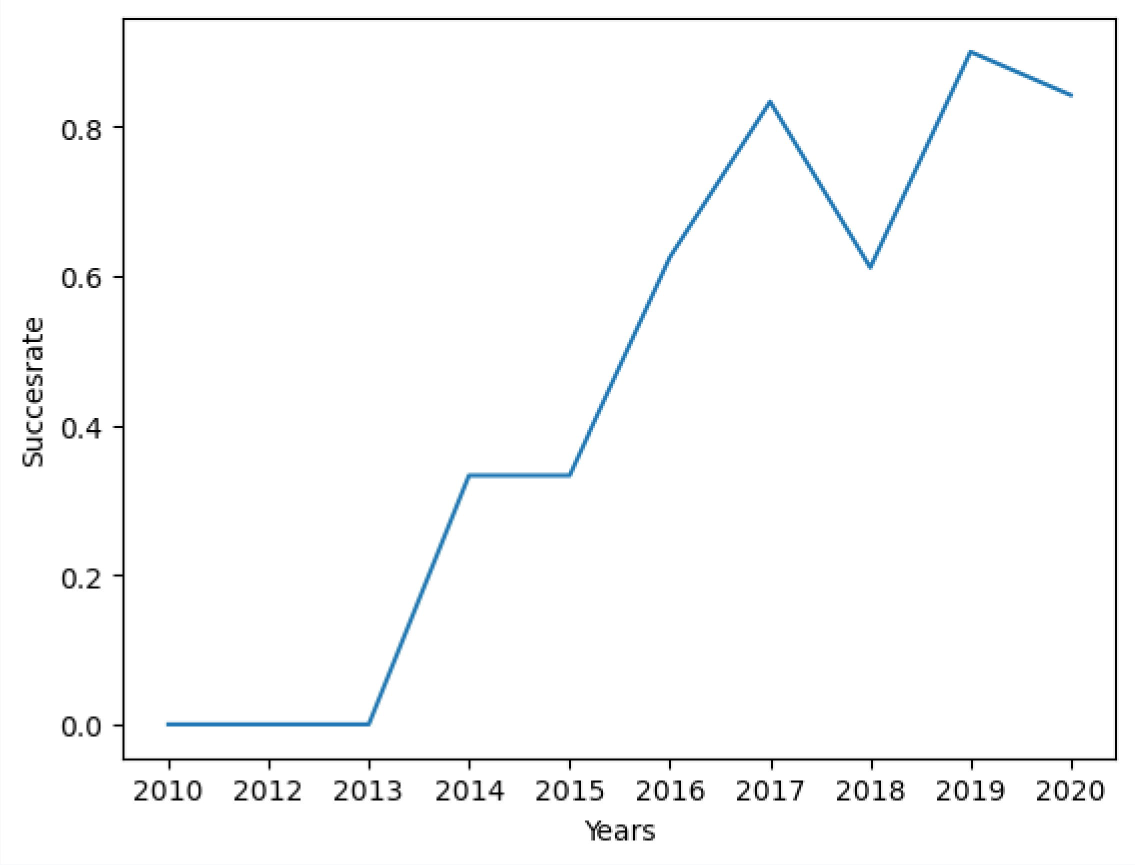
Payload vs. orbit type

- This plot compares payload mass across orbit types. The color shows mission success or failure.
- It highlights which orbits typically require heavier payloads, useful for mission planning and booster selection.



Launch success yearly trend

- The line chart shows the average success rate per year. The overall upward trend indicates improving reliability and technological advancements over time.



All launch site names

- This slide lists all distinct launch sites used.

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

Launch site names begin with “KSC”

- This table displays five records of launch sites beginning with “KSC,” confirming the presence of Kennedy Space Center pads in the dataset.

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)
2017-03-16	6:00:00	F9 FT B1030	KSC LC-39A	EchoStar 23	5600	GTO	EchoStar	Success	No attempt
2017-03-30	22:27:00	F9 FT B1021.2	KSC LC-39A	SES-10	5300	GTO	SES	Success	Success (drone ship)
2017-05-01	11:15:00	F9 FT B1032.1	KSC LC-39A	NROL-76	5300	LEO	NRO	Success	Success (ground pad)
2017-05-15	23:21:00	F9 FT B1034	KSC LC-39A	Inmarsat-5 F4	6070	GTO	Inmarsat	Success	No attempt

Total payload mass

- The cumulative payload mass carried by NASA boosters is 45596 kg.

total_payload
45596

Average payload mass by F9 v1.1

- The average payload mass for missions using the Falcon 9 v1.1 booster is 2928,4 kg. This is useful when handling missing data.

avg_payload
2928.4

First successful ground landing date

- On 2016-04-08 was the first successful landing on a drone ship, marking a milestone in reusable rocket technology.

min(Date)
2016-04-08

Successful drone ship landing with payload between 4,000 and 6,000

- These boosters successfully landed on a drone ship and had a payload between 4,000–6,000 kg.
- This shows they have operational capability in mid-range payloads.

Booster_Version
F9 FT B1032.1
F9 B4 B1040.1
F9 B4 B1043.1

Total number of successful and failed mission outcomes

- Summary of all mission outcomes, providing insight into overall reliability and failure rates.

mission_outcome	num_missions
Success	100
Failure	1

Boosters carried maximum payload

- The boosters that have carried the maximum payload mass, highlighting peak performance cases.

Booster_Version
F9 B5 B1048.4
F9 B5 B1049.4
F9 B5 B1051.3
F9 B5 B1056.4
F9 B5 B1048.5
F9 B5 B1051.4
F9 B5 B1049.5
F9 B5 B1060.2
F9 B5 B1058.3
F9 B5 B1051.6
F9 B5 B1060.3
F9 B5 B1049.7

2015 launch records

- The months, booster versions and launch sites for the successful landing outcomes on a ground pad in the year 2017.

Month_Name	Booster_Version	Launch_Site	Landing_Outcome
February	F9 FT B1031.1	KSC LC-39A	Success (ground pad)
May	F9 FT B1032.1	KSC LC-39A	Success (ground pad)
June	F9 FT B1035.1	KSC LC-39A	Success (ground pad)
August	F9 B4 B1039.1	KSC LC-39A	Success (ground pad)
September	F9 B4 B1040.1	KSC LC-39A	Success (ground pad)
December	F9 FT B1035.2	CCAFS SLC-40	Success (ground pad)

Rank landing outcomes between 2010-06-04 and 2017-03-20

- Ranks landing outcomes by frequency between 2010-06-04 and 2017-03-20, showing which outcomes were most common in descending order.

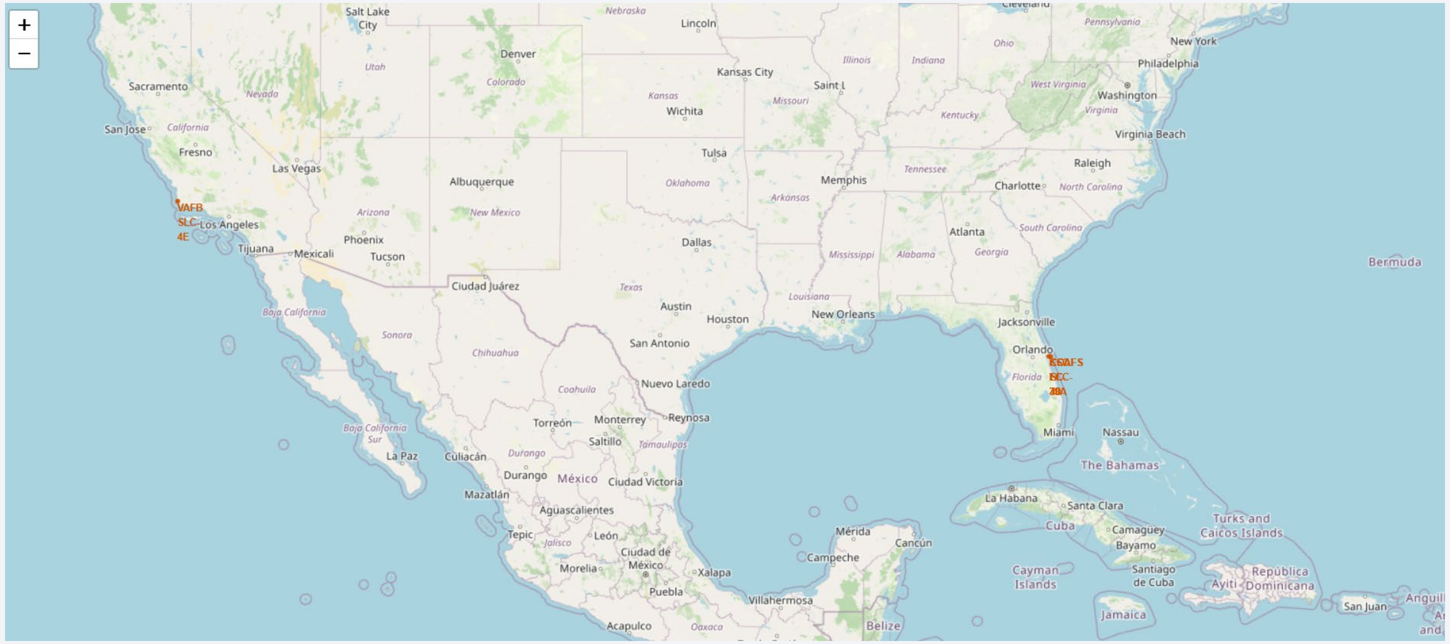
Landing_Outcome	count
No attempt	10
Success (drone ship)	5
Failure (drone ship)	5
Success (ground pad)	3
Controlled (ocean)	3
Uncontrolled (ocean)	2
Failure (parachute)	2
Precluded (drone ship)	1

Section 3

Launch Sites Proximities Analysis

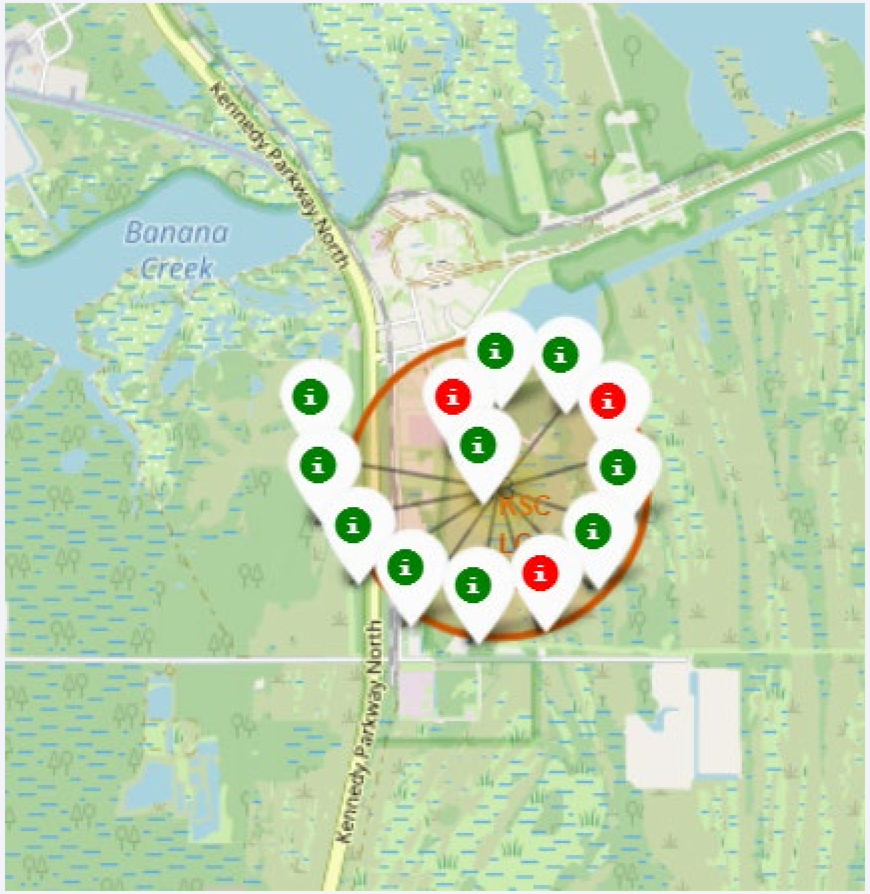
An overview of the SpaceX launch sites

- SpaceX uses 4 launch sites. VAFB SLC-4E is the only one on the west coast and the other three are close together on the east coast.
- Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/10.1/site%20map%20task%201.html



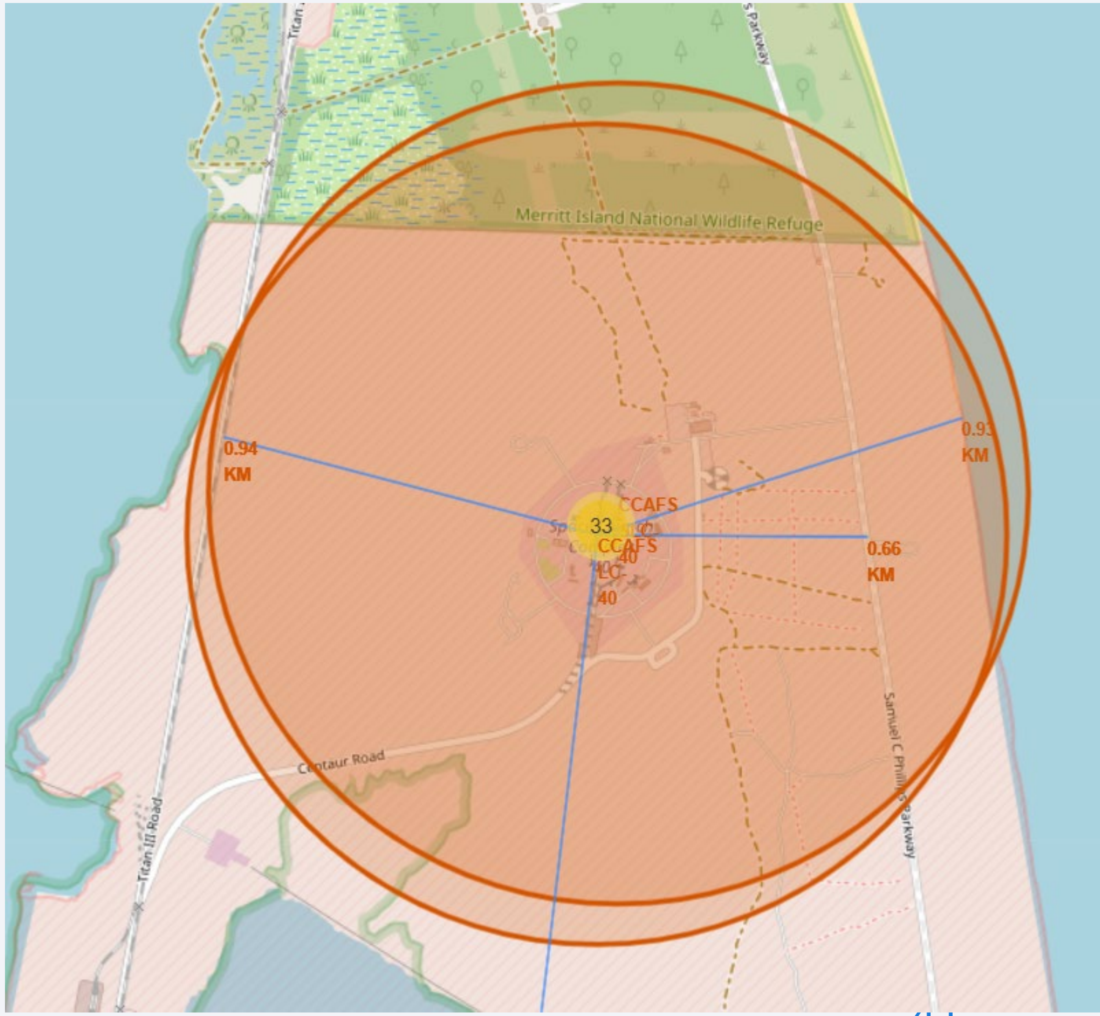
The labeled launch outcomes of KSC LC-39A

- The map shows a label for every SpaceX launch at KSC LC-39A
- In 13 launches there were 3 failed landings, giving KSC LC-39A a success rate of 76,9%
- Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/10.1/site_map%20task%202.html



CAFS LC-40 and it's proximities

- The map highlights the proximity of a railway, highway, and coastline to launch site CAFS LC-40, with a blue line and the distances displayed for context.
- The blue line going out of frame indicates the distance to the nearest city, which is located far away to ensure safety in case of launch or landing incidents.
- The site's closeness to a railway and highway supports efficient transportation of rockets and components.
- Its location near open water is strategic, as landings often occur at sea, reducing risk to populated areas in case of failure.
- Reference: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/10.1/site_map%20task%203.html



Section 4

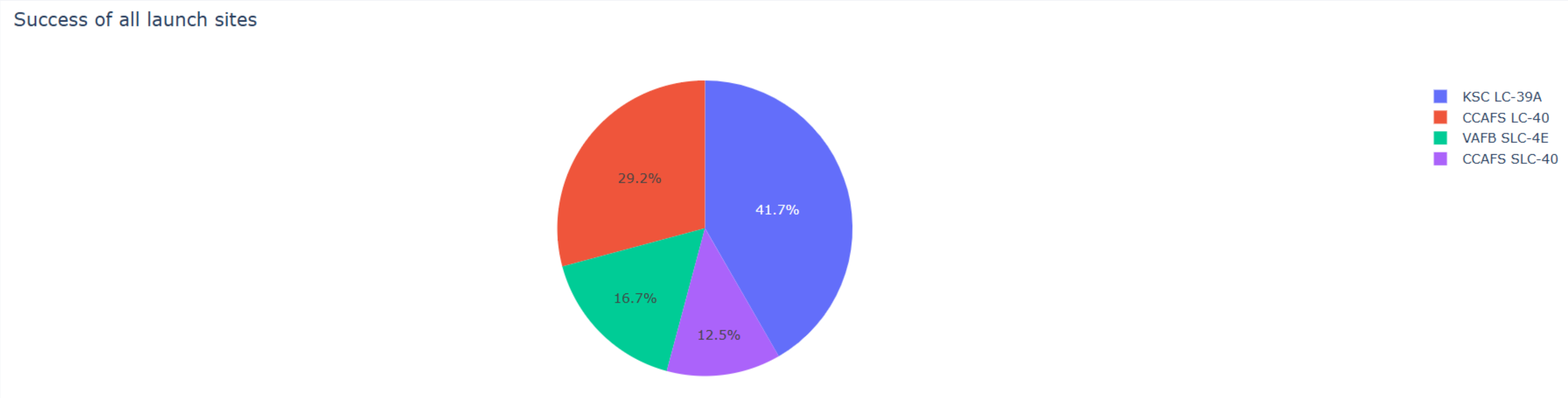
Build a Dashboard with Plotly Dash

The launch success rate for all launch sites

- This pie chart show the success rate of all launch site. Sites with higher success rates indicate better operational conditions.
- KSC LC-39A is the most successful site. CCAFS SLC-40 is the least successful.
- Notes:

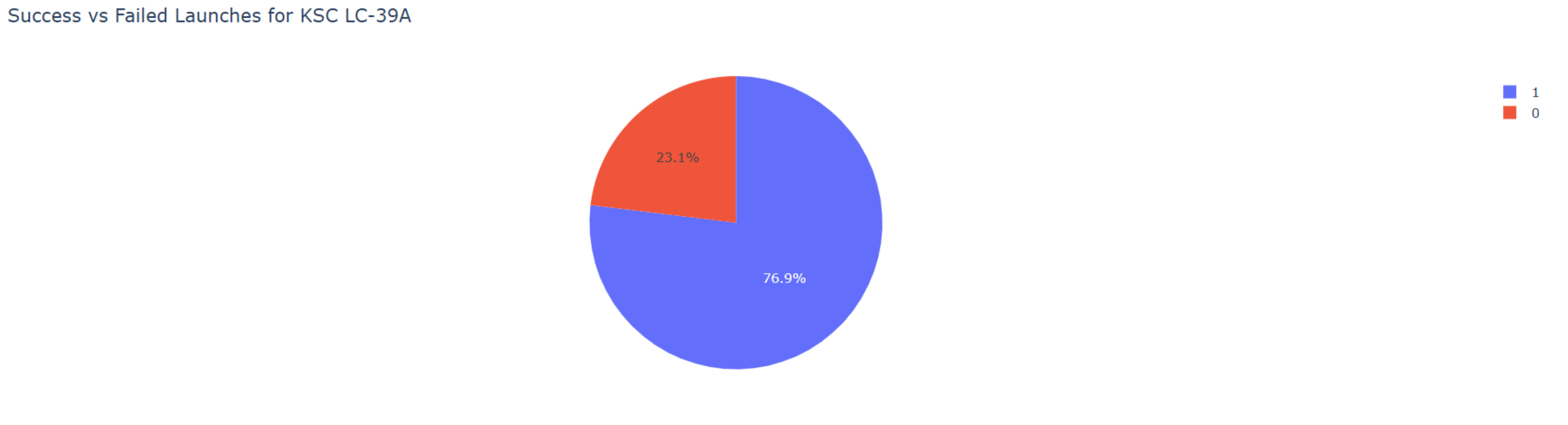
    - Not all sites have the same number of launches

    - Some sites were used more in an earlier or later stage



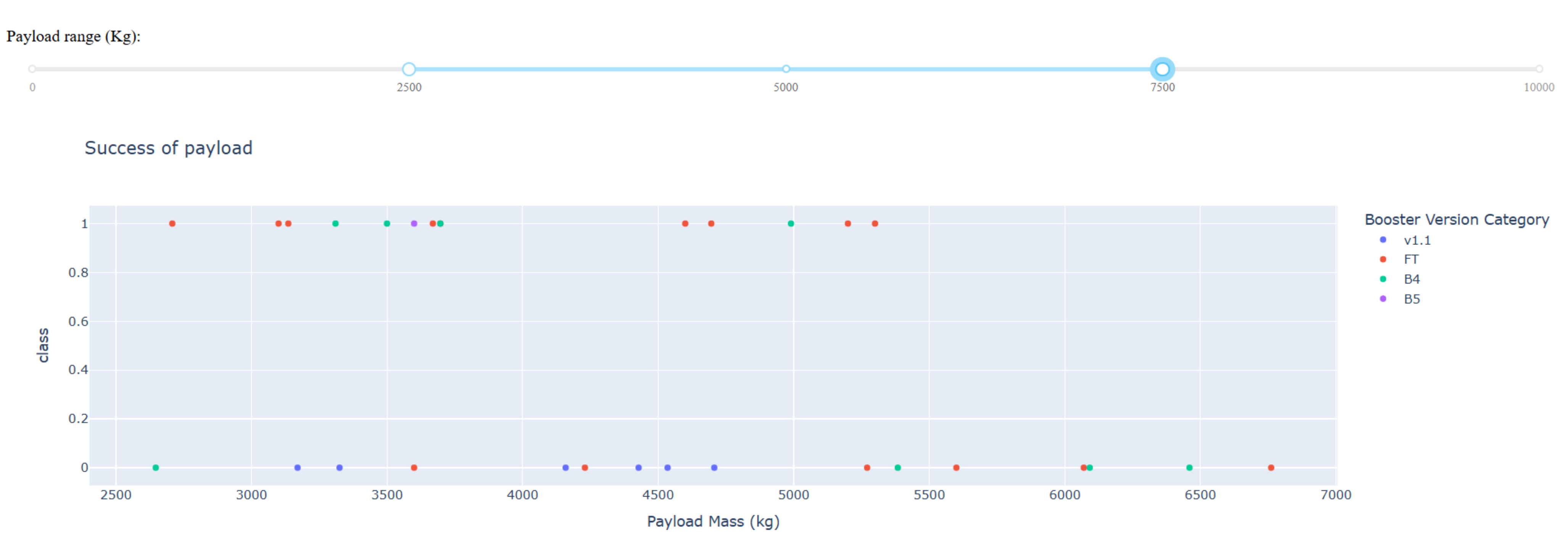
An overview of the successful and failed launches at KSC LC-39A

- This pie chart show the success and failures of KSC LC-39A, which has the highest success ratio



The launch outcomes vs payload of different booster versions

- Analyzes success rates by payload range and booster version. The payload range is selected to be between 2500 kg and 7500 kg.
- This graph shows which combinations yield the highest success, guiding future mission planning.

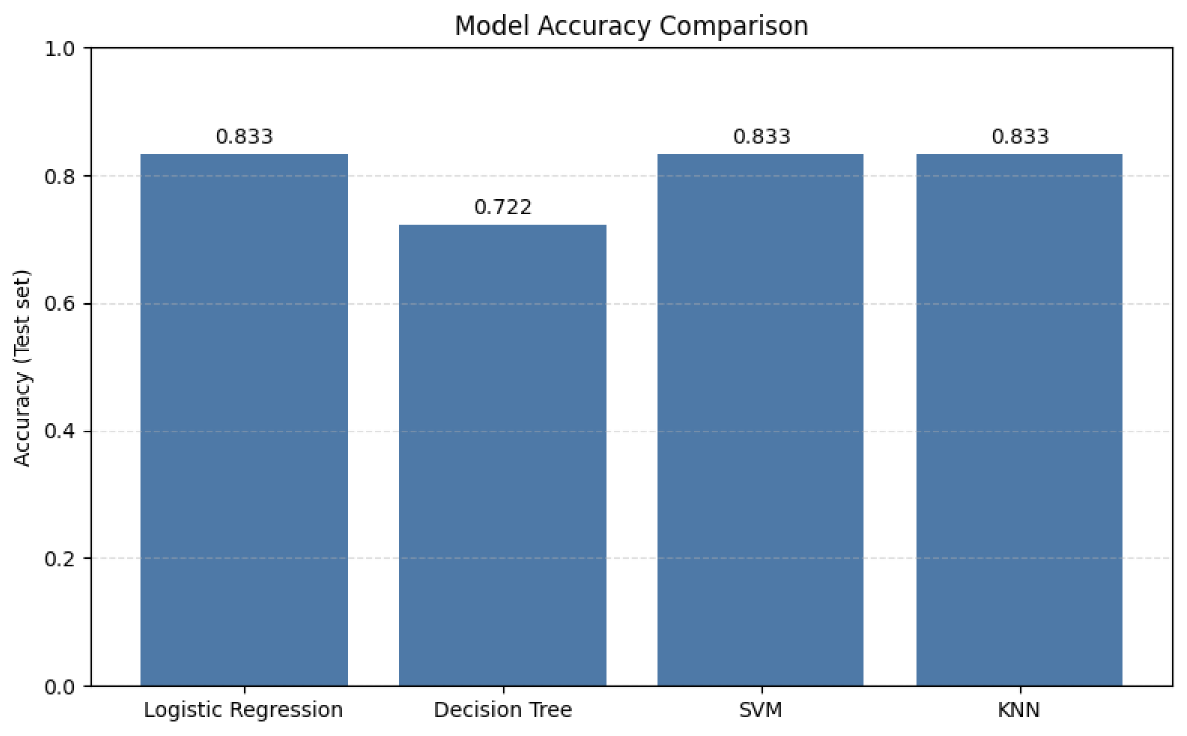


Section 5

Predictive Analysis (Classification)

Classification accuracy

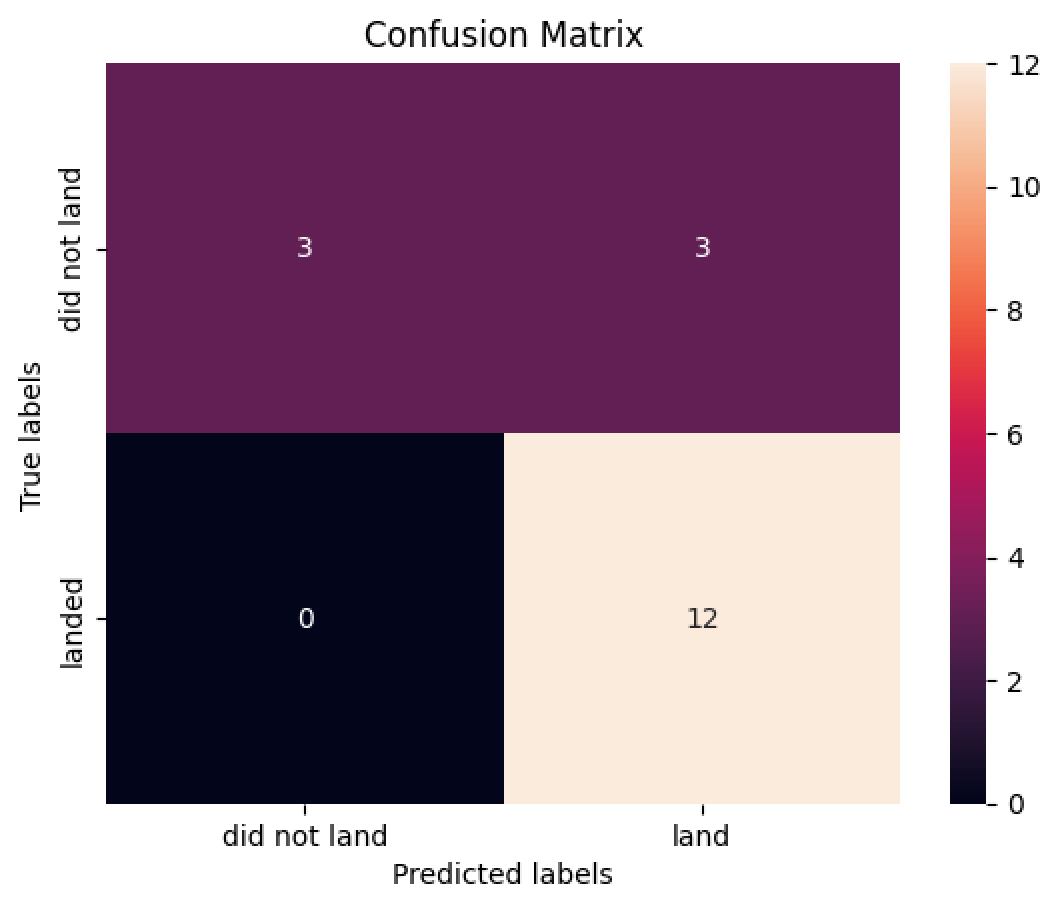
- Test Accuracy:
  Logistic Regression, SVM, and KNN show similar accuracy (~83%).
  Decision Tree performs noticeably worse.
- Cross-Validation Score (cv_best_mean_score):
  Decision Tree slightly higher during training, but this does not translate to better test performance.
- ROC–AUC Score:
  SVM achieves the highest ROC score, indicating superior ability to distinguish between classes.
  Decision Tree scores significantly lower, confirming weaker generalization.
- Best parameters for each model are listed in the appendix.



model	cv_best_mean_score	test_accuracy	ROC score:
Logistic Regression	0.846429	0.833333	0.888889
SVM	0.848214	0.833333	0.958333
KNN	0.848214	0.833333	0.895833
Decision Tree	0.878571	0.722222	0.680556

Confusion matrix

- The confusion matrix explains how well a model predicts each class and where misclassifications occur.
- Logistic Regression, SVM, and KNN share the same confusion matrix.
  These models correctly classify all actual landings (12 true positives).
  They also produce 3 false positives, meaning they tend to predict “landed” more often.
- Decision Tree performs worse and has a different confusion matrix (see appendix).



Conclusions

- After evaluating multiple models based on cross-validation score, test accuracy, the confusion matrix and ROC–AUC, the SVM emerges as the best-performing model. While all models achieved similar accuracy, SVM demonstrated the highest ROC–AUC score (0.9583), indicating superior ability to distinguish between successful and failed landings across all thresholds.
- This makes SVM the most robust and reliable choice for predicting Falcon 9 first-stage landing success.

All models scoring exactly the same is uncommon. There are a few factors that might have caused this:

- Overall, there are more mission successes than mission failures. Although this is great for SpaceX and technology development, it causes some problems with data skewness. The fact that one class is more prominent in the dataset will affect the performance of a data model, especially when predicting whether the landing will fail. This can be seen in the confusion matrix.

- The dataset used to train and test the model had only 90 datapoints. This is limited to train a data model which could affect the models' performance.

- The technology has developed a lot since the first landing. The improvement of the technology has not been considered when training the models.

Appendix

The links used to retrieve data from online sources:

- SpaceX API
  https://api.spacexdata.com/v4/rockets/
  https://api.spacexdata.com/v4/launchpads/
  https://api.spacexdata.com/v4/payloads/
  https://api.spacexdata.com/v4/cores/
  https://api.spacexdata.com/v4/launches/past

- Wikipedia
  https://en.wikipedia.org/w/index.php?title=List_of_Falcon_9_and_Falcon_Heavy_launches&oldid=1027686922

Appendix

- The first 5 row of the data retrieved using the SpaceX API
- The full dataset in csv: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.4/dataset_SpaceX_API.csv

FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcome	Flights	GridFins	Reused	Legs	LandingPad	Block	ReusedCount	Serial	Longitude	Latitude
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
2	2012-05-22	Falcon 9	525.000000	LEO	CCSFS SLC 40	None None	1	False	False	False	None	1.0	0	B0005	-80.577366	28.561857
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
4	2013-09-29	Falcon 9	500.000000	PO	VAFB SLC 4E	False Ocean	1	False	False	False	None	1.0	0	B1003	-120.610829	34.632093
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

Appendix

- The first 2 rows of the Table 'Past launches' from the Wikipedia page

Past launches

2010 to 2013

[hide] Flight No.	Date and time (UTC)	Version, Booster [b]	Launch site	Payload[c]	Payload mass	Orbit	Customer	Launch outcome	Booster landing
1	4 June 2010, 18:45	F9 v1.0[7] B0003.1[8]	CCAFS, SLC-40	Dragon Spacecraft Qualification Unit		LEO	SpaceX	Success	Failure[9][10] (parachute)
	First flight of Falcon 9 v1.0.[11] Used a boilerplate version of Dragon capsule which was not designed to separate from the second stage.(more details below) Attempted to recover the first stage by parachuting it into the ocean, but it burned up on reentry, before the parachutes even deployed.[12]								
2	8 December 2010, 15:43[13]	F9 v1.0[7] B0004.1[8]	CCAFS, SLC-40	Dragon demo flight C1 (Dragon C101)		LEO (ISS)	NASA (COTS) NRO	Success[9]	Failure[9][14] (parachute)
	Maiden flight of Dragon capsule, consisting of over 3 hours of testing thruster maneuvering and reentry.[15] Attempted to recover the first stage by parachuting it into the ocean, but it disintegrated upon reentry, before the parachutes were deployed.[12] (more details below) It also included two CubeSats,[16] and a wheel of Brouère cheese.								
	22 May 2012,	F9 v1.0[7] B0005.1[8]	CCAFS, SLC-40	Dragon demo flight C2+[18]	525 kg (1,157 lb)[19]	LEO (ISS)	NASA (COTS)	Success[20]	No attempt

Appendix

- The first 5 row of the data retrieved from Wikipedia
- The full dataset in csv: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.4/dataset_Wikipedia.csv

Flight No.	Launch site	Payload	Payload mass	Orbit	Customer	Launch outcome	Version Booster	Booster landing	Date	Time
1	CCAFS	Dragon Spacecraft Qualification Unit	0	LEO	SpaceX	Success\n	F9 v1.07B0003.18	Failure	4 June 2010	18:45
2	CCAFS	Dragon	0	LEO	NASA	Success	F9 v1.07B0004.18	Failure	8 December 2010	15:43
3	CCAFS	Dragon	525 kg	LEO	NASA	Success	F9 v1.07B0005.18	No attempt\n	22 May 2012	07:44
4	CCAFS	SpaceX CRS-1	4,700 kg	LEO	NASA	Success\n	F9 v1.07B0006.18	No attempt	8 October 2012	00:35
5	CCAFS	SpaceX CRS-2	4,877 kg	LEO	NASA	Success\n	F9 v1.07B0007.18	No attempt\n	1 March 2013	15:10

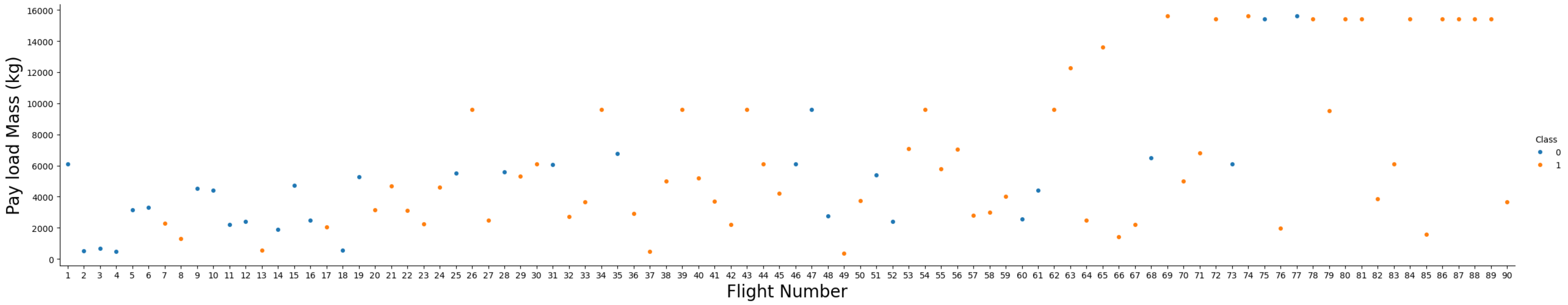
Appendix

- The first 5 row of the dataset after data wrangling
- The full dataset in csv: https://github.com/michellethys2/IBM-datascience-capstone-project/blob/main/9.4/dataset_data_wrangling.csv

FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcome	Flights	GridFins	Reused	Legs	LandingPad	Block	ReusedCount	Serial	Longitude	Latitude	Class
1	2010-06-04	Falcon 9	6104.959412	LEO	CCAFS SLC 40	None None	1	False	False	False	NaN	1.0	0	B0003	-80.577366	28.561857	0
2	2012-05-22	Falcon 9	525.000000	LEO	CCAFS SLC 40	None None	1	False	False	False	NaN	1.0	0	B0005	-80.577366	28.561857	0
3	2013-03-01	Falcon 9	677.000000	ISS	CCAFS SLC 40	None None	1	False	False	False	NaN	1.0	0	B0007	-80.577366	28.561857	0
4	2013-09-29	Falcon 9	500.000000	PO	VAFB SLC 4E	False Ocean	1	False	False	False	NaN	1.0	0	B1003	-120.610829	34.632093	0
5	2013-12-03	Falcon 9	3170.000000	GTO	CCAFS SLC 40	None None	1	False	False	False	NaN	1.0	0	B1004	-80.577366	28.561857	0

Appendix

- This scatter plot shows the payloads distributed across the flight number. Higher flight numbers indicate later launches, so patterns here reveals which sites were used more frequently over time.
- The color shows mission success or failure.



Appendix

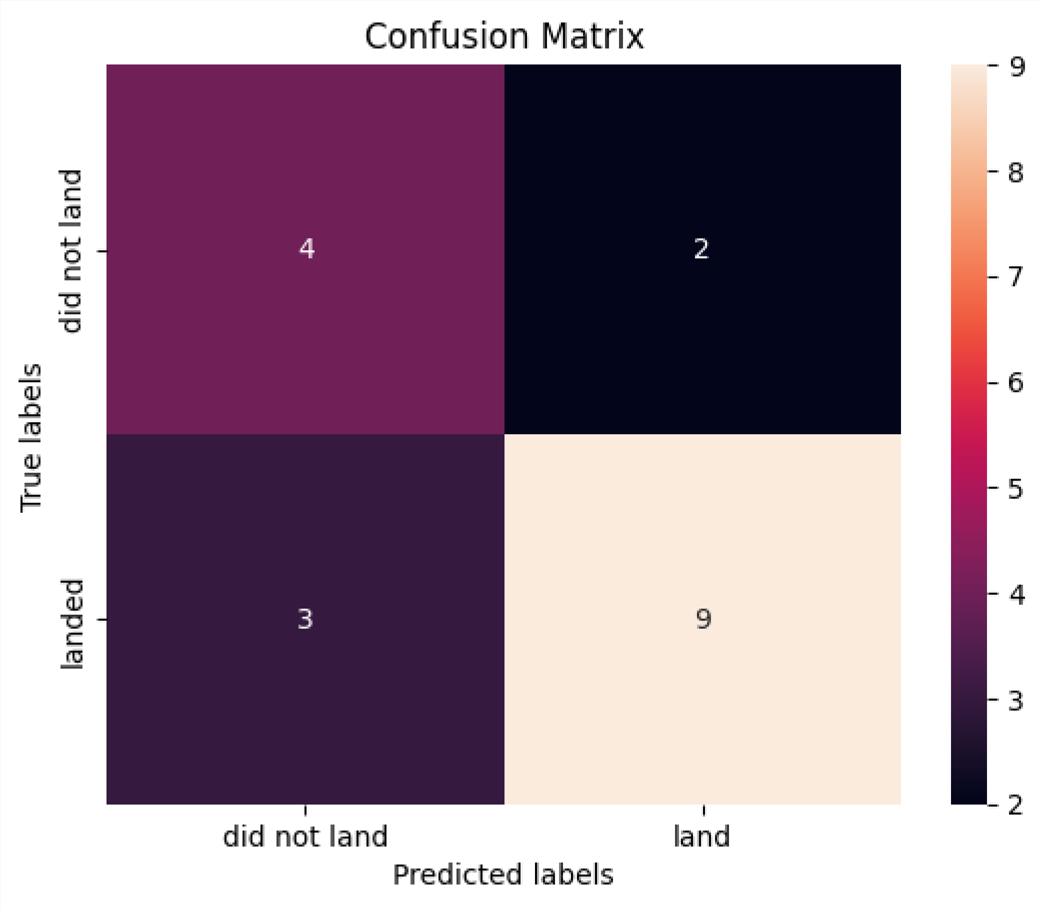
The best parameters for each model (results of grid search):

- Logistic regression:
  - 'C': 0.01, 'penalty': 'l2', 'solver': 'lbfgs'
- Support Vector Machine
  - 'C': 1.0, 'gamma': 0.03162277660168379, 'kernel': 'sigmoid’
- Decision tree
  - 'criterion': 'gini', 'max_depth': 10, 'max_features': 'sqrt’, 'min_samples_leaf': 4, 'min_samples_split': 2, 'splitter': 'random’
- K Nearest Neighbors
  - 'algorithm': 'auto', 'n_neighbors': 10, 'p’: 1

Appendix

The Decision Tree model misclassifies more cases compared to other models:

- It fails to predict 3 successful landings (false negatives).
- It incorrectly predicts 2 failures as successes (false positives).




Thank you!