

# Winning Space Race with Data Science

a ~åæäeqçì êå  
g~å=ØMDQ



# I ï íâåÉ

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b ñ É Åì íâ É Þì ã ã ~ ðó

fåíêçÇì Åáçå

j ÉíÜçÇçæÖó

o Éëì äë

` çåÅâ ääçå

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# fåíêçÇì Åíáçå

mēç ÉÁÍ‡ † Éäí Éí ñåÇþ Éíí‰öw

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Section 1

# Methodology

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Rocket launch data from SpaceX API with URL:

```
: SpXURL="https://api.spacexdata.com/v4/launches/past"
:
: response = requests.get(SpXURL)

:
: #json to normalize

: # decode response
: static_json_df = res.json()

:
: # json_normalize
: data = pd.json_normalize(static_json_df)

:
: rows = data_falcon9['PayloadMass'].values.tolist()[0]

: df_rows = pd.DataFrame(rows)
: df_rows = df_rows.replace(np.nan, PayloadMass)

:
: data_falcon9['PayloadMass'][0] = df_rows.values
: data_falcon9
```

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```
static_url = "https://en.wikipedia.org/w/index.php?title=List_of_Falcon_9_and_Falcon_Heavy_launches&oldid=1027686922"
```

Next, request the HTML page from the above URL and get a `response` object.

## TASK 1: Request Falcon9 Launch Wiki page from its URL

First, let's perform an HTTP GET method to request the Falcon9 Launch HTML page, as an HTTP response

```
# use requests.get()
html_data = requests.get(static_url)
html_data.status_code
```

200

Create a `BeautifulSoup` object from the HTML response.

```
# Use BeautifulSoup()
soup = BeautifulSoup(html_data.text, 'html.parser')
```

Print the page title to verify if the `BeautifulSoup` object was created properly.

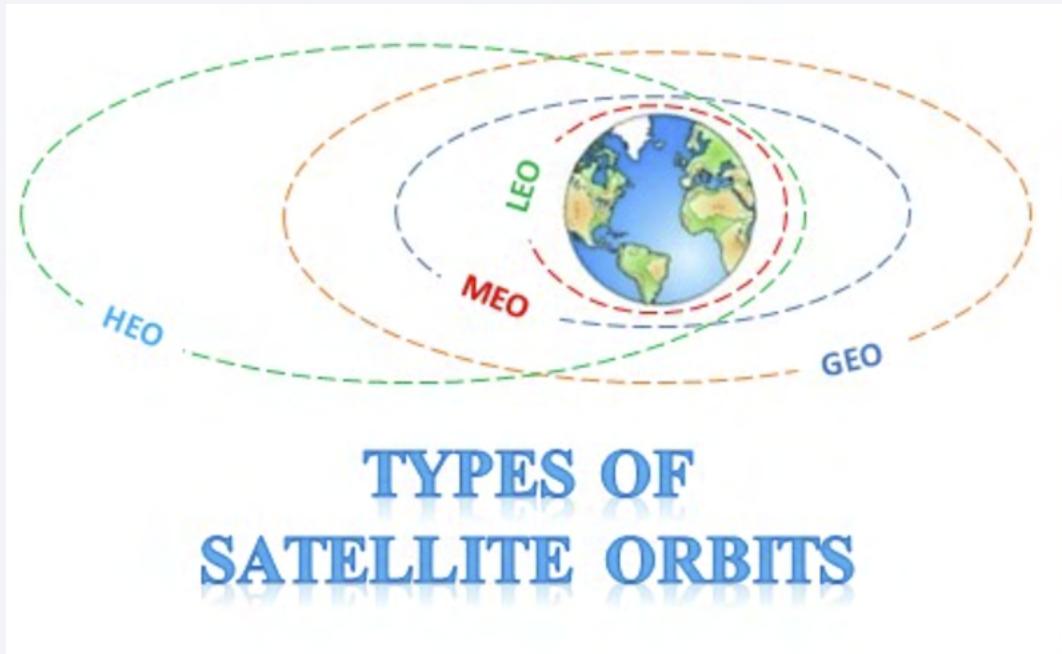
```
# Use soup.title  
soup.title
```

[List of Falcon 9 and Falcon Heavy launches](#) - Wikipedia

df.columns.names = [ ]

```
element = soup.find_all('th')
for row in range(len(element)):
    try:
        name = extract_column_from_header(element[row])
        if (name is not None and len(name) > 0):
            column_names.append(name)
    except:
        pass
```

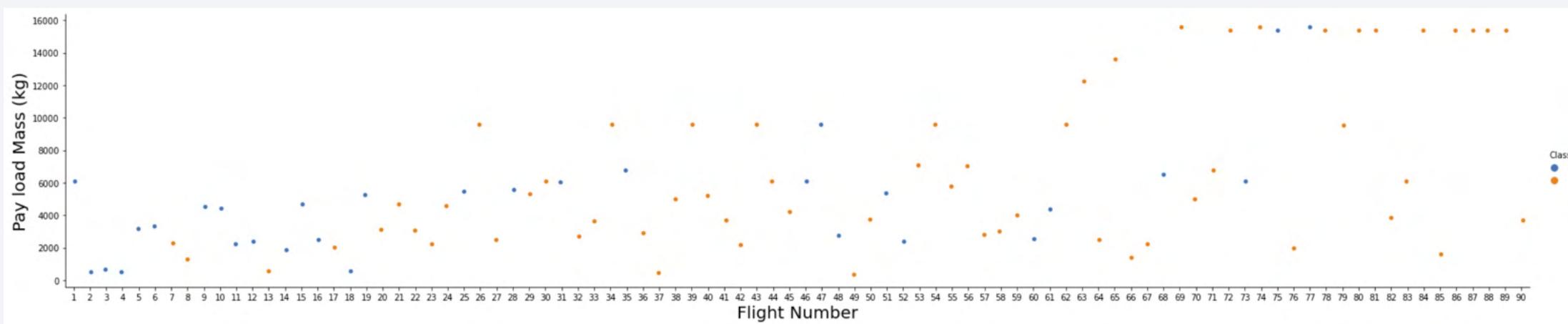
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  - q ÜÉã É~åé~óö~Çã ~ëë~çÜÉc ~åçå~V~Éëéå~N~ÄççëíÉ~K
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# I ÅÇ~å ÇåíÉê~Åíâ É‡ ~é‡ áÜççä ã

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C e Å E e l ‡ Ü å A Ü ä ã å A Ü e á E e ~ A c ~ e i E Ç ~ Ü å Ü E e ~ i E c N e i Å E e e Ñ ä ã å A Ü E e K  
^ Ç C å å ~ ä ã ~ E Å ç ä ä i E E c E C e i ~ å A E e e N ä ã E ~ A Ü ä ã å A Ü e á E r c å ~ E ~ ö E c ä i e  
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í áö~a ~ëÜÄç~êö~ áÜñöçíö~a ~ëÜ

i åâ=ÜíéëWÖáÜì ÄkÅçã Líçì êåPâN` ~éëíçåÉc~äÅçåVmêçåÉÅC

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^ ñe ~êÉíóçñä ~ÅÜä É~é~êå öä ççéæ~é~é Åçåëíâ ÁÉç~åçüéâ ÜbéÉ~ê~ä ÉíÉ~é~é~éçéíâ åÉçüéçì ÖÜä êççü~é~êÅÜ sK

q ÜÉã ÉíêÅçÑåÜçåÉÑêÉí ~ä ~íåÖçì êã ççÉæ~ ~ë=ÅÅì ê-Åóíï ÜåÅÜï É  
ÉåÜ~åÅÉÇíÜçì ÖÜÑÉ~ ï ßÉåÖåÉéåÖ~åÇÑåÉJì ååÖçÑ~öçéåÜä ëK

r ää ~íÉä! Œ ÉçÉåíä ÑÉÇíÜÉÅä-eeäÅ~íååä çÇÉä! áÜÅÜÉÜÅÜÉeí  
éÉåñçä ~åÅÉK

i ääâ=ÜíéëWÖáÜ Äkçä Líçì êåPâN` ~éëíçåÉc~äçåVmêçäÅíO

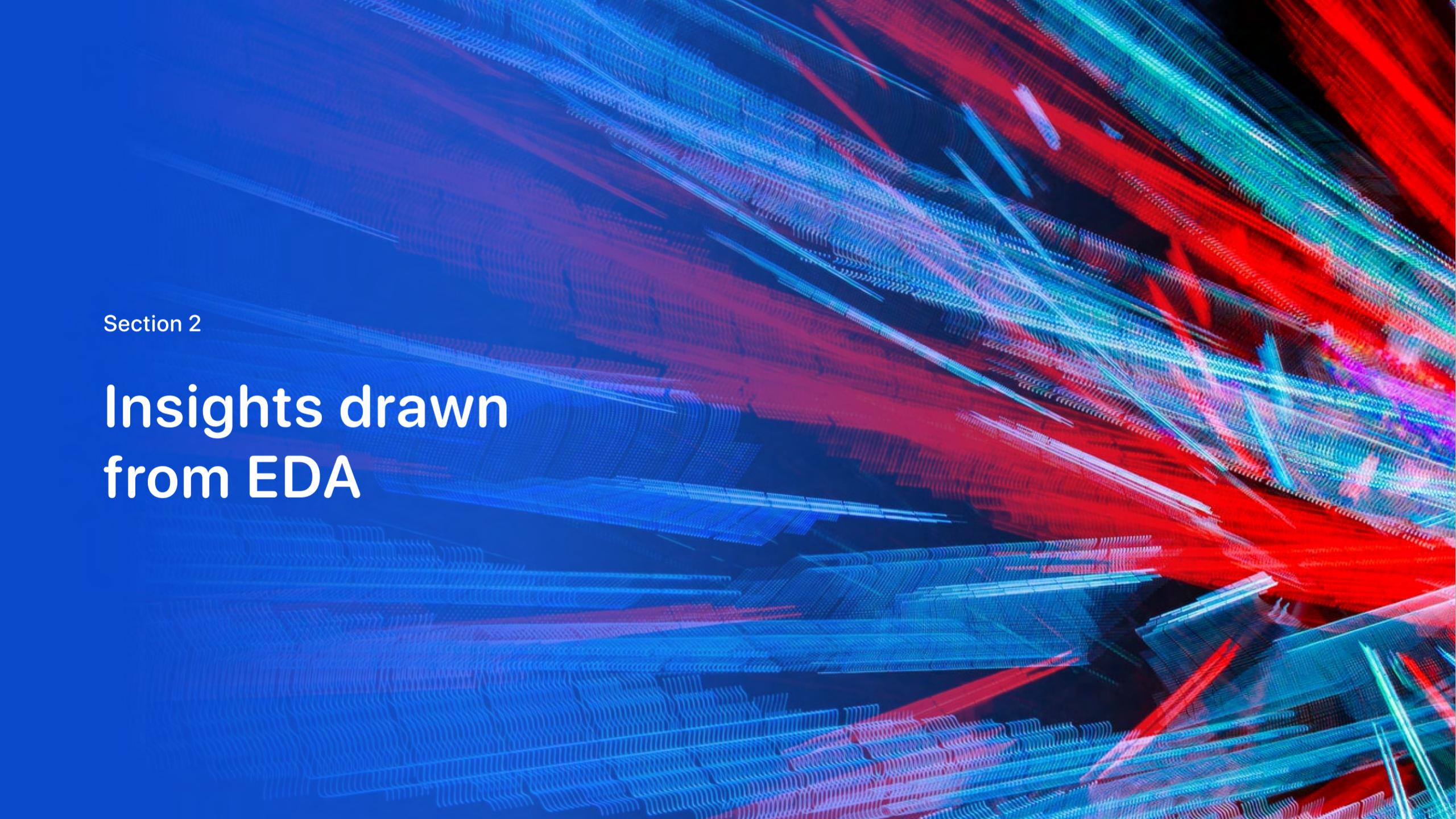
# o Éëì äë

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o Éëì äë=Ñçã =Éñéäçê~íççó=Ç~í~=å~ä~ä

p ÅêÉÉåëÜçíë=QEä çåëíê~íåÖäíÉê~Åíâ É=å~ä~ä

I ì íÅçã Éë=çÑéëÉçåÅíâ É=å~ä~ä

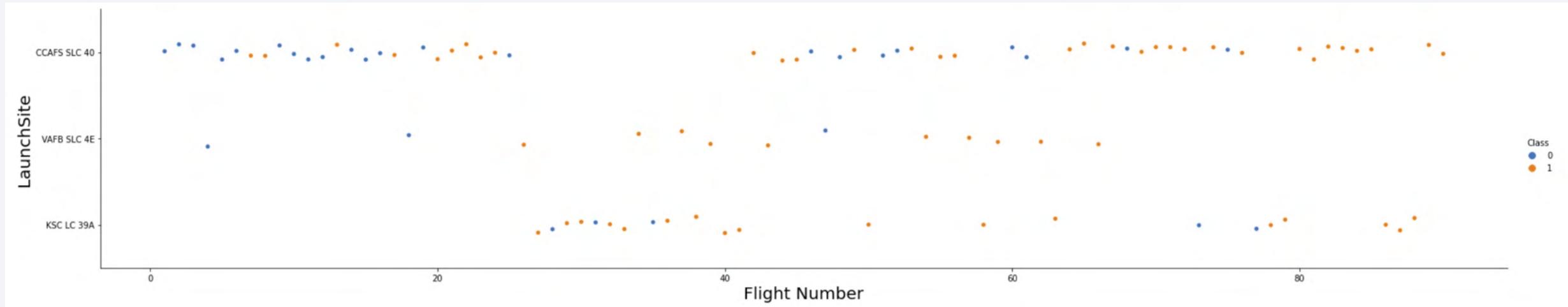
The background of the slide features a complex, abstract digital pattern. It consists of numerous thin, glowing lines that create a sense of depth and motion. The colors used are primarily shades of blue, red, and purple, which are interwoven to form a grid-like structure that resembles a wireframe or a microscopic view of a material's internal structure.

Section 2

## Insights drawn from EDA

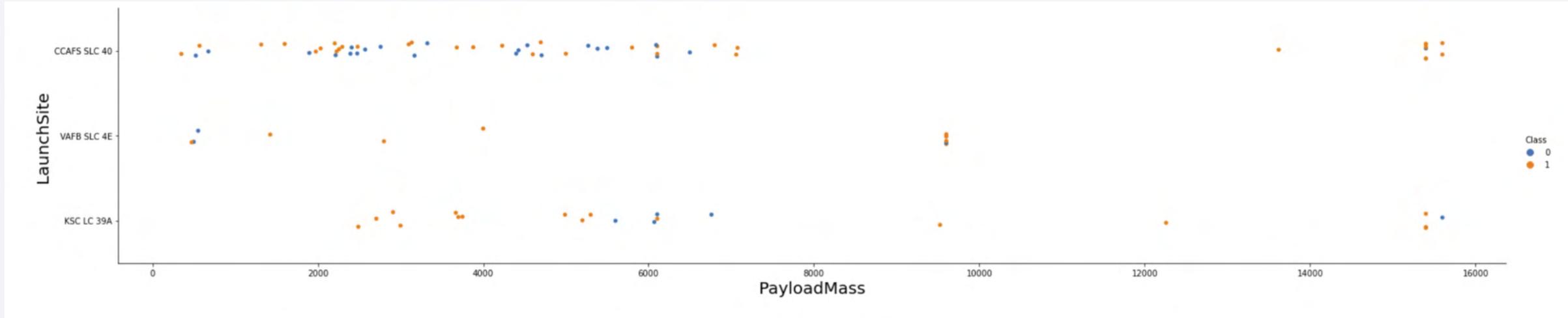
# căOÜík ì ã ÄÉêñ öK ~ì åÅÜp áÉ

q ÜÉ=Öe~éÜ~åC~íÉC~=Åç~éÉä~íåå~ ÜÉ=É~å~åÅÉ~öE~å~ÜÉ~åì ã ÄÉêç~N~Üüë~í~  
ä~ì åÅÜë~åÉ~ö~ëëç~å~íÉC~í~ åÜ~ÜÖÜÉ~ë~í~ ÅÅÉ~ë~ë~í~N~ë~ì åÅÜ~ë~í~Ü~í~ë~åÉK

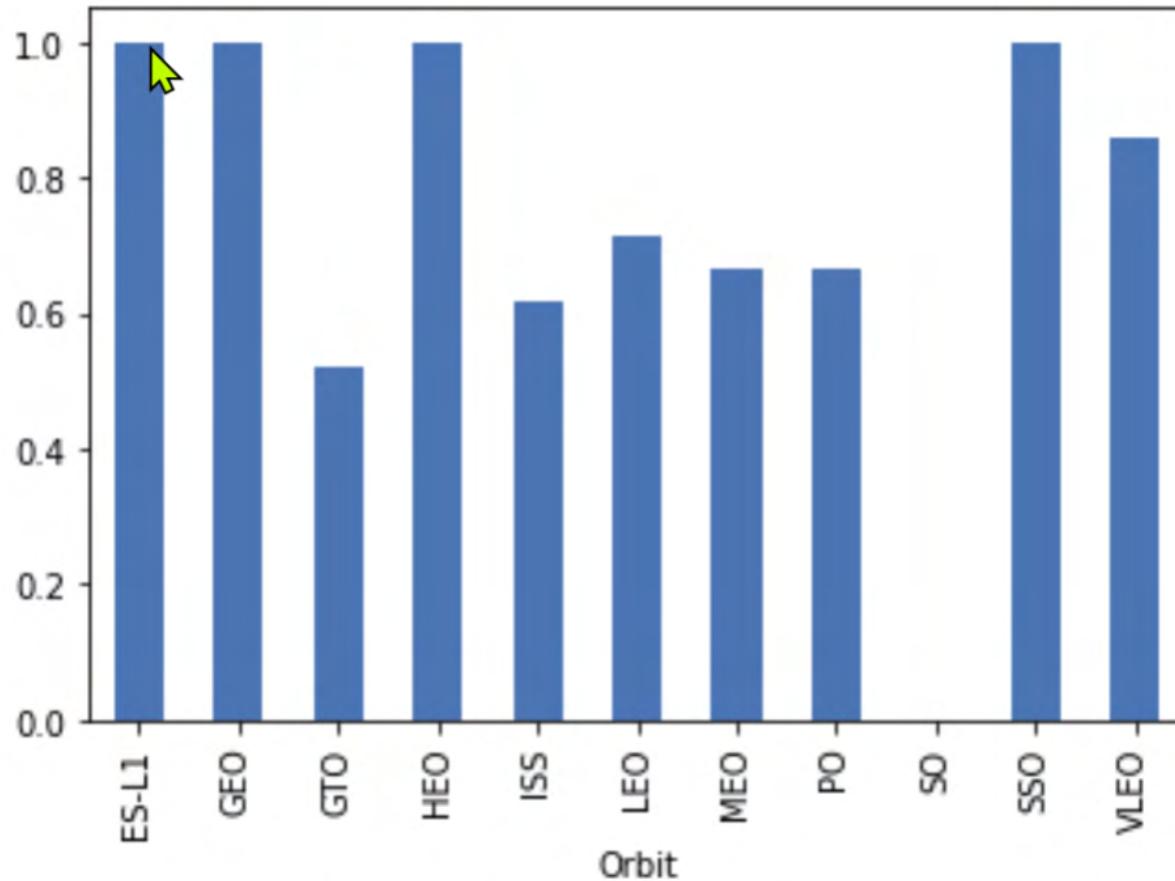


m̄óäç~Ç† ëk‡ ~ì åÅÜþ áÉ

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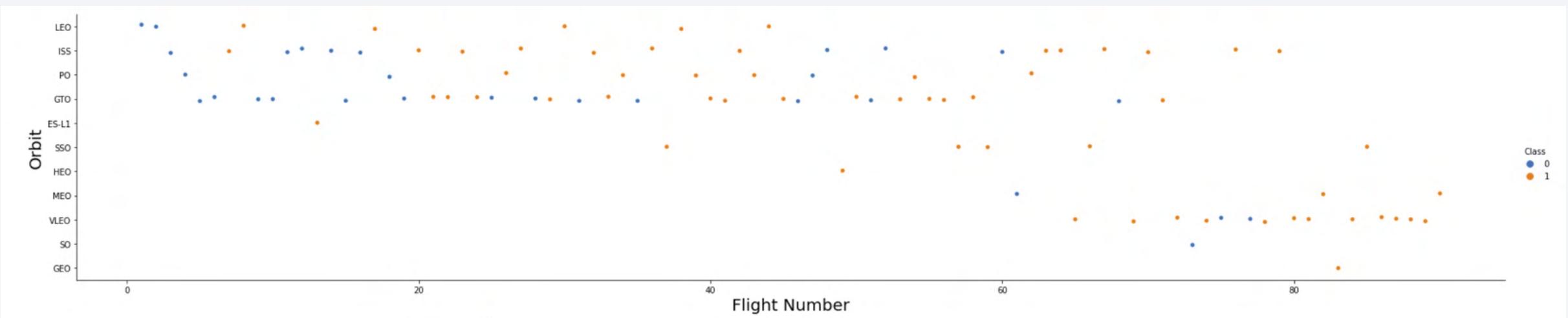
# pì ÅÅÉeeë ~íÉñ ëK! êÄá=çóéÉ



qÜEëÉ=ÜçÜEä çëíëì ÅÅÉeeë  
ê~íÉñpJ Nëbl Iëbl Iëpl I  
si bl ÜçÜEä çëíëì ÅÅÉeeë  
ê~íÉK

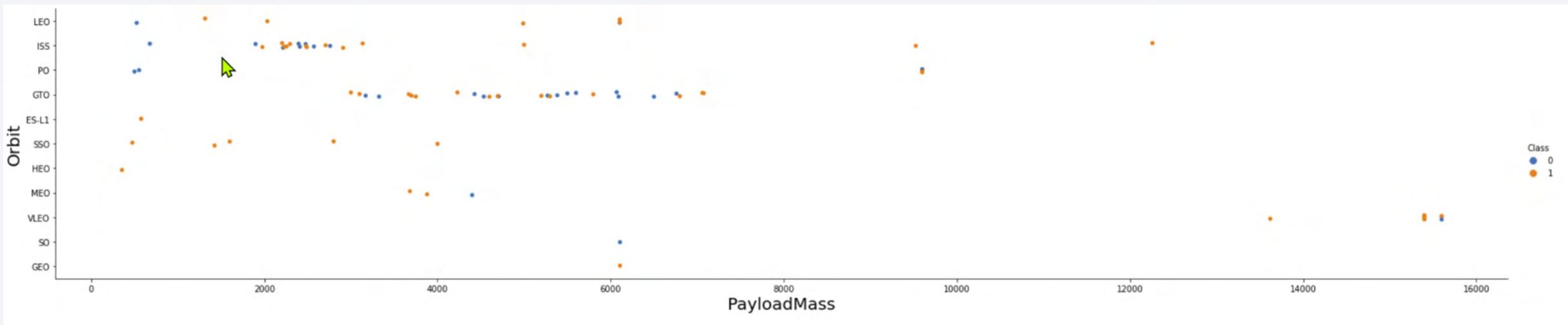
# caðÜí‡ i ã ÄÉê† ëK‡ êÄá=qóéÉ

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i ÜÉ=Æ=ei ÅÅÉeeÑl ää æeäçåë‡ aÜ‡äÜÉ‡ bI çêÄá=ééÉ~êçç åÅÉ~ëÉ‡ aÜ‡ÜÉ=ä i ã ÄÉê  
çÑNÜüel‡ ÜäE=äÜÉ=d qI çêÄá=ÜÉ=ä i ã ÄÉêçÑNÜüe=Çéë=äçí=ëÉÉä =çç=äNl ÉåÅÉ  
ëi ÅÅÉee=e=íÉëK

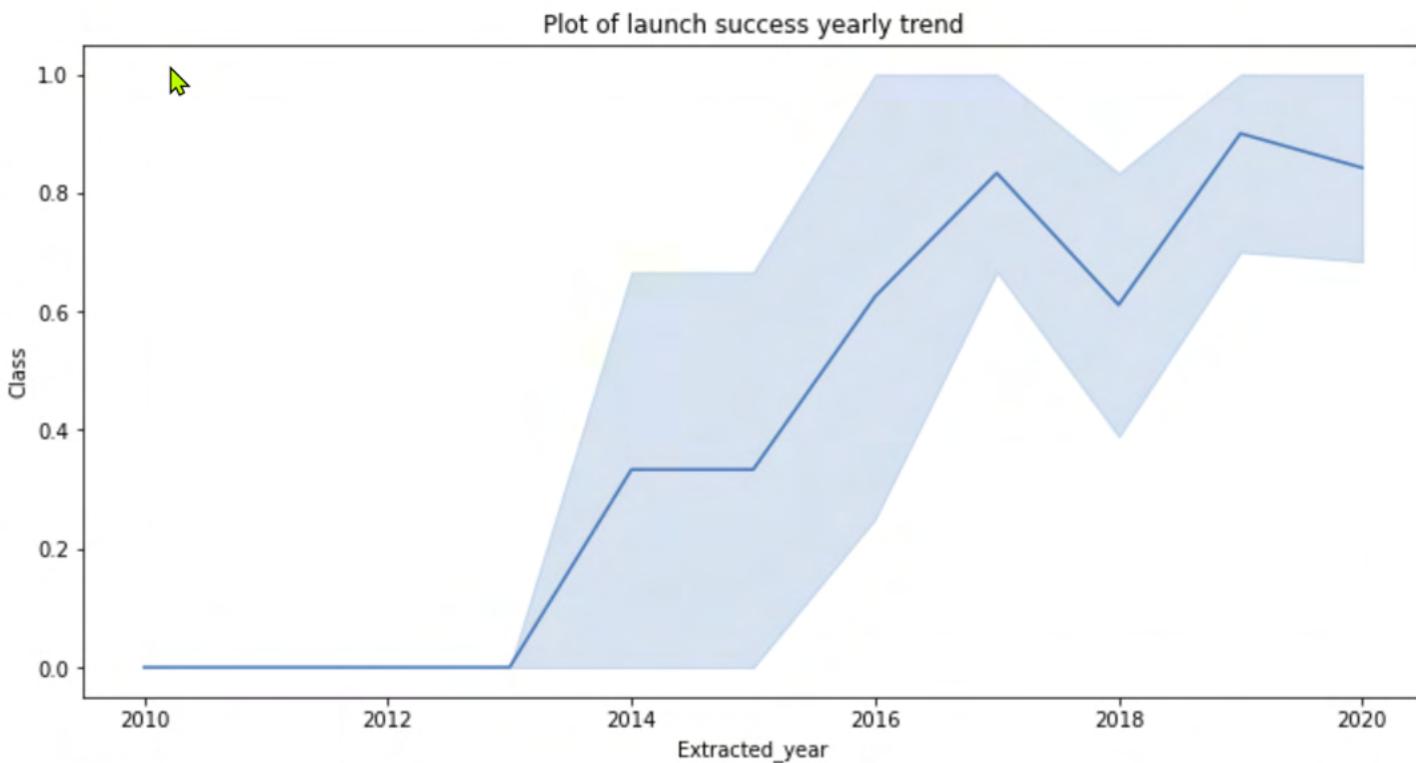


m~óäç~Ç† ëk‡ êÄá=çqóéÉ

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~åÇçfp~p~çü~êää~ä~ÜÉ~å~çü~ö~äÜ~ÜÉ~í~ä~éé~ó~çü~çéK



# i ~ì åÅÜpì ÅÅÉeeëv É~êë=q êÉåÇ



q ÜE=Öê~éÜhåÇå~íEë=ÅçåëæíÉåíñ èi ~êCíêÉåÇå~íÜE èi ÅÅÉeeë=e~íÉ~ñçå ~ÜE=jÉ~êCMNPñ èiç=CMOK

# ^ äñ ~ì åÅÜþ áÉþ ~ã Éë

launchsite	
0	KSC LC-39A
1	CCAFS LC-40
2	CCAFS SLC-40
3	VAFB SLC-4E

pÉaÉÅí ñ åæì ÉçÅÅì ê~åÅÉçÑ  
íÜÉñ ~à ÉñÉã =äì åÅÜëáÉ  
Ñçã ñÜÉç~í~ëÉíñ Éñ Éë  
í çêâåÖñ áÜK

# SpaceX Flights to the International Space Station

q Übér~ÄrÉCæéäóëRæÁçéCéf ÜÉÉ~í åÅÜéáÉëÆÖåñ áÜñ` ` ^ }

	<b>date</b>	<b>time</b>	<b>boosterversion</b>	<b>launchsite</b>	<b>payload</b>	<b>payloadmasskg</b>	<b>orbit</b>	<b>customer</b>	<b>missionoutcome</b>	<b>landingoutcome</b>
0	2010-04-06	18:45:00	F9 v1.0 B0003	CCAFS LC-40	Dragon Spacecraft Qualification Unit	0	LEO	SpaceX	Success	Failure (parachute)
1	2010-08-12	15:43:00	F9 v1.0 B0004	CCAFS LC-40	Dragon demo flight C1, two CubeSats, barrel of...	0	LEO (ISS)	NASA (COTS) NRO	Success	Failure (parachute)
2	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
3	2012-08-10	00:35:00	F9 v1.0 B0006	CCAFS LC-40	SpaceX CRS-1	500	LEO (ISS)	NASA (CRS)	Success	No attempt
4	2013-01-03	15:10:00	F9 v1.0 B0007	CCAFS LC-40	SpaceX CRS-2	677	LEO (ISS)	NASA (CRS)	Success	No attempt

# qçí~äm~óäç~Çđ ~ëë

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ÄççëíÉä=äQRIRVS=ääçÖë~ä ëK

total_payloadmass
0 45596

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cæíþì ÅÅÉeeÑ ðð êçì åÇ‡ ~åÇåÖa ~íÉ

fíð ~ë=åçíÉÇÜ~íðÜé=åááæðí ÅÅÉeeÑ aÖçì åÇé~ÇæåÇåÖçÅí åÉÇçå=a ÉÅéä ÄÉéOD=OMRK

**firstsuccessfull\_landing\_date**

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0 2015-12-22

# pì ÅÅÉeeÑ ñaa çåÉp Üé‡ ~åÇåÖ‡ áÜk~óç~ç ÄÉíi ÉÉå=QMM=åÇ-SMM

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é~óç~çå ~ëë=ÉñÅÅÉçåÖ=QMM=åçÖe~å ë=Åí i=Åä ~åçåÖ‡ åçé=SM=åçÖe~å ëK

## boosterversion

- |   |               |
|---|---------------|
| 0 | F9 FT B1022   |
| 1 | F9 FT B1026   |
| 2 | F9 FT B1021.2 |
| 3 | F9 FT B1031.2 |

# qçí~äk ì ã ÄÉêçÑpì ÅÅÉeeÑ ä~åÇe~â Ûéj æëåçå I ì íÅçã Éë

t ÉÉä éäçóÉçÜÉj äçÅ~êçB Båçì êt e b o b Åäì ëÉç=ÑéÅ~ëÉëj ÜÉéÜÉj æëåçål ì íÅçã É  
i ~ëÉáÜÉ~ëi ÅÅÉeeçê~Ñâ ÛÉK

The total number of successful mission outcome is:



The total number of failed mission outcome is:



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boosterversion	payloadmasskg	
0	F9 B5 B1048.4	15600
1	F9 B5 B1048.5	15600
2	F9 B5 B1049.4	15600
3	F9 B5 B1049.5	15600
4	F9 B5 B1049.7	15600
5	F9 B5 B1051.3	15600
6	F9 B5 B1051.4	15600
7	F9 B5 B1051.6	15600
8	F9 B5 B1056.4	15600
9	F9 B5 B1058.3	15600
10	F9 B5 B1060.2	15600
11	F9 B5 B1060.3	15600

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	<b>boosterversion</b>	<b>launchsite</b>	<b>landingoutcome</b>
0	F9 v1.1 B1012	CCAFS LC-40	Failure (drone ship)
1	F9 v1.1 B1015	CCAFS LC-40	Failure (drone ship)

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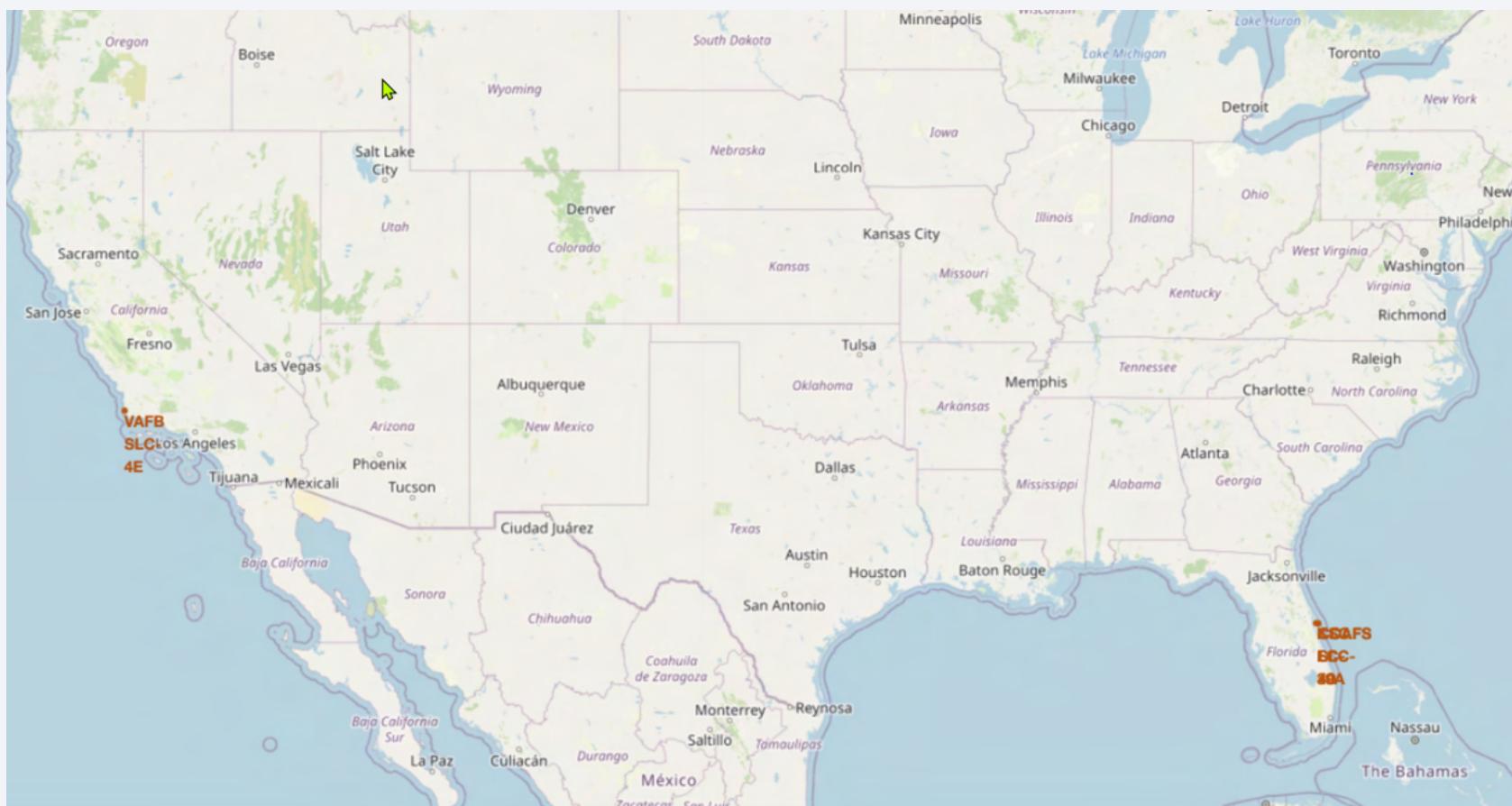
landingoutcome	count
0	No attempt
1	Success (drone ship)
2	Failure (drone ship)
3	Success (ground pad)
4	Controlled (ocean)
5	Uncontrolled (ocean)
6	Precluded (drone ship)
7	Failure (parachute)

The background of the slide is a photograph taken from space at night. It shows the curvature of the Earth's horizon against a dark blue sky. City lights are visible as numerous small white and yellow dots, primarily concentrated in the lower right quadrant where a large, brightly lit urban area is visible. In the upper right corner, there is a faint, greenish glow of the aurora borealis or a similar atmospheric phenomenon.

Section 4

# Launch Sites Proximities Analysis

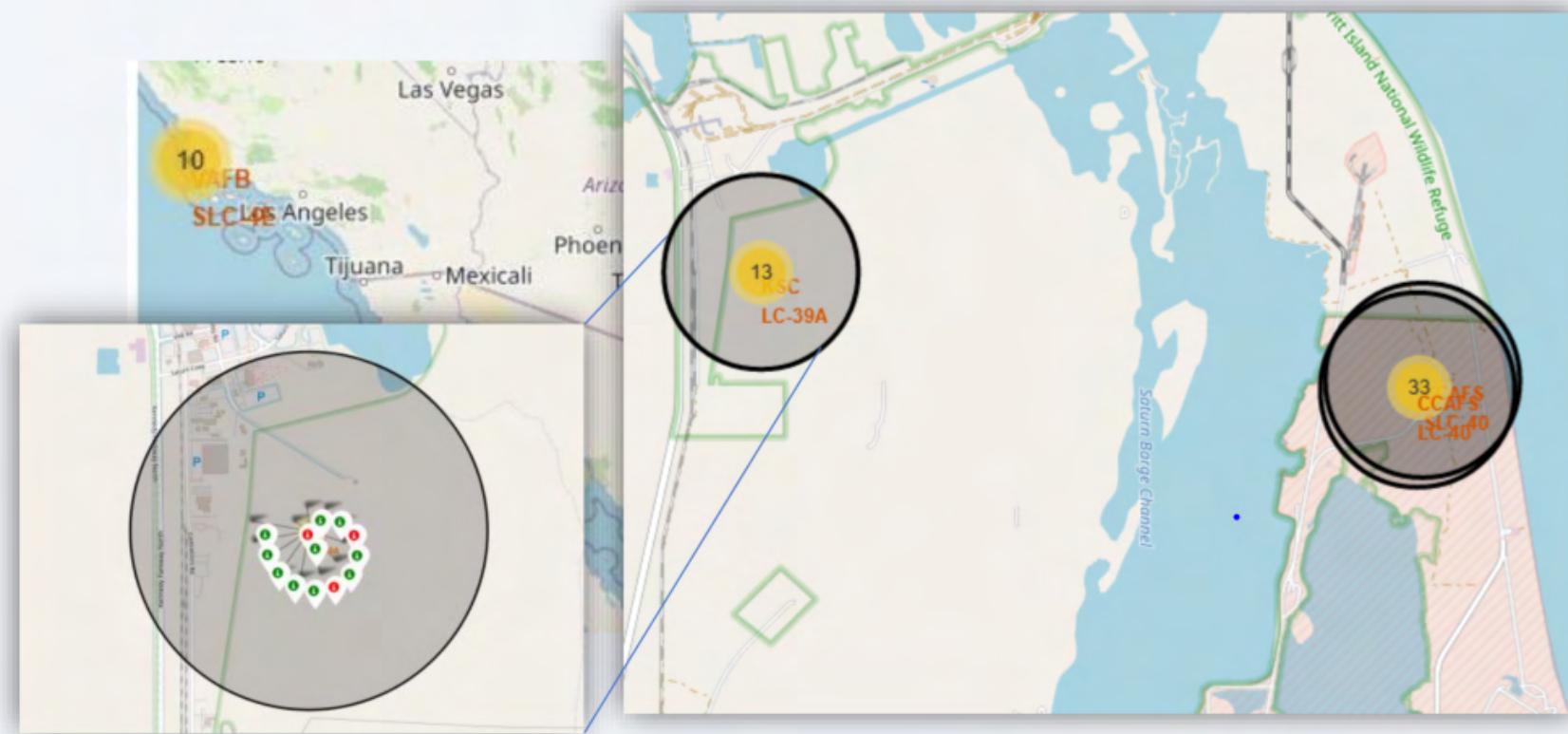
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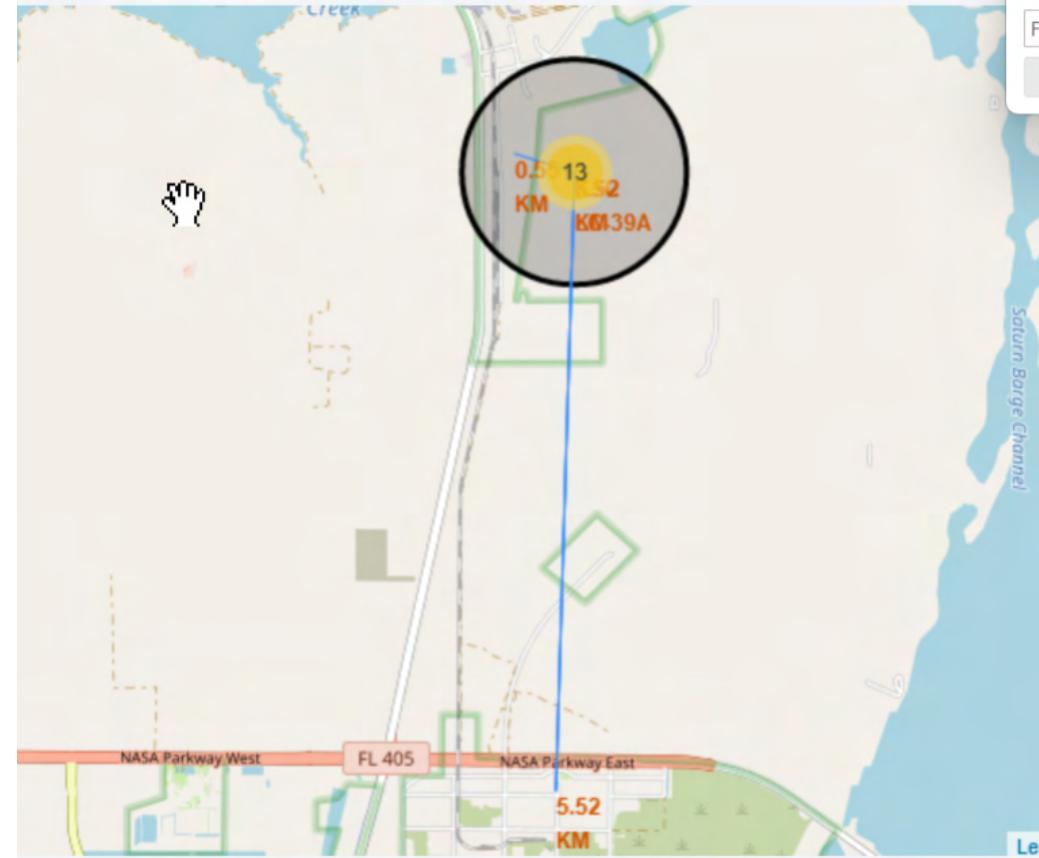
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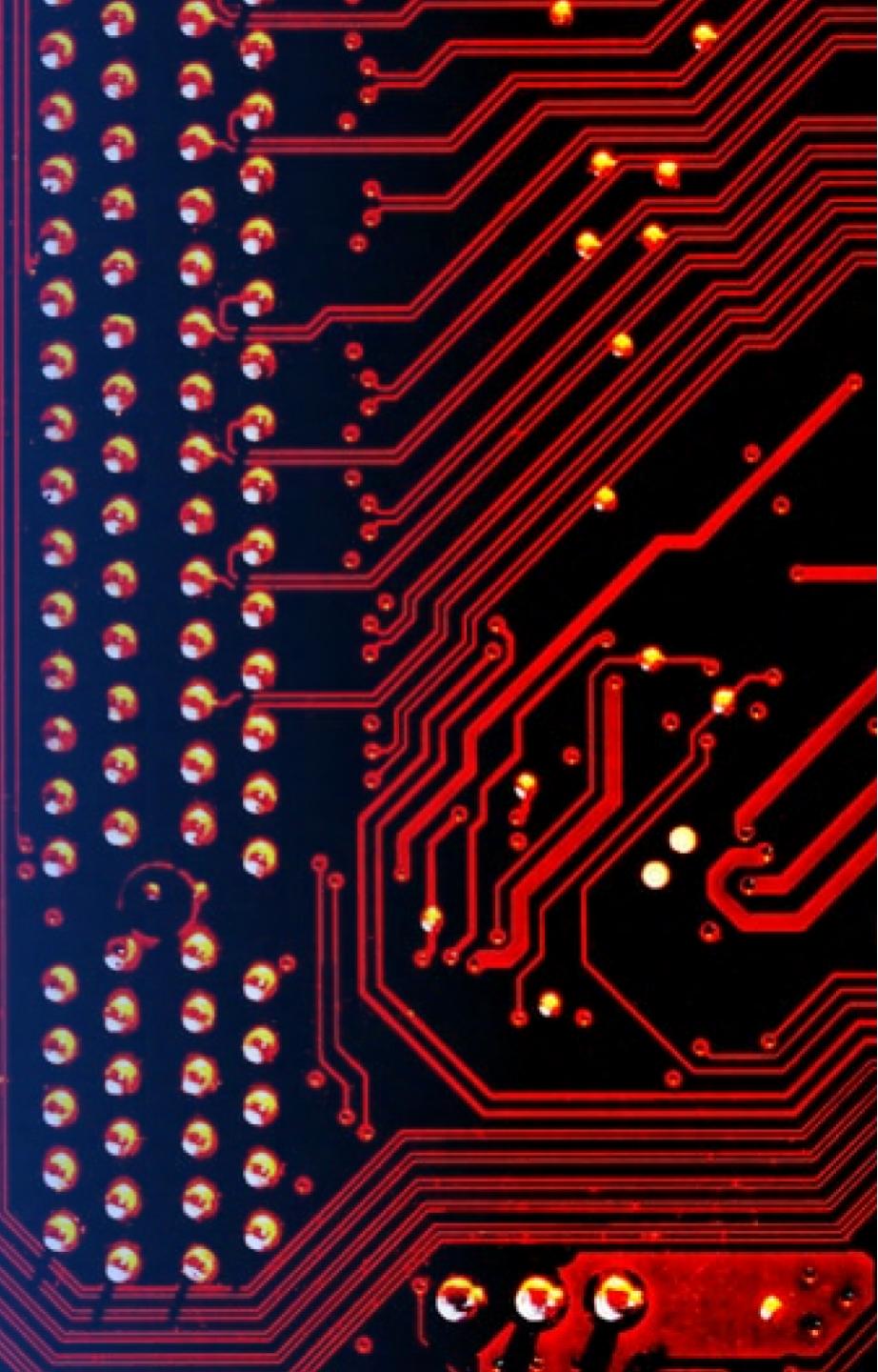
ÓÓ·ĽĽ·ĶĶ İJĘ ĚĘŠUĘŠSĘT ĚĘŠUĘŠTVĘT  
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Section 5

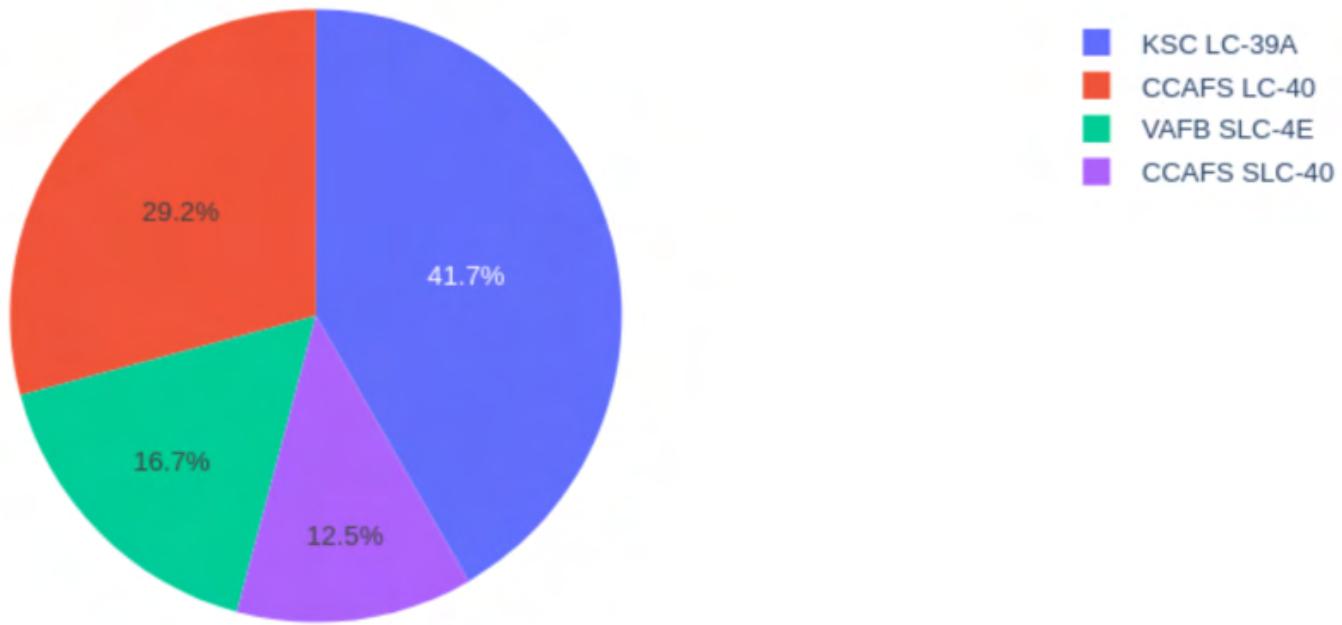
# Build a Dashboard with Plotly Dash



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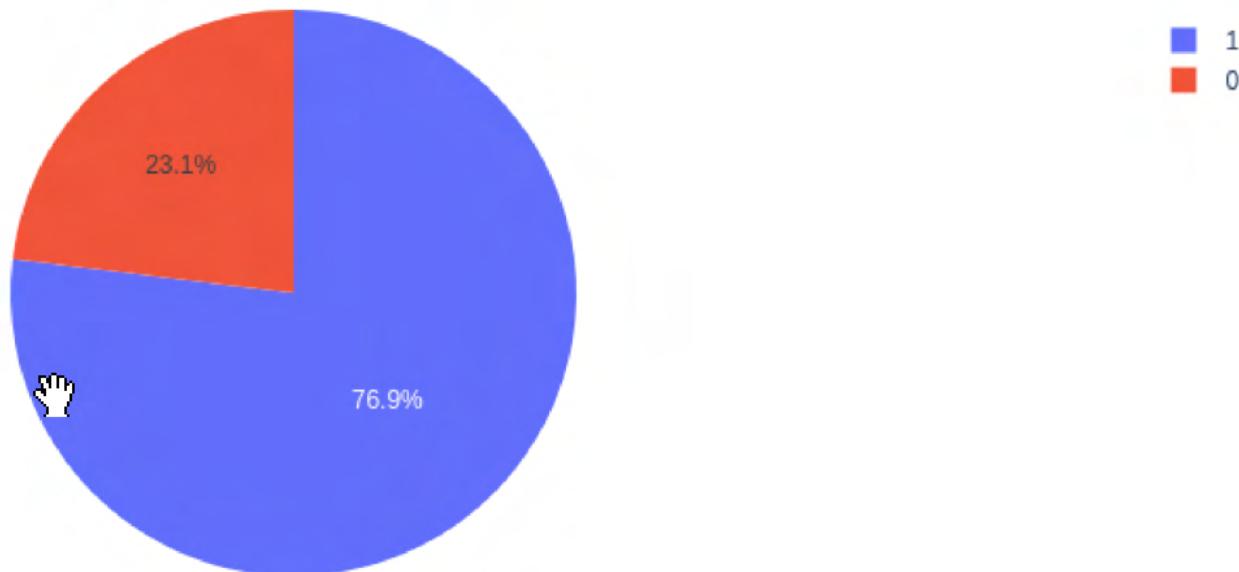
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Total Success Launches By Site



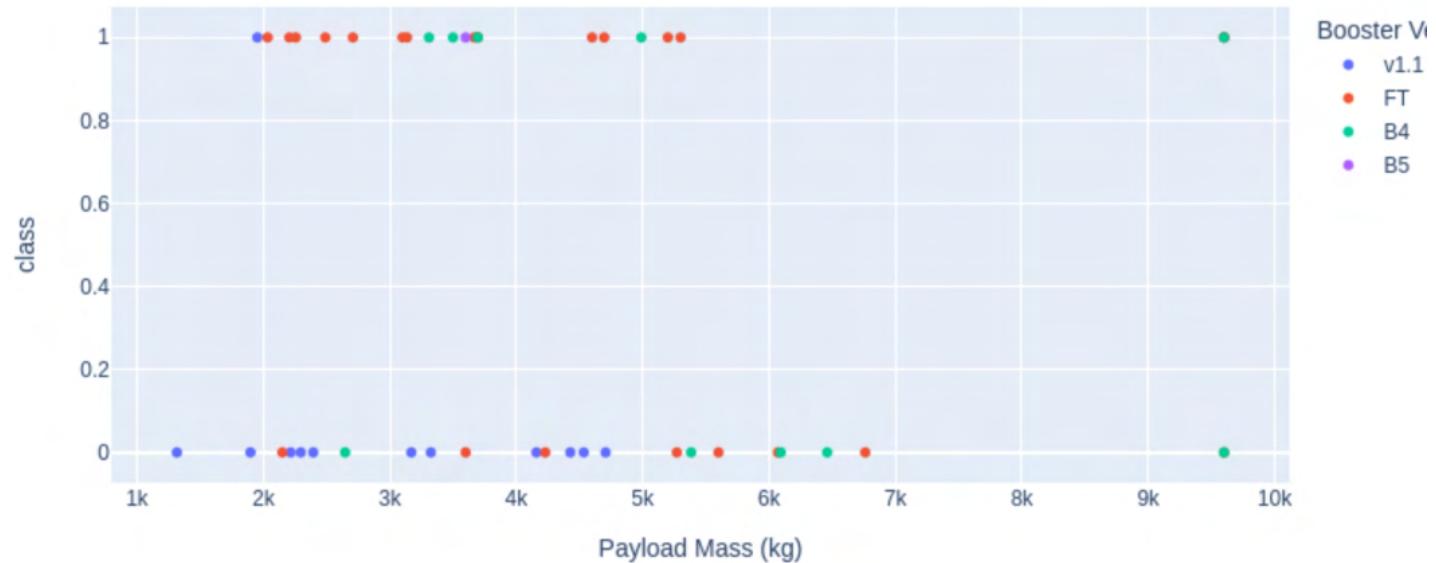
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Total Launches for site KSC LC-39A



# SpaceX Falcon Heavy Payload Mass vs Class

All sites - payload mass between 1,000kg and 10,000kg



The background of the slide features a dynamic, abstract design. It consists of several thick, curved lines that transition from a bright yellow-green at the top right to a deep blue at the bottom left. These curves create a sense of motion and depth, resembling a tunnel or a stylized landscape. The overall effect is modern and professional.

Section 6

# Predictive Analysis (Classification)

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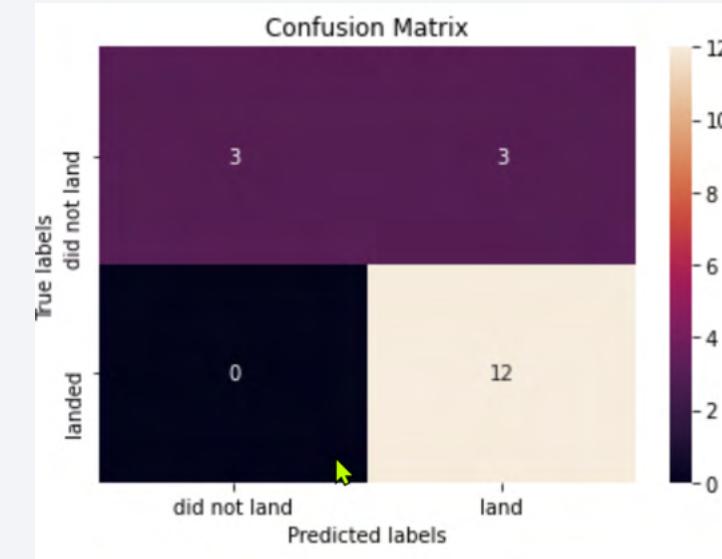
Best model is DecisionTree with a score of 0.8732142857142856

Best params is : {'criterion': 'gini', 'max\_depth': 6, 'max\_features': 'auto', 'min\_samples\_leaf': 2, 'min\_samples\_split': 5, 'splitter': 'random'}

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Thank you!

