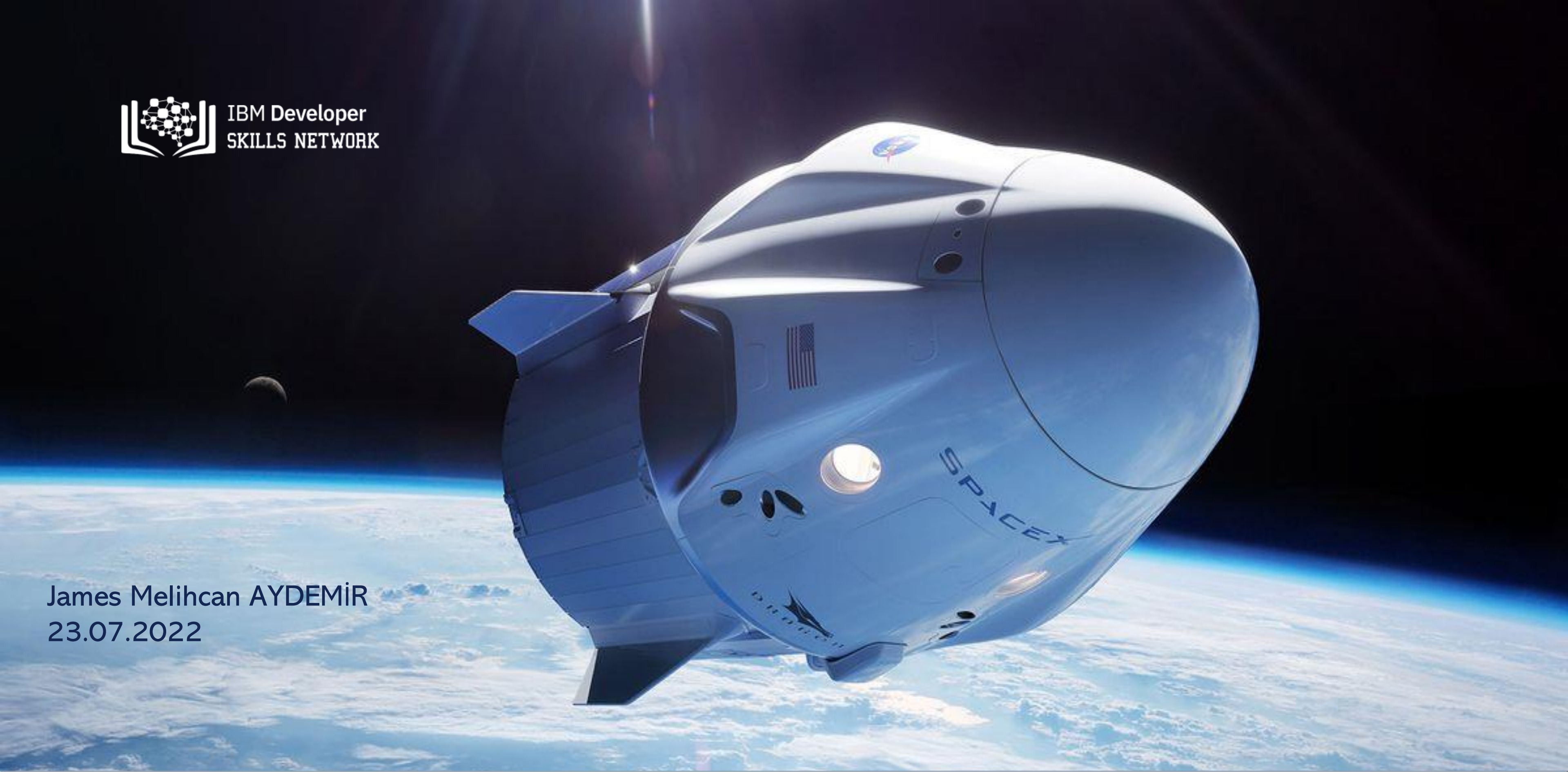
IBM Developer
SKILLS NETWORK



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23.07.2022

Winning Space Race With Data Science

OUTLINE

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

EXECUTIVE SUMMARY

- Summary of methodologies
  1. Data Collection via API and Web Scraping
  2. Data Wrangling
  3. Exploratory Data Analysis with SQL and Data Visualization
  4. Interactive Visual Analytics with Folium
  5. Predictive Analysis with classification models

- Summary of all results
  1. Exploratory Data Analysis results
  2. Interactive Visual Analytics results
  3. Predictive Analysis Results

INTRODUCTION

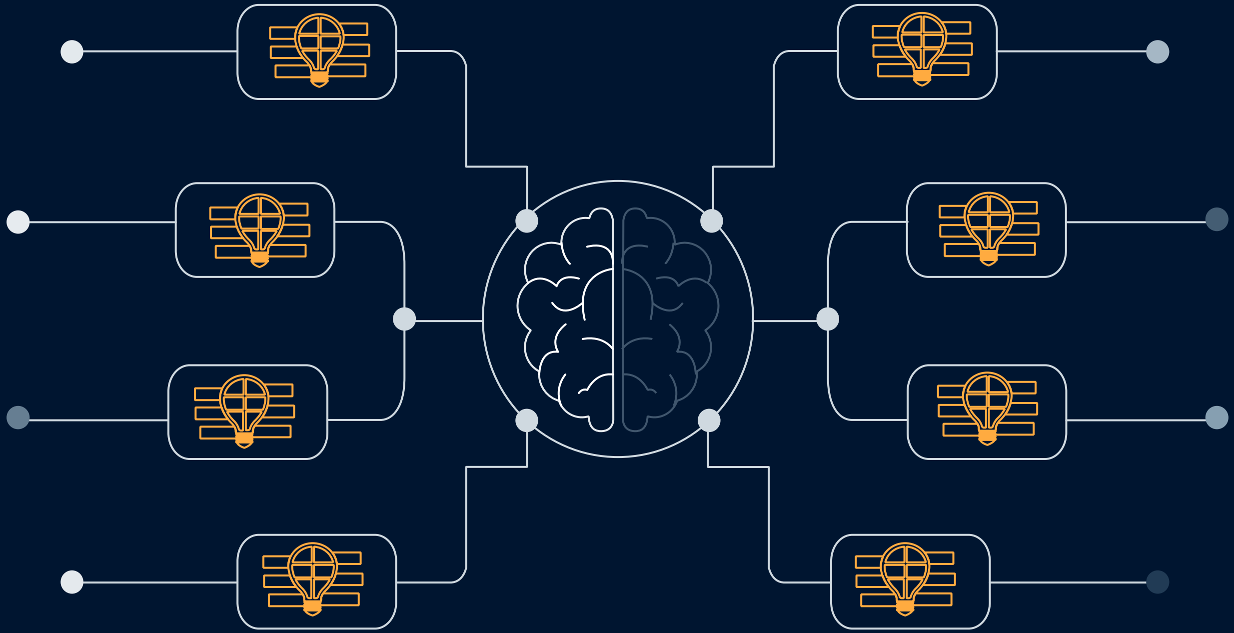
SpaceX advertises Falcon 9 rocket launches on its website, with a cost of 62 million dollars; other providers cost upward of 165 million dollars each, much of the savings is because SpaceX can reuse the first stage. Therefore if we can determine if the first stage will land, we can determine the cost of a launch. This information can be used if an alternate company wants to bid against SpaceX for a rocket launch. The goal of this Project is to create machine learning model to predict succesful landing outcomes of the first stage that effects the cost of a launch directly.

Problems we want to solve are;

- ✓ Identfying all elements that affect the landing outcomes and how it is affecting the outcome
- ✓ The relationship between each variables that affect the landing outcomes
- ✓ Determining what conditions are needed to decrease the probability of unsuccesful landing

METHODOLOGY

SECTION 1



METHODOLOGY

Executive Summary

- Data collection methodology
  - *Data collection from SpaceX API*
  - *Web scraping from a Wikipedia page*
- Perform data wrangling
  - *Transforming categorical data fields via One Hot Encoding*
  - *Specifying to Exclude irrelevant data*
- 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 and evaluating Machine Learning Models to specify best classification model*

DATA COLLECTION

Data collection is the process of gathering, measuring, and analyzing accurate data from a variety of relevant sources to find answers to research problems, answer questions, evaluate outcomes, and forecast trends and probabilities.

01

Gather

02

Measure

03

Analyze

As mentioned on previous pages, the dataset was collected by SpaceX REST API and Web Scraping from Wikipedia page that includes Falcon 9 historical launch records with outcomes.

DATA COLLECTION WITH SPACEX API

Getting response from api

```
spacex_url="https://api.spacexdata.com/v4/launches/past"
```

```
response = requests.get(spacex_url)
```

Converting json file to dataframe

```
# Use json_normalize meethod to convert the json result into a dataframe
data = pd.json_normalize(response.json())
```

Filtering relevant data

```
data_falcon9 = data[data['BoosterVersion'] == 'Falcon 9']
```

Handling with missing values

```
payloadmean = data_falcon9['PayloadMass'].mean()
data_falcon9['PayloadMass'].replace(np.nan,payloadmean, inplace=True)
```

Sample of dataframe

```
# Show the head of the dataframe
data.head(5)
```

	FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcome	Flights	GridFins	Reused	Legs	LandingPad	Block	ReusedCount	Serial	Longitude	Latitude
0	1	2006-03-24	Falcon 1	20.0	LEO	Kwajalein Atoll	None None	1	False	False	False	None	NaN	0	Merlin1A	167.743129	9.047721
1	2	2007-03-21	Falcon 1	NaN	LEO	Kwajalein Atoll	None None	1	False	False	False	None	NaN	0	Merlin2A	167.743129	9.047721
2	4	2008-09-28	Falcon 1	165.0	LEO	Kwajalein Atoll	None None	1	False	False	False	None	NaN	0	Merlin2C	167.743129	9.047721
3	5	2009-07-13	Falcon 1	200.0	LEO	Kwajalein Atoll	None None	1	False	False	False	None	NaN	0	Merlin3C	167.743129	9.047721
4	6	2010-06-04	Falcon 9	NaN	LEO	CCSFS SLC 40	None None	1	False	False	False	None	1.0	0	B0003	-80.577366	28.561857

[Github Link]

DATA COLLECTION - SCRAPING

Getting response from HTML

```
data = requests.get(static_url).text
```

Creating beatiful soup object

```
soup = BeautifulSoup(data,"html.parser")
```

Finding tables and extracting column names

```
column_names = []

# Apply find_all() function with `th` element on first_launch_table
temp = first_launch_table.find_all('th')
# Iterate each th element and apply the provided extract_column_from_header() to get a column name
for x in temp:
    name = extract_column_from_header(x)
    # Append the Non-empty column name (`if name is not None and len(name) > 0`) into a list called column_names
    if name is not None and len(name)>0:
        column_names.append(name)
```

```
html_tables = soup.find_all('tr')
```

Creating dictionary

```
launch_dict= dict.fromkeys(column_names)
```

Converting dictionary to

```
df=pd.DataFrame(launch_dict)
df
```

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

Github Link

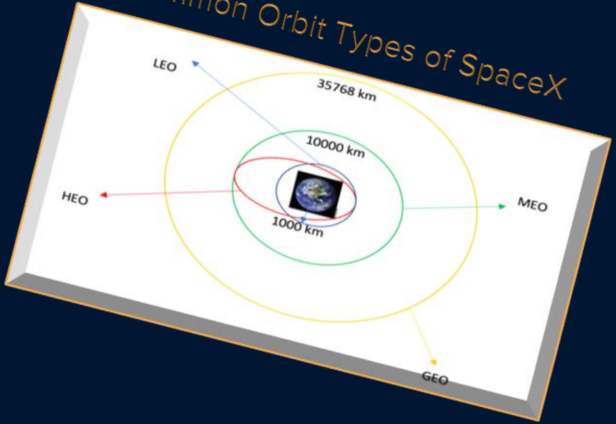
DATA WRANGLING

Data wrangling is the process of cleaning and unifying messy and complex data sets for easy access and analysis.

Wrangling Process

- Calculated the number of launches on each site
- Calculated the mission outcomes per orbit type
- Created landing outcome labels for further analysis, modelling and visualization steps
- Exported to csv

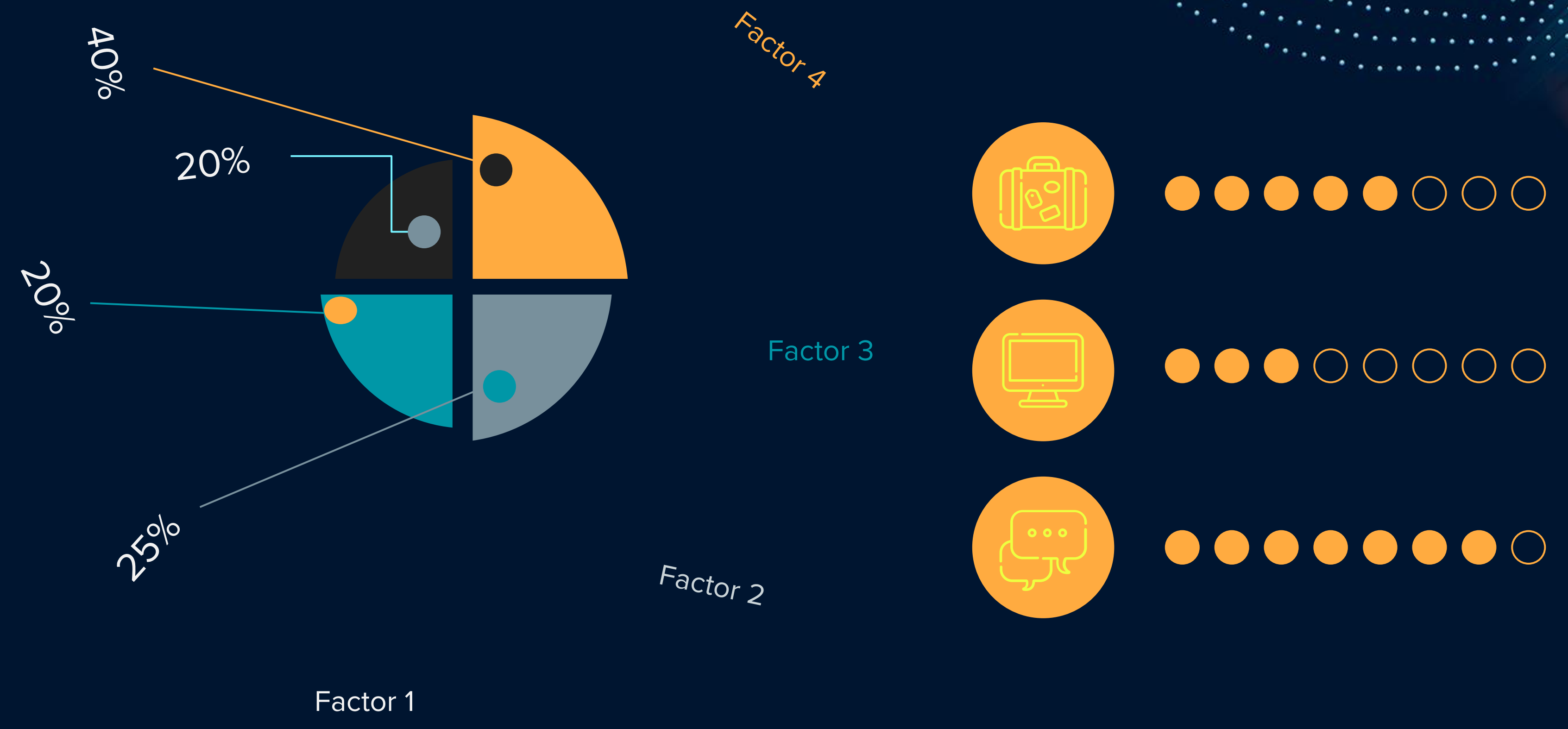
Common Orbit Types of SpaceX



[Github Link](#)

Exploratory Data Analysis

With Data Visualization



Exploratory Data Analysis

With Data Visualization

We tried to find relationships like patterns, dependencies between attributes on each other or between attributes and outcome by the help of graphs. We used scatter plots, bar charts and line plots to specify the relationships in our project.

It is one of the easiest and efficient ways to see and understand relationships that affect our outcome, using data visualization techniques.

We visualized our data to analyze relationships between the attributes such as;

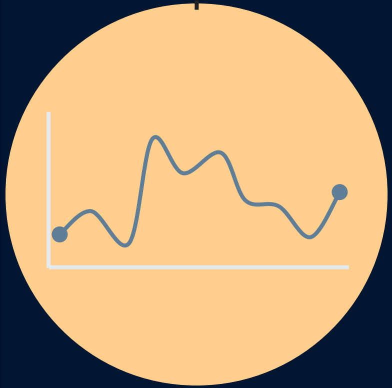
- ✓ Payload and Flight Number
- ✓ Flight Number and Launch Site
- ✓ Payload and Launch Site
- ✓ Flight Number and Orbit Type
- ✓ Payload and Orbit Type

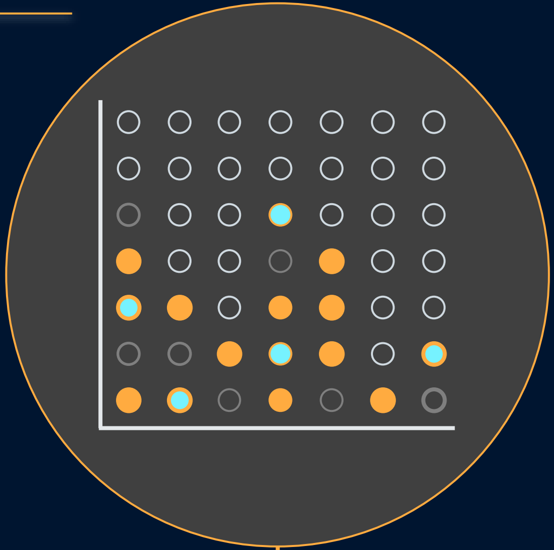
Github Link

Explatory Data Analysis

With Data Visualization

Used line graph to show trends or pattern of the attribute over time which in this case, is used to see the launch success yearly trend.





Used scatter plot to show dependency of attributes on each other

Used bar graph to determine which orbits have the highest probability of success.

Github Link

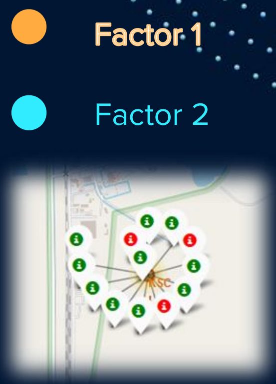
Explatory Data Analysis

With SQL

- Displaying the names of the launch sites
- Displaying 5 records where launch sites begin with the string ‘CCA’.
- Displaying the total payload mass carried by booster launched by NASA (CRS).
- Displaying the 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 sites names for in year 2015.
- Rank the count of landing outcomes or success between the date 2010-06-04 and 2017-03-20, in descending order

Github Link

BUILD AN INTERACTIVE MAP WITH FOLIUM



We used the latitude and longitude coordinates of launch sites, added markers for relevant places on the map with a label of the name of launch sites .

We assigned different colours to launch outcomes so we could see clearly the results of each launch, **green** for succesful launches and **red** for unsuccesful launches.

Finally we calculated distances between launch sites and various landmarks such as railways, highways, coastlines and cities.

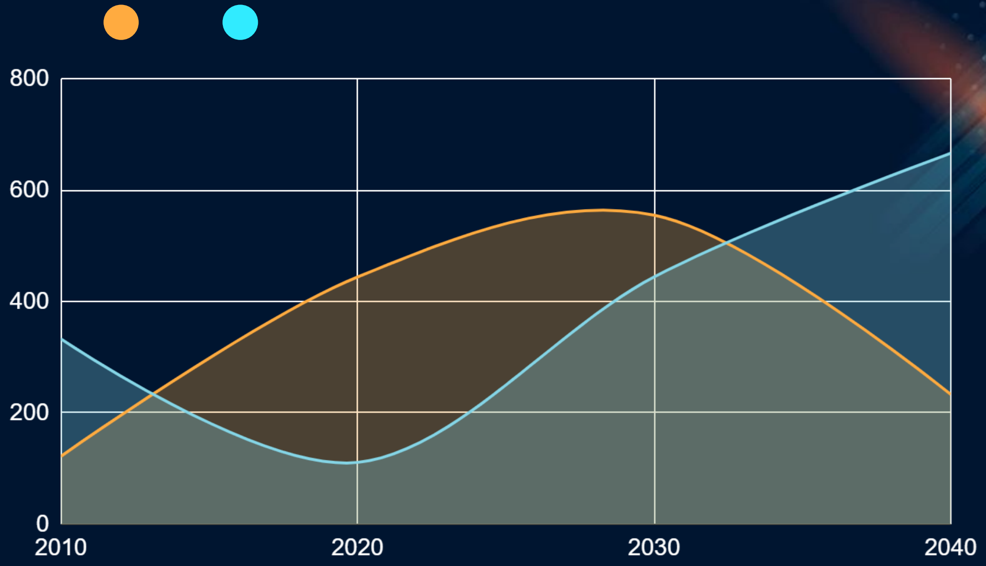
[Github Link]

BUILDING DASHBOARD

With Plotly Dash

Factor 2

We plotted pie charts and scatter graphs interactivly with Plotly Dash to show relationships between payload mass (kg), booster version and outcome and also total outcomes by certain launch sites to user.

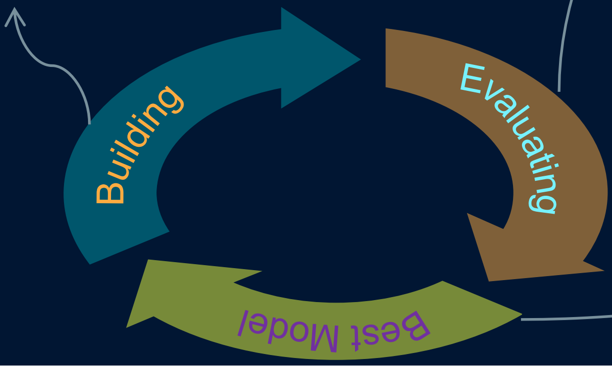


[Github Link]()

PREDICTIVE ANALYSIS (CLASSIFICATION)

Building Model

1. Loaded dataset into NumPy and Pandas
2. Transformed, standartized and splitted all dataset to create training and test datasets
3. Specified Machine Learning Algorithms that are convenient for our purpose.

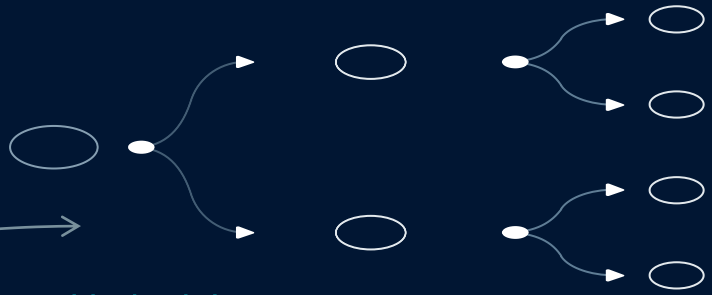


Evaluating Model

4. Set parameters for each algorithms
5. Fit datasets into GridsearchCv object to specify best parameters for each algorithm
6.Check accuracy scores for each Model and plot confusion Matrix to specify best performing model for Project

Choosing Best Model

7. Specified best classification model



Github Link

RESULTS

The results will be categorized to 3 main results

01

Explatory Data Analysis Results

02

Interactive Analytics Demo in Screenshots

03

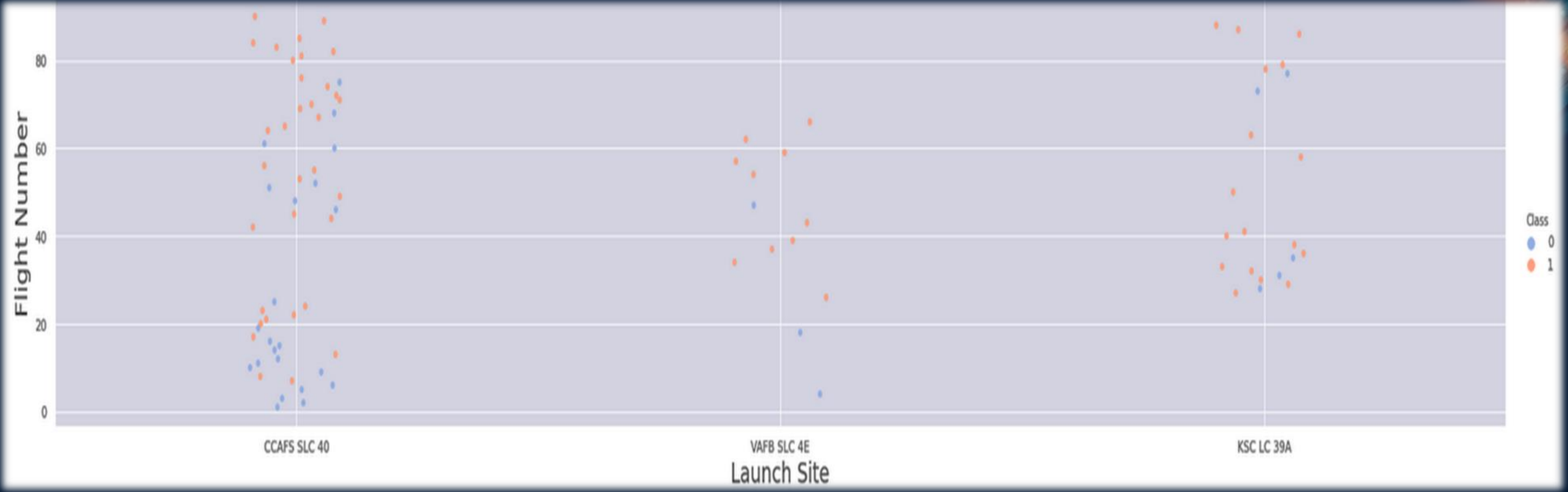
Predictive Analysis Results

INSIGHTS DRAWN FROM EDA

Section 2

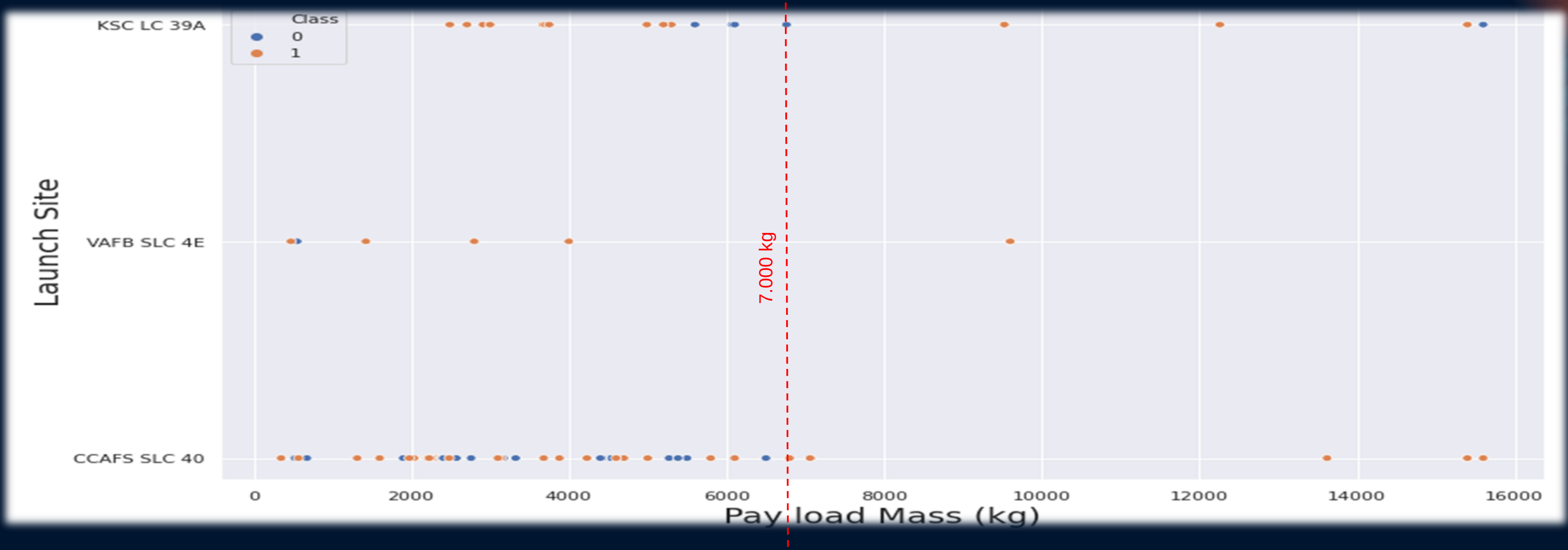
FLIGHT NUMBER vs LAUNCH SITE

What is concluded from the scatter plot is that there is positive correlation between amount of flights and success rate except CCAFS SLC40 launch site. This means the higher number of flights and the higher succes rates.



PAY LOAD MASS vs LAUNCH SITE

What is concluded from the scatter plot is that if the pay load mass is heavier than 7.000kg, the probability of succes rate will be highly increased but there is no clear enough pattern between pay load mass and success rate to make a decision.



SUCCESS RATE vs ORBIT

What is concluded from the bar plot is that some orbits has 100% success rate such as SSO, HEO, GEO AND ES-L1 while SO orbit produced 0% rate of success.

However, deeper analyses show that some of these orbits have only **1** occurrence such as GEO, SO, HEO and ES-L1 which means we need more data to see a pattern or a trend before we make a decision.

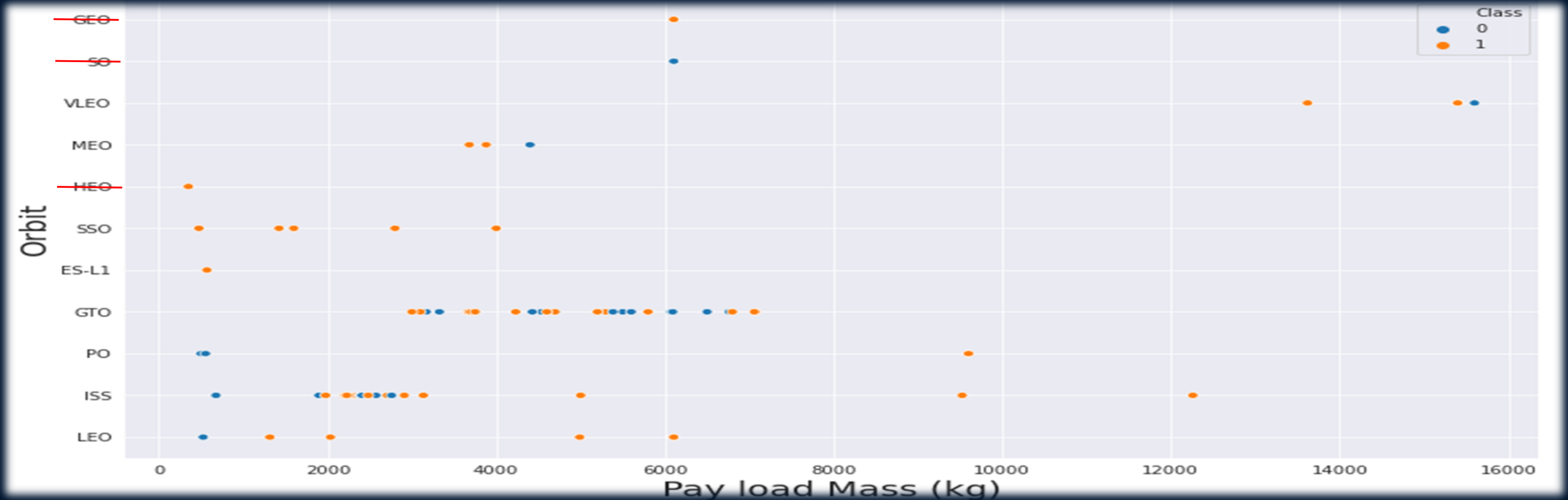
FLIGHT NUMBER vs ORBIT

What is concluded from the scatter plot is that there is positive correlation between amount of flights and success rate except GTO orbit. Orbits that have only one occurence such as ES-L1, GEO, HEO, SO should also be excluded from the above conclusion.

PAYLOAD MASS vs ORBIT

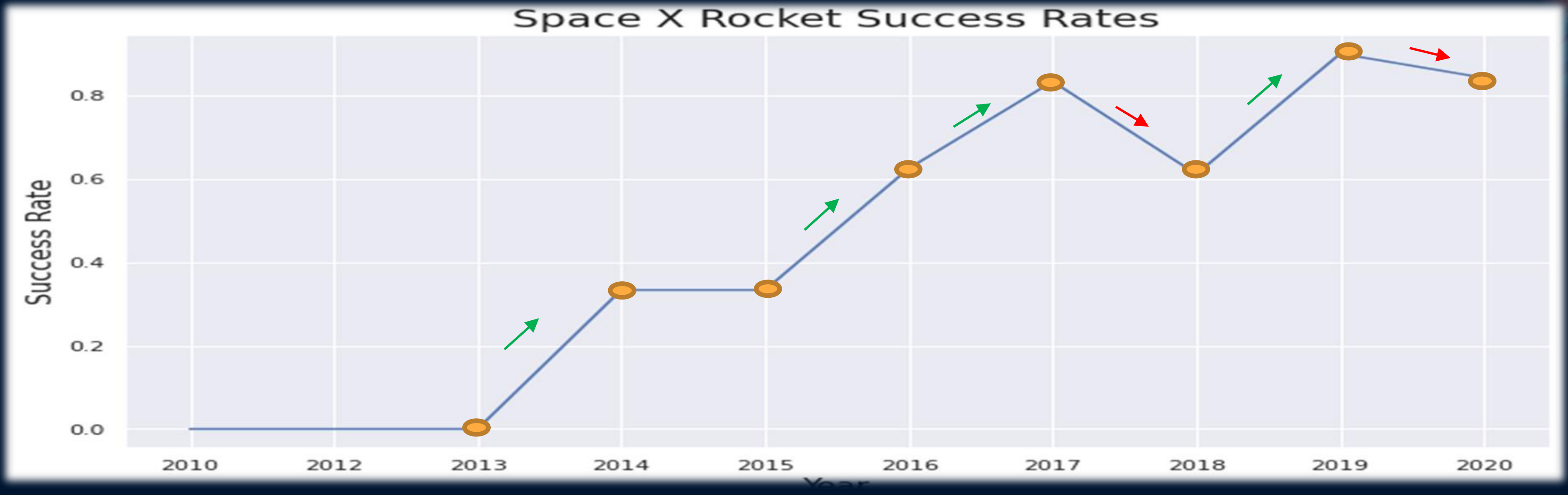
There is positive correlation between payload and LEO, ISS and P0 orbits (Heavier payload, more success rate). However, it has negative impact on MEO and VLEO orbit. GTO orbit seems to depict no relation between the attributes.

Specified previously, SO, GEO and HEO orbit need more data to see a pattern or a trend.



SUCCESS RATE YEARLY TREND

There is an increasing success rate from 2013 to 2020. Although there is a slight dip after 2019, yearly trend strongly tends to increase.



ALL LAUNCH SITES NAMES
LAUNCH SITES NAMES BEGIN WITH CCA

Used key word distinct to show unique launch sites in the dataset.

SQL Query

```
%sql SELECT DISTINCT LAUNCH_SITE AS UNIQUE_LAUNCH_SITES FROM JMN09461.SPACEXTBL;
```

Query Output

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

Used key word limit 5 and like 'CCA%' to show 5 launch sites begin with CCA in the dataset.

SQL Query

```
%sql SELECT * FROM JMN09461.SPACEXTBL WHERE LAUNCH_SITE LIKE 'CCA%' LIMIT 5;
```

Query Output

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	07:44:00	F9 v1.0 B0005	CCAFS LC-40	Dragon demo flight C2	525	LEO (ISS)	NASA (COTS)	Success	No attempt
2012-10-08	00:35:00	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

TOTAL PAYLOAD MASS BY NASA (CRS) AVERAGE PAYLOAD MASS BY F9 V1.1

Calculated total payload mass of NASA(CRS) as 45.596 kg via SUM key word.

SQL Query

```
%sql SELECT DISTINCT SUM(PAYLOAD_MASS__KG_) OVER (PARTITION BY CUSTOMER) AS SUM_OF_NASA_CRS FROM JMN09461.SPACEXTBL WHERE CUSTOMER = 'NASA (CRS)' ;
```

Query Output

sum_of_nasa_crs
45596

Calculated average payload mass of booster version F9 v1.1 as 2.928 kg via AVG key word.

SQL Query

```
%sql SELECT DISTINCT AVG(PAYLOAD_MASS__KG_) OVER (PARTITION BY BOOSTER_VERSION) AS GROUPED_AVG FROM JMN09461.SPACEXTBL WHERE BOOSTER_VERSION = 'F9 v1.1' ;
```

Query Output

grouped_avg
2928

FIRST SUCCESFULL GROUND LANDING DATE SUCCESFULL DRONESHIP LANDING ON SPECIFIED KG

Observed that the first succesfull landing outcome was 22.12.2015. We used min() function to get the result.

SQL Query

```sql
%sql SELECT DISTINCT MIN(DATE) OVER (PARTITION BY LANDING_OUTCOME ) AS FIRST_SUCCES_LANDING FROM JMN09461.SPACEXTBL WHERE LANDING_OUTCOME = 'Success (ground pad)' ;
```

Query Output

first_succes_landing
2015-12-22

We used the WHERE clause to filter for boosters which have successfully landed on ship with payload mass greater than 4000 kg but less than 6000 kg

SQL Query

```sql
%sql SELECT DISTINCT BOOSTER_VERSION FROM SPACEXTBL WHERE LANDING_OUTCOME = 'Success (drone ship)' AND PAYLOAD_MASS__KG_ > 4000 AND PAYLOAD_MASS__KG_ < 6000;
```

Query Output

booster_version
F9 FT B1021.2
F9 FT B1031.2
F9 FT B1022
F9 FT B1026

TOTAL NUMBERS OF MISSION OUTCOMES BOOSTERS CARRIED MAXIMUM PAYLOAD

Used case when and count methods as sub query to observe total outcome amounts.

SQL Query

```
%sql select DISTINCT GROUP_SUCCESS, COUNT(MISSION_OUTCOME) OVER (PARTITION BY GROUP_SUCCESS)
from (SELECT *, (case when MISSION_OUTCOME LIKE 'Success%' then 'SUCCESFUL_COUNT' else 'FAILURE_COUNT' end) as group_success FROM SPACEXTBL)A
```

Query Output

group_success	2
FAILURE_COUNT	1
SUCCESFUL_COUNT	100

Used the MAX() function as sub query to filter boosters which have carried maximum kg of payload mass.

SQL Query

```
%sql SELECT DISTINCT BOOSTER_VERSION AS "Booster Versions which carried the Maximum Payload Mass" FROM SPACEXTBL WHERE PAYLOAD_MASS__KG_ =(SELECT MAX(PAYLOAD_MASS__KG_) FROM SPACEXTBL);
```

Query Output

Booster Versions which carried the Maximum Payload Mass
F9 B5 B1048.4
F9 B5 B1048.5
F9 B5 B1049.4
F9 B5 B1049.5
F9 B5 B1049.7
F9 B5 B1051.3
F9 B5 B1051.4
F9 B5 B1051.6
F9 B5 B1056.4
F9 B5 B1058.3
F9 B5 B1060.2
F9 B5 B1060.3

LAUNCH RECORDS OF 2015
SUCCESFUL LANDING NUMBERS BETWEEN 2010-2017 (RANKED)

Used like clause to filter dates begins with 2015 and filtering Failure (drone ship) via '=' operator. To extract month and year infos seperately, used substr function.

SQL Query

```
%sql SELECT LANDING_OUTCOME, BOOSTER_VERSION, LAUNCH_SITE, substr(Date, 6, 2) as month, substr(Date,1,4) AS YEAR FROM SPACEXTBL WHERE DATE LIKE '2015-%' AND LANDING_OUTCOME = 'Failure (drone ship)';
```

Query Output

landing_outcome	booster_version	launch_site	MONTH	YEAR
Failure (drone ship)	F9 v1.1 B1012	CCAFS LC-40	01	2015
Failure (drone ship)	F9 v1.1 B1015	CCAFS LC-40	04	2015

Used the combination of between and like clauses to filter succesful landing outcomes between 04.06.2010 and 20.03.2017 dates. Then used count(), group by and order by clauses to get total numbers of landing outcomes in descending order .

SQL Query

```
%sql SELECT LANDING_OUTCOME as "Landing Outcome", COUNT(LANDING_OUTCOME) AS "Total Count" FROM SPACEXTBL
WHERE DATE BETWEEN '2010-06-04' AND '2017-03-20' AND LANDING_OUTCOME LIKE 'Success%' GROUP BY  LANDING_OUTCOME ORDER BY COUNT(LANDING_OUTCOME) DESC ;
```

Query Output

Landing Outcome	Total Count
Success (drone ship)	5
Success (ground pad)	3

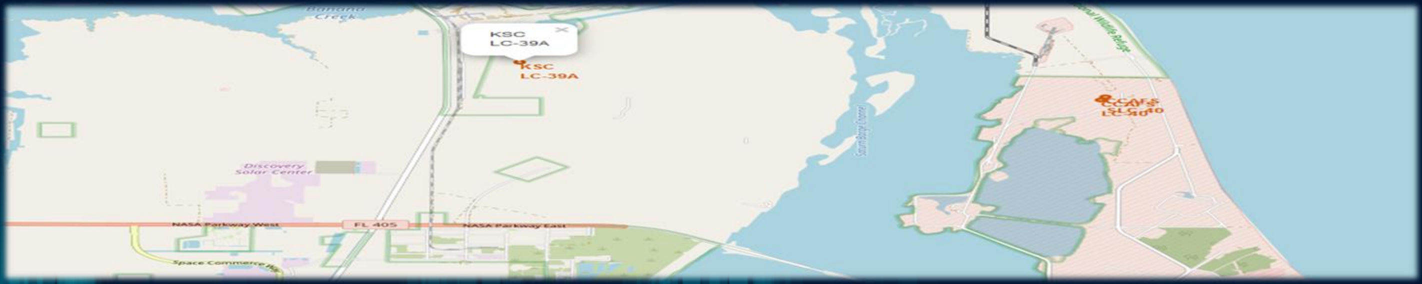
PROXIMITY ANALYSES OF LAUNCH SITES

SECTION 3

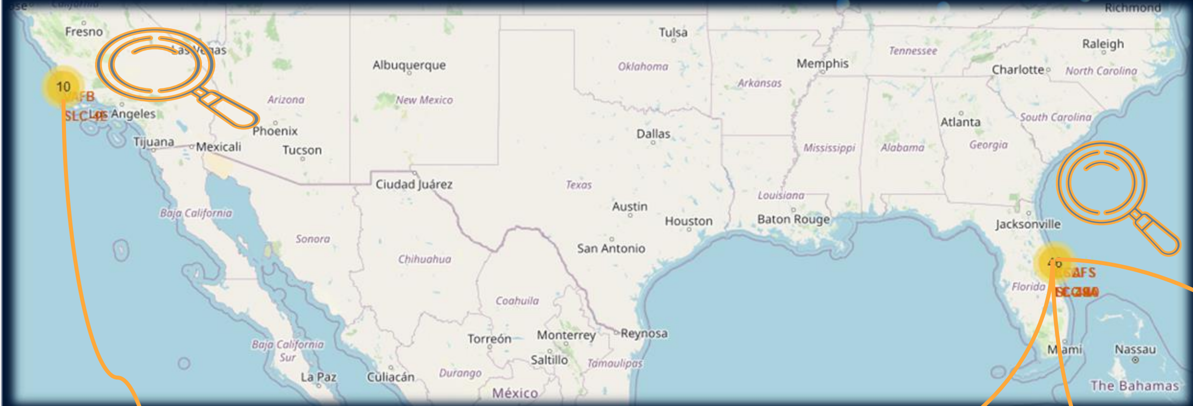
LOCATION OF THE LAUNCH SITES

Observed that all the SpaceX launch sites are located in the coast lines of United States.

Three of launch sites located close to each other while the one of the launch sites located far from them.

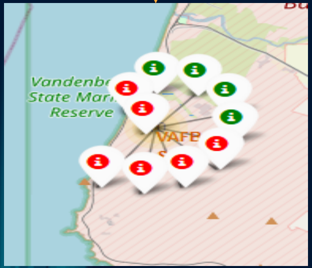


LOCATION OF THE LAUNCH SITES

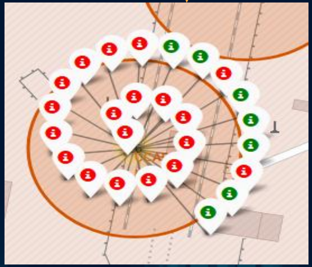


Green marker shows succesful landings, red marker shows failures.

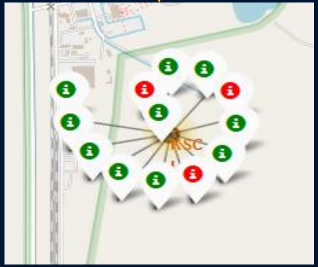
It is clear from the markers at first glance that KSC LC-39A have highest success rate and also CCASF SLC-40 site is the place where least launches have been conducted.



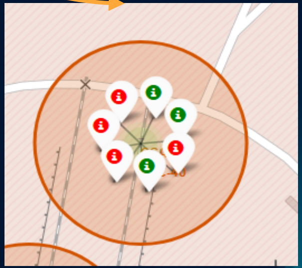
VAFB SLC-4E



CCAFS LC-40



KSC LC-39A



CCAFS SLC-40

LAUNCH SITE DISTANCES FROM LANDMARKS

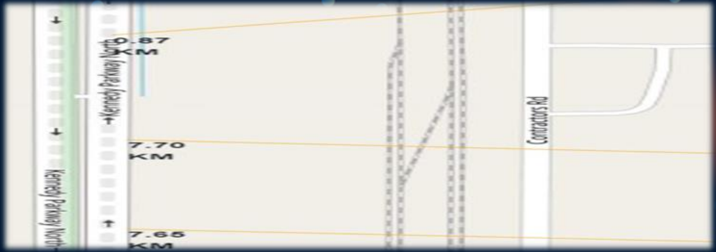
Observed that all launch sites have located at places close to coastlines. Distances from all launch sites are less than 1.5 km.

Observed that all launch sites have located at places far away from cities. Distances from all launch sites are more than 75 km.

Observed that all launch sites have located at places close to railways. Distances from all launch sites are less than 6 km.

LAUNCH SITE DISTANCES FROM LANDMARKS

Observed that most of launch sites have located at places far away from highways. Distances from most of launch sites are more than 7.5 km.



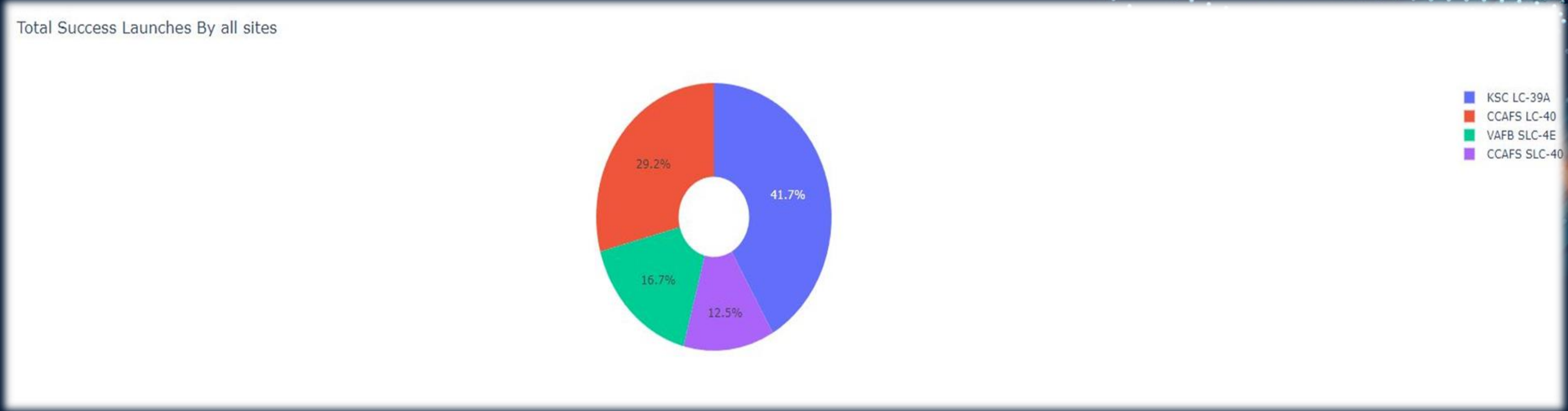
Conclusions

Are all launch sites close to coastlines ?	Yes
Are all launch sites far away from cities ?	Yes
Are all launch sites close to railways ?	No
Are all launch sites close to highways ?	No

DASHBOARD WITH PLOTLY DASH

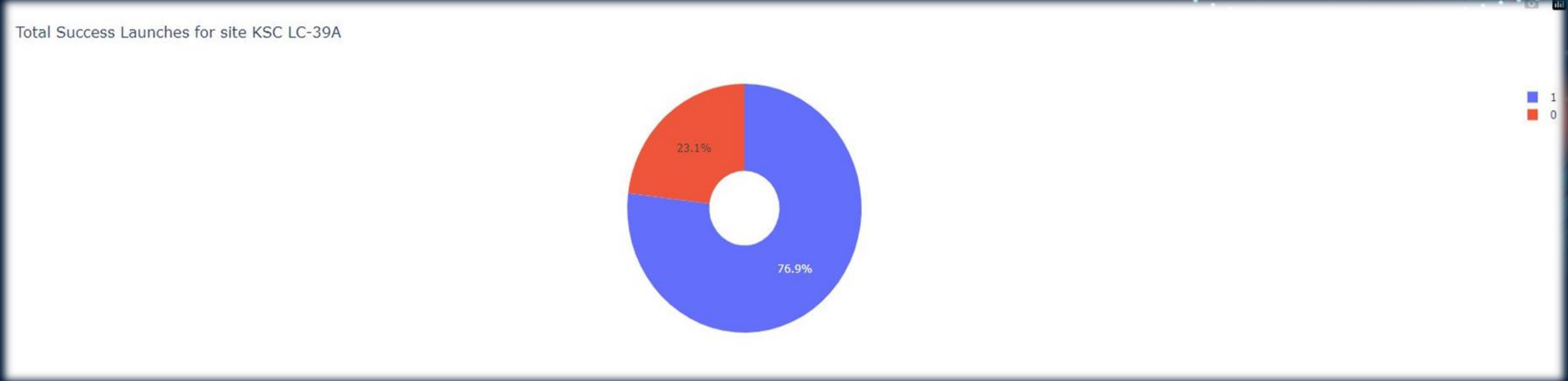
Section 4

Successful Launches Per Launch Site



KSC LC-39A has the largest succesful launches..

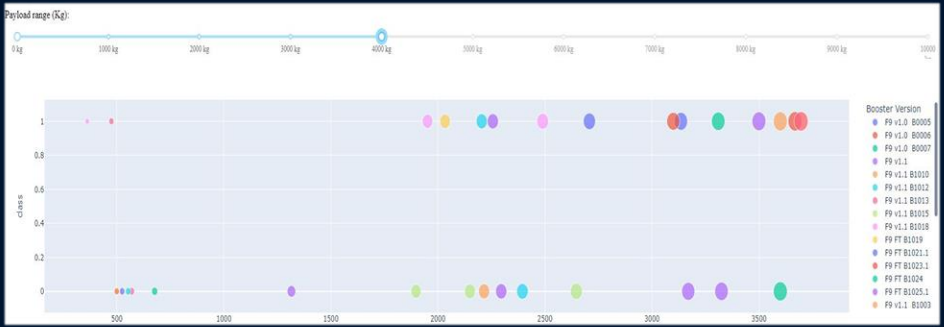
Highest Launch Success Ratio



KSC LC-39A has the highest launch succes rate.

Payload - Launch Outcome Scatter Plot

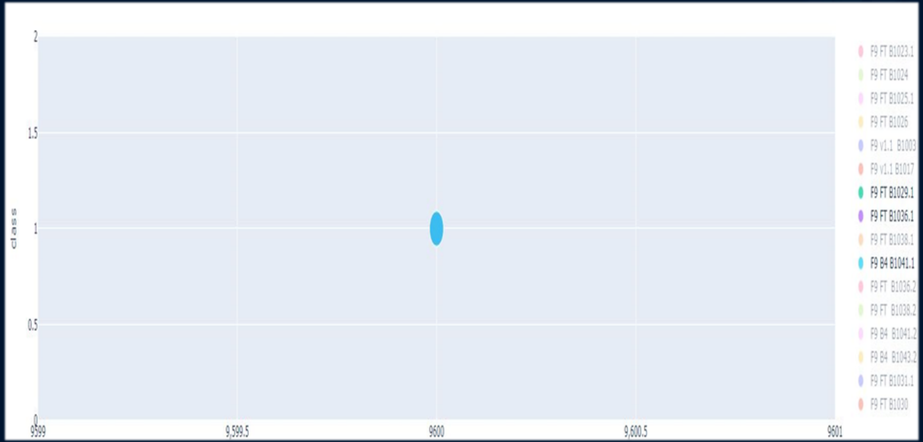
0-4.000 kg



4.000-10.000 kg

We can see that all the success rates for low weighted payload is higher than heavy weighted payload.

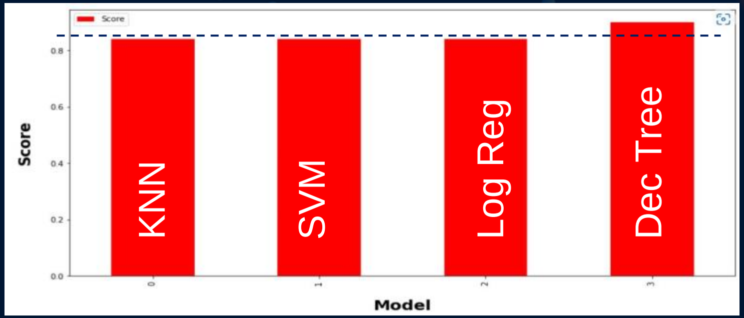
FT and B4 F9 Booster versions have the highest launch success rate.



PREDICTIVE ANALYSIS
Section 5

CLASSIFICATION ACCURACY

Four classification models were trained and tested . After tuning model parameters, were calculated best scores for each model, the best algorithm was specified as Decision Tree Classifier model with 0.90 score.

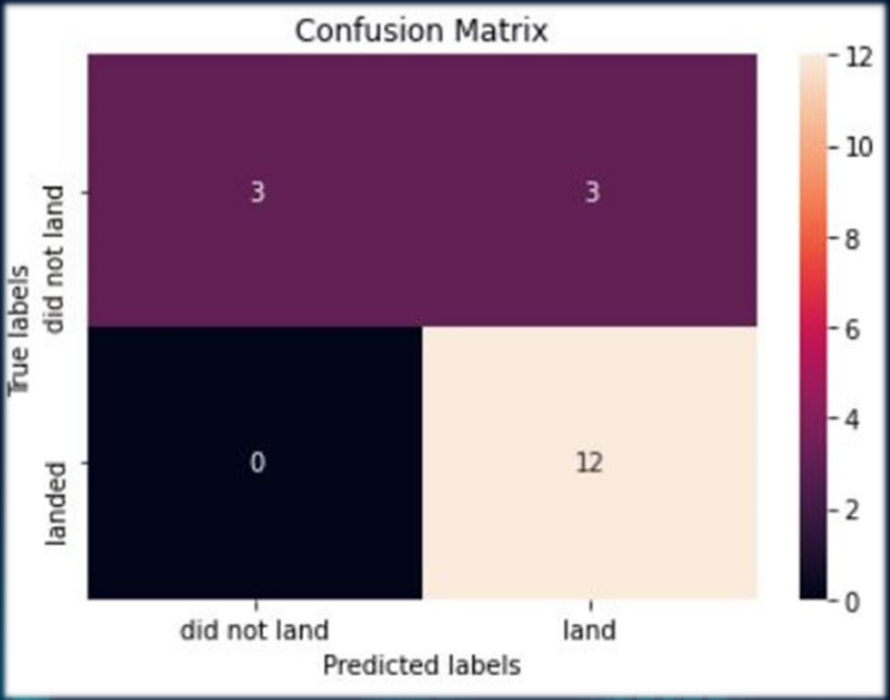


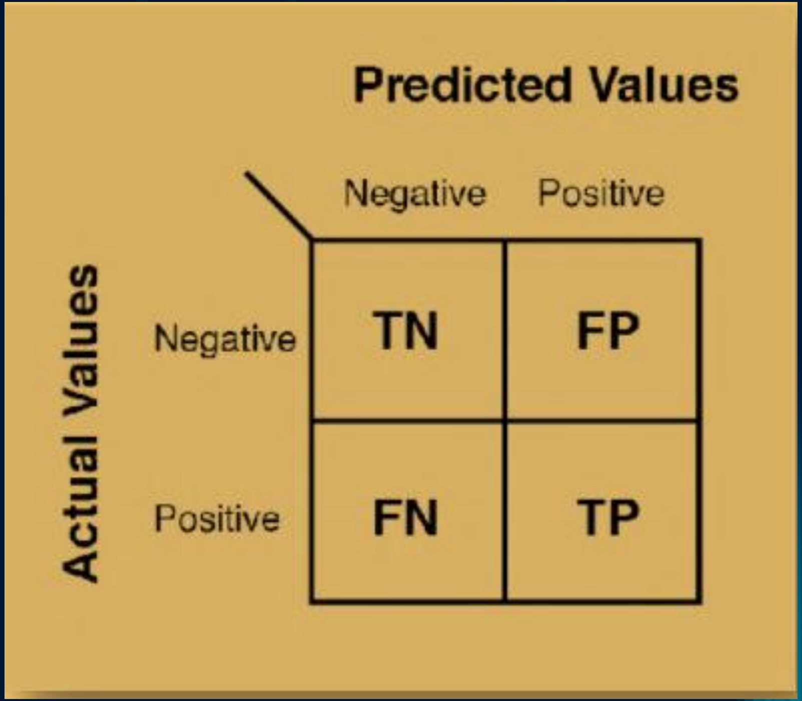

```
algorithms = {'KNN':knn_cv.best_score_,'Tree':tree_cv.best_score_,'LogisticRegression':logreg_cv.best_score_}
bestalgorithm = max(algorithms, key=algorithms.get)
print('Best Algorithm is',bestalgorithm,'with a score of',algorithms[bestalgorithm])
if bestalgorithm == 'Tree':
    print('Best Params is :',tree_cv.best_params_)
if bestalgorithm == 'KNN':
    print('Best Params is :',knn_cv.best_params_)
if bestalgorithm == 'LogisticRegression':
    print('Best Params is :',logreg_cv.best_params_)
```

```
Best Algorithm is Tree with a score of 0.9027777777777778
Best Params is : {'criterion': 'entropy', 'max_depth': 14, 'max_features': 'sqrt', 'min_samples_leaf': 2, 'min_samples_split': 2, 'splitter': 'random'}
```

CONFUSION MATRIX

Concluded from confusion matrix of the decision tree classifier, the unsuccesful landings that are predicted as succesful landings wrongly by our model, namely False Positives, are the major problem of our model.





CONCLUSION

01 Decision Tree Classifier is the best model for our dataset

02 There is a negative impact of heavier payload on landing performance.

03 There is a strongly increasing trend on succes rate of launches from 2013 to 2020. Considering positive correlation between launch number and success rate, we can conclude that the company keep learning from its experiences in promising way for the future.

04 KSC LC-39A has the highest succes rate.

05 SSO orbit has the highest success rate as %100. (Excluded GEO, HEO, ES-L1 orbits because of the low occurences.)

06 Launch sites of SpaceX are located far from densely populated places like cities, railways and highways, and also located on coastlines to conduct safer launches.

APPENDIX

I. Wikipedia Page includes the list of Falcon 9 and Falcon Heavy launches

APPENDIX I.

Wikipedia Link

List of Falcon 9 and Falcon Heavy launches

From Wikipedia, the free encyclopedia

This is an old revision of this page, as edited by C-randles (talk | contribs) at 11:39, 9 June 2021 *(cite refs)*. The present address (URL) is a permanent link to this revision, which may differ significantly from the current revision.
(diff) ← Previous revision | Latest revision (diff) | Newer revision → (diff)

Since June 2010, rockets from the Falcon 9 family have been launched 169 times, with 167 full mission successes, one partial failure and one total loss of spacecraft. In addition, one rocket and its payload were destroyed on the launch pad during the fueling process before a static fire test.

Designed and operated by private manufacturer SpaceX, the Falcon 9 rocket family includes the retired versions Falcon 9 v1.0, v1.1, and v1.2 "Full Thrust" Block 1 to 4, along with the currently active Block 5 evolution. Falcon Heavy is a heavy-lift derivative of Falcon 9, combining a strengthened central core with two Falcon 9 first stages as side boosters.[1]

The Falcon design features reusable first-stage boosters, which land either on a ground pad near the launch site or on a drone ship at sea.[2] In December 2015, Falcon 9 became the first rocket to land propulsively after delivering a payload to orbit.[3] This achievement is expected to significantly reduce launch costs.[4] Falcon family core boosters have successfully landed 132 times in 143 attempts. A total of 31 boosters have flown multiple missions, with a record of ten missions by the same booster.

Falcon 9's typical missions include cargo delivery and crewed flights to the International Space Station (ISS) with the Dragon and Dragon 2 capsules, launch of communications satellites and Earth observation satellites to geostationary transfer orbits (GTO), and low Earth orbits (LEO), some of them at polar inclinations. The heaviest payload launched to a LEO are a batch of 60 Starlink satellites weighing a total 15,600 kg (34,400 lb) which SpaceX flies regularly, to a roughly 290 km (180 mi) orbit.[5] The heaviest payload launched to a geostationary transfer orbit (GTO) was Intelsat 35e with 6,761 kg (14,905 lb).[a] Launches to higher orbits have included the Deep Space Climate Observatory (DSCOVR) probe to the Sun–Earth Lagrange point L_1, the Transiting Exoplanet Survey Satellite (TESS) space telescope on a lunar flyby trajectory, and the Falcon Heavy test flight which launched Elon Musk's Tesla Roadster into a heliocentric orbit extending beyond the orbit of Mars.

Left to right: Falcon 9 v1.0, v1.1, v1.2 "Full Thrust", Falcon 9 Block 5, Falcon Heavy, and Falcon Heavy Block 5.

Contents [hide]

THANK YOU

Do you have any questions?

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