



SpaceY

Winning Space Race with Data Science

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Vhswhp ehu#5354 #



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- Iqwurgxfwlrq
- P hkrgrarj |
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- Project background and context
 - 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.
- Problems you want to find answers
 - If SpaceY can determine if the first stage of Falcon 9 will land, we can determine the cost of a launch. We can use this information to make a data-driven decision when we should bid against SpaceX for a rocket launch.

Section 1

Methodology

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 - Jdwkhuhg#SpaceX launch data from the [SpaceX REST API](#) and scraped data from [Falcon 9 Wiki Pages](#)
- Shuirup #gdwd z udqj dqj
 - Fdndqhg#gdwd#hsolfhg#Sd|ardgP dvv QDQ#@A#Sd|ardgP dvv1p hdq
 - Shuirup #h{sarudwrul#gdwd#dqdd|v1v#HGD ,#xvlqj #y1vxdd}dwlrq#dqg VT O
 - Shuirup #bwhudfwlyh#y1vxdd#dqdd wlfv#xvlqj #Irdxp #dqg Sarwo| Gdvk
 - Shuirup #suhg Ifwyh#dqdd|v1v#xvlqj #Eowlvliifdwlrq#p rghov
 - Used machine learning (ML) to determine if the first stage of Falcon 9 will land successfully. Split data into training data and test data to find the best Hyperparameter for K-Nearest Neighbor (KNN), Support Vector Machine (SVM), Decision Trees (DT), and Logistic Regression (LR). Determined method that performed best using test data.

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- \rx#ghhg#r#suhvhgw#\rxu#gdwd#Frohfwlrq#surfhvv#vh#nh|#skudvhv#lqg#iarz fkduw

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Goal#From#Vsdflh [DSL]

- kwsv-2j1kxe1frp2vzhhws2gdwdvlhqfh0fdswrqh2are2p1q2Dssdhg(53Gdwd(53Vflqh(53Fdswrqh(530(53Gdwd(53Frontwirqls|qe

<https://api.spacexdata.com/v4/rockets/>

<https://api.spacexdata.com/v4/payloads/>

<https://api.spacexdata.com/v4/launchpads/>

<https://api.spacexdata.com/v4/cores/>

<https://api.spacexdata.com/v4/past/>

- Filter on Falcon 9
- Remove irrelevant columns
- Replace NAN PayloadMass with Mean Payload Mass

FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcome	Flights	GridFins	Reused	Legs	LandingPad	Block	ReusedCount	Serial	Longitude	Latitude
4	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
5	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
6	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
7	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
8	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
...
89	86 2020-09-03	Falcon 9	15600.000000	VLEO	KSC LC 39A	True ASDS	2	True	True	True	5e9e3032383ecb6bb234e7ca	5.0	7	B1060	-80.603956	28.608058
90	87 2020-10-06	Falcon 9	15600.000000	VLEO	KSC LC 39A	True ASDS	3	True	True	True	5e9e3032383ecb6bb234e7ca	5.0	7	B1058	-80.603956	28.608058
91	88 2020-10-18	Falcon 9	15600.000000	VLEO	KSC LC 39A	True ASDS	6	True	True	True	5e9e3032383ecb6bb234e7ca	5.0	9	B1051	-80.603956	28.608058
92	89 2020-10-24	Falcon 9	15600.000000	VLEO	CCSFS SLC 40	True ASDS	3	True	True	True	5e9e3033383ecbb9e534e7cc	5.0	7	B1060	-80.577366	28.561857
93	90 2020-11-05	Falcon 9	3681.000000	MEO	CCSFS SLC 40	True ASDS	1	True	False	True	5e9e3032383ecb6bb234e7ca	5.0	2	B1062	-80.577366	28.561857

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- [kwsv-22j1kxe1frp2vzhhws2gdwdvflhgfh0fdswrgh2are2p dwhu0Dssdhg\(53Gdwd\(53Vflhgfh\(53Fdswrgh\(530\(53Zhe\(53Vfudsbjj1s|qe](#)

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

TASK 2: Extract all column/variable names from the HTML table header

TASK 3: Create a data frame by parsing the launch HTML tables

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
4	5	CCAFS	SpaceX CRS-2	4,877 kg	LEO	NASA	Success\n	F9 v1.0B0007.1	No attempt\n	1 March 2013	15:10



Gdwd#Z udqj jqqj

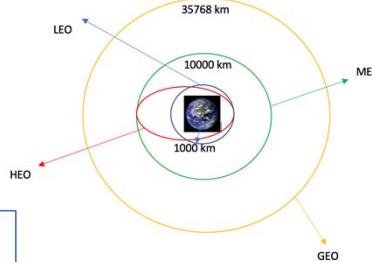
- <https://github.com/sweetps/datascience-capstone/blob/master/Applied%20Data%20Science%20Capstone%20-%20Data%20Wrangling.ipynb>

TASK 1: Calculate the number of launches on each site

TASK 2: Calculate the number and occurrence of each orbit

TASK 3: Calculate the number and occurrence of mission outcome per orbit type

TASK 4: Create a landing outcome label from Outcome column



FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcome	Flights	GridFins	Reused	Legs	LandingPad	Block	ReusedCount	Serial	Longitude	Latitude	Class
0	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	False
1	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	False
2	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	False
3	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	False
4	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	False
...
85	86 2020-09-03	Falcon 9	15400.000000	VLEO	KSC LC 39A	True ASDS	2	True	True	True	5e9e3032383ecb6bb234e7ca	5.0	2	B1060	-80.603956	28.608058	True
86	87 2020-10-06	Falcon 9	15400.000000	VLEO	KSC LC 39A	True ASDS	3	True	True	True	5e9e3032383ecb6bb234e7ca	5.0	2	B1056	-80.603956	28.608058	True
87	88 2020-10-18	Falcon 9	15400.000000	VLEO	KSC LC 39A	True ASDS	6	True	True	True	5e9e3032383ecb6bb234e7ca	5.0	5	B1051	-80.603956	28.608058	True
88	89 2020-10-24	Falcon 9	15400.000000	VLEO	CCAFS SLC 40	True ASDS	3	True	True	True	5e9e3033383ecbb9e534e7cc	5.0	2	B1060	-80.577366	28.561857	True
89	90 2020-11-05	Falcon 9	3681.000000	MEO	CCAFS SLC 40	True ASDS	1	True	False	True	5e9e3032383ecb6bb234e7ca	5.0	0	B1062	-80.577366	28.561857	True

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- <https://github.com/sweetps/datascience-capstone/blob/master/Applied%20Data%20Science%20Capstone%20-%20EDA%20with%20Viz.ipynb>
 - HGD#D Xqghuvwdqg lqj #Gdwd#kurxjk#Ylxdd}dwlrq
 - Vfdwhu#Sarw#Ldj kwQxp ehuyv1Sd|ardgP dwv dqg#ryhuo\|#kh#rxwfrp h#r i#kh#olxqfk#
 - Vfdwhu#Sarw#Ldj kwQxp ehuyv1Odxqfkvlh dqg#ryhuo\|#kh#rxwfrp h#r i#kh#olxqfk#
 - Vfdwhu#Sarw#Sd|ardgP dwv yv1Odxqfkvlh dqg#ryhuo\|#kh#rxwfrp h#r i#kh#olxqfk#
 - Edu#Fkdu#Rue1#y#Vxffhv
 - Vfdwhu#Sarw#Ldj kwQxp ehuyv1Rue1#dqg#ryhuo\|#kh#rxwfrp h#r i#kh#olxqfk#
 - Vfdwhu#Sarw#Sd|ardgP dwv yv1Rue1#dqg#ryhuo\|#kh#rxwfrp h#r i#kh#olxqfk#
 - Olqh#Fkdu#P hdq#Vxffhv#\|#hdu
 - Ihdwkuh#Hqj lqhhuhqj
 - Vhdfwhg#^Rue1#Odxqfkvlh#Odqg lqj Sdg#Vhulda#lk rqh krw\hqfrglqj

HGD# lk VTO

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- <https://github.com/sweetps/datascience-capstone/blob/master/Applied%20Data%20Science%20Capstone%20-%20EDA%20with%20SQL.ipynb>
 - Ordghg#SpaceX DataSet +Fvy,#lqwr#G E5#gdwdedvh
 - Udq#VT O#T xhuhv
 - *Display the names of the unique launch sites in the space mission*
 - *Display 5 records where launch sites begin with the string 'CCA'*
 - *Display the total payload mass carried by boosters launched by NASA (CRS)*
 - *Display average payload mass carried by booster version F9 v1.1*
 - *List the date when the first successful landing outcome in ground pad was achieved.*
 - *List the names of the boosters which have success in drone ship and have payload mass greater than 4000 but less than 6000*
 - *List the total number of successful and failure mission outcomes*
 - *List the names of the booster versions which have carried the maximum payload mass using subquery*
 - *List the failed landing_outcomes in drone ship, their booster versions, and launch site names for in year 2015*
 - *Rank the count of landing outcomes (such as Failure (drone ship) or Success (ground pad)) between the date 2010-06-04 and 2017-03-20, in descending order*

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- <https://github.com/sweetps/datascience-capstone/blob/master/Applied%20Data%20Science%20Capstone%20-%20Folium.ipynb>
 - Fuhdwhg#Irdxp #p dsv#z lk#irorZ bj#renhfW
 - P dunhu#Foxwhu#D xvhg#w#p dun#oxqfkhw#D uhg#idbxuh#j uhq#vxfhvv
 - Flufhv#D xvhg#w#p dun#oxqfk#vvhv
 - OlqhV#D xvhg#w#krz #g lwdqfhv#ehwz hhq#oxqfk#vvhv#dgg#sur{lp lhhv#xfk#dv#uloz d|

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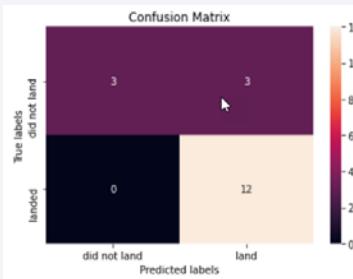
- https://github.com/sweetps/datascience-capstone/blob/main/spacex_dash_appy.py
 - Fuhdwg#lqwhudfwlyh#Sh#Fkduwr i#rwdoqxp ehu rixxflhvix#lxqfkhv# lk#gurs#grz q#dv#wr#vhdfw#lxqfk#vlh
 - Fuhdwg d dqnhg vfdwhu sarw#r#sd |ardgP dvv yv#Vxflhv# lk#srq#franhg#edvhg#rq#errwhu#yhwlrq#fdwhj ru| #Hqdeohg#kvhu#r#vhdfw#kh#dqjh#r#sd |ardg#
 - H{solq#z k |#rx#dgghg#krvh#sarw#dqg#lqwhudfwlrqv
 - Dgg#kh#JlKxe#XUO#r#| rxu#rp sdnwg#Sarw| G dvk#ole #dv#dq#h{whujdtihihhqfh#dqg#shhu#hyhz #sxusrvh
- **Finding Insights Visually**
 - 1.Which site has the largest successful launches? CAFS LC-40
 - 2.Which site has the highest launch success rate? KSC LC-39A
 - 3.Which payload range(s) has the highest launch success rate? 2K-4K
 - 4.Which payload range(s) has the lowest launch success rate? 2K-6K
 - 5.Which F9 Booster version (**v1.0**, **v1.1**, **FT**, **B4**, **B5**, etc.) has the highest launch success rate? **FT**

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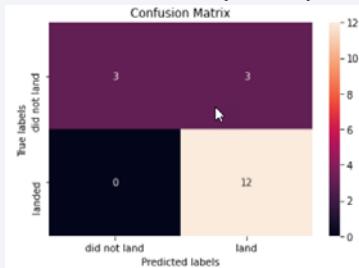
- [datascience-capstone/Applied Data Science Capstone - ML Prediction.ipynb at master · sweetps/datascience-capstone \(github.com\)](#)

- Find best Hyperparameter using **GridSearchCV**

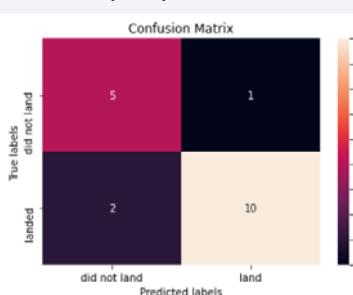
K-Nearest Neighbor (KNN) – score = 0.83



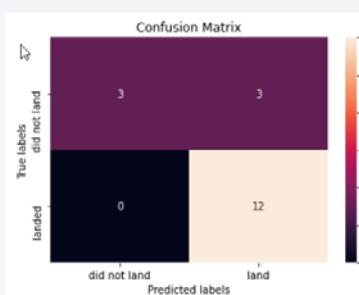
Support Vector Machine (SVM) – score = 0.83



Decision Trees (DT) – score = 0.83



Logistic Regression (LR) – score = 0.83



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- Igwhudfwlyh#dqdd wlfv#ghp r#lq#vfuhhqvkrw
- Odxqfk#Vlhv#Sur {lp lhv#Dqdd vlv
- Suhq lfwlh#dqdd vlv#thvxow

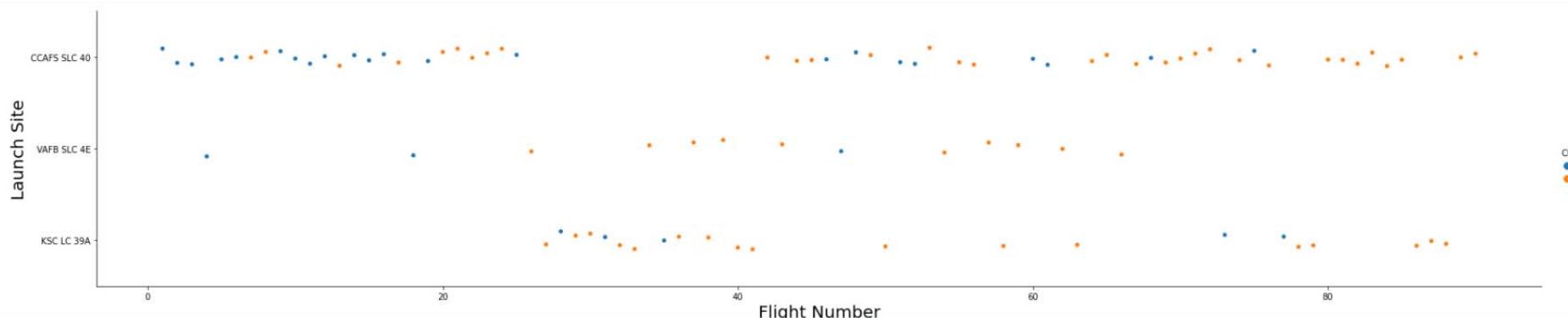
The background of the slide features a dynamic, abstract pattern of glowing lines. These lines are primarily blue and red, with some green and purple accents. They appear to be moving in a three-dimensional space, creating a sense of depth and motion. The lines are thick and have a slight glow, making them stand out against the dark background.

Section 2

Insights drawn from EDA

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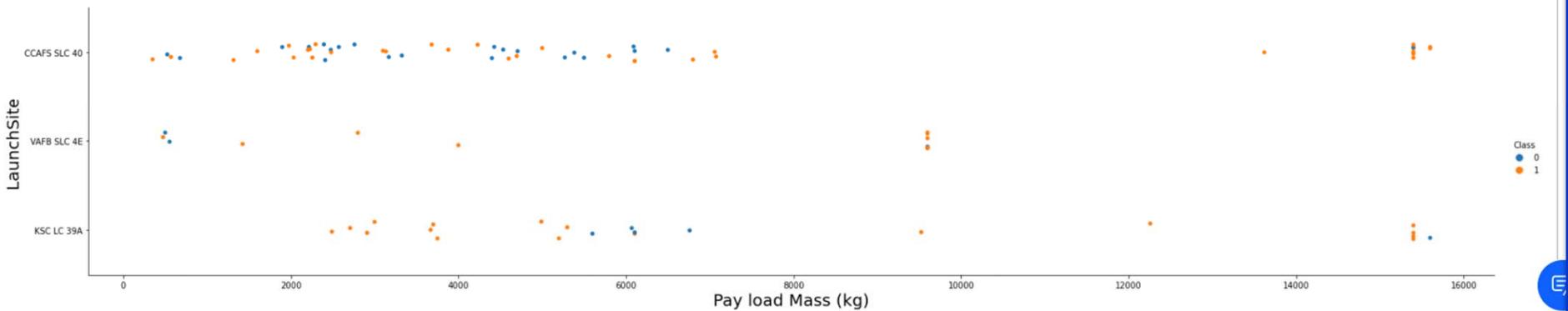
```
# Plot a scatter point chart with x axis to be Flight Number and y axis to be the Launch site, and hue to be the class value
sns.catplot(y="LaunchSite", x="FlightNumber", hue="Class", data=df, aspect = 5)
plt.xlabel("Flight Number", fontsize=20)
plt.ylabel("Launch Site", fontsize=20)
plt.show()
```



- YDIE#VOF#7H#kdg#hz hu#Dxqfkhv#Wkdq#Wkh#rwkhut5#Vlhv#Dqg#Kdv#kdg#hz hu#idloxuhv##
- FFDIV#VOF#73#kdg#p dq | #idloxuhv#hdud #rq1

Sd | ardg#yv#Dxqfk#Vlh

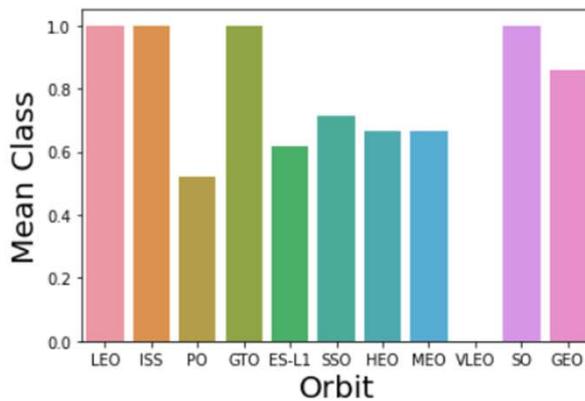
```
# Plot a scatter point chart with x axis to be Pay Load Mass (kg) and y axis to be the Launch site, and hue to be the class value  
sns.catplot(x="PayloadMass", y="LaunchSite", hue="Class", data=df, aspect = 5)  
plt.ylabel("LaunchSite", fontsize=20)  
plt.xlabel("Pay load Mass (kg)", fontsize=20)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



- VAFB SLC 4E has not launched heavy loads.
- CCAFS SLC 40 and KSC LC 39A launched more lighter loads than heavy loads.

Vxffhvv#Jdwh#yv#Ruelw#sh

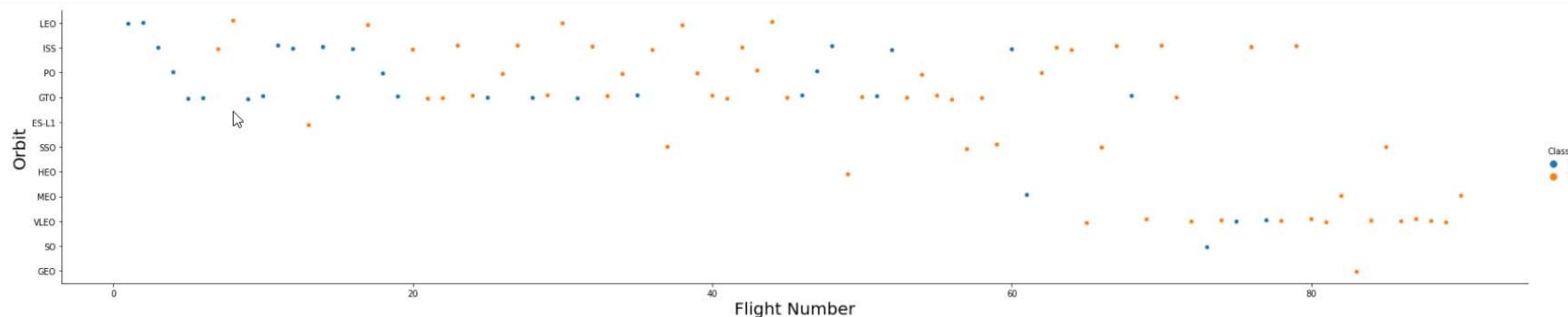
```
# HINT use groupby method on Orbit column and get the mean of Class column
#df.groupby("Orbit").mean(['Class']).plot(kind='bar')
sns.barplot(x = df['Orbit'].unique() , y = df.groupby(['Orbit'])['Class'].mean())
plt.xlabel("Orbit", fontsize=20)
plt.ylabel("Mean Class", fontsize=20)
plt.show()
```



- OHR #Vv#JWR #VR #rulew#okdg#dp hdq#Vxffhvv#folvv,#r#1 B 1#
- SR #rulew#okdg#kh#dp hdq#Vxffhvv

Idj kw#Qxp ehu#yv#Ruelw|sh

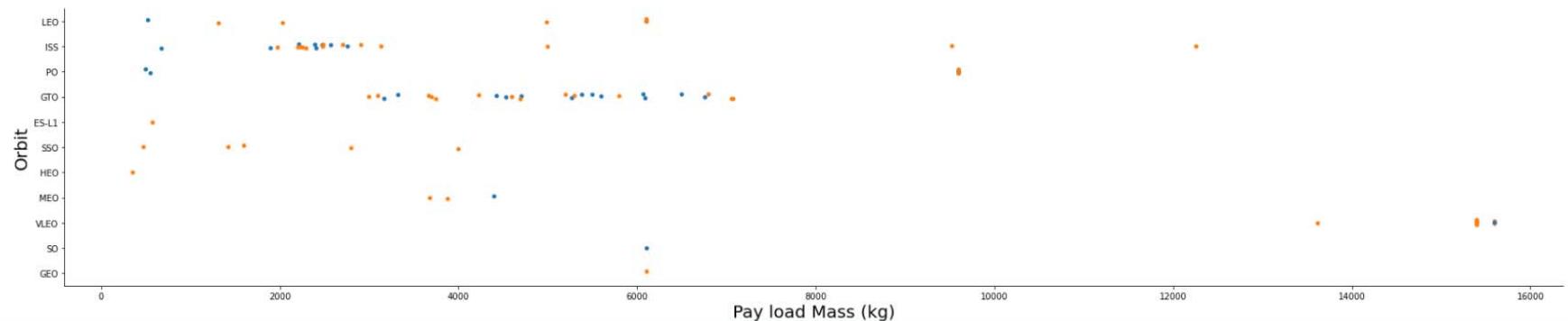
```
# Plot a scatter point chart with x axis to be FlightNumber and y axis to be the Orbit, and hue to be the class value
sns.catplot(y="Orbit", x="FlightNumber", hue="Class", data=df, aspect = 5)
plt.xlabel("Flight Number", fontsize=20)
plt.ylabel("Orbit", fontsize=20)
plt.show()
```



- OHR #ruelw|kh#Vxfhvvtbs shdw#hodhg#r#kh#Qxp ehu#r#idj kw
- Wkhuh#hhp v#r#eh#gr#hodwlrqvkls#ehwz hhq#idj kw#Qxp ehu#z khq#lq#JWR #ruelw

Sd|ardg#yv#RuelwW|sh

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



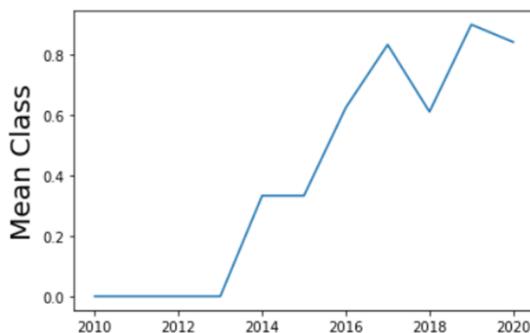
- Khdy| #sd|ardgv#kdyh#d#ghj dwlyh#lqioxhqfh#rq#JWR #ruelw#
- Khdy| #sd|ardgv#kdyh#d#srvlyh#rq#JWR #dqg#Srou#DHR #IVV,#ruelw1

Odxqfk#Vxffhvv#\\hdud #Wuhqg

```
# Plot a Line chart with x axis to be the extracted year and y axis to be the success rate
df['Year'] = pd.DataFrame(Extract_year(df['Date'])).astype('int')
sns.lineplot(x = df['Year'].unique() , y = df.groupby(['Year'])['Class'].mean())
plt.ylabel("Mean Class", fontsize=20)
df.shape
df.head()
```

7]:

	FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcome	Flights	GridFins	Reused	Legs	LandingPad	Block	ReusedCount	Serial	Longitude	Latitude	Class	Year
0	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	2010
1	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	2012
2	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	2013
3	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	2013
4	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	2013



▷

- Wkh#vxfhvvt#dwh#vlfh#5346#rvh#irp #534 : #lvqj #dj dlq#lq#534 ;
- Iq 534 <#kh#vxfhvvt#dwh#ehjdq#r#ghfuhvh#dj dlq

DatDxqfk#Vlh#Qdp hv

```
%%sql
select distinct launch_site from NLM13978.SPACEX
* ibm_db_sa://nlm13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90l08kqb1od81cg.databases.appdomain.cloud:31198/bludb
Done.

5]: launch_site
    CCAFS LC-40
    CCAFS SLC-40
    KSC LC-39A
    VAFB SLC-4E
```

- Xvh#G lwlqfw#vr#ndfk#dxqfk#vlh#lv#lqfoxghg#rqd#rgh#lp h

Odxqfk#Vlh#Qdp hv#Ehj bq#z lk##FFD*

```
%%sql
select LAUNCH_SITE from NLM13978.SPACEX WHERE launch_site like 'CCA%' limit 5
* ibm_db_sa://nlm13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90l08kqb1od8lcg.databases.appdomain.cloud:31198/bludb
Done.

|: launch_site
CCAFS LC-40
CCAFS LC-40
CCAFS LC-40
CCAFS LC-40
CCAFS LC-40
```

- Ibhuh#dxqfkbvvh rq#FFDA#q#z khuh#fdxvh

WrwddSd | ardg#P dvv

```
%%sql
select SUM(PAYLOAD_MASS__KG_) from NLM13978.SPACEX WHERE CUSTOMER='NASA (CRS)'

* ibm_db_sa://nlm13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90108kqb1od8lcg.databases.appdomain.cloud:31198/bludb
Done.

: 1
45596
```

- IbhuhFXVWR P HU#rq#Q DVD #FUV A#q#z khuh#folxvh
- Dj juhjdwh#SD \ OR DG bP DVVbbNJb#xvlqj #VXP

Dyhudjh#Sd|ordg#P dvv#e |#I<#y4 14

```
%%sql
select SUM(PAYLOAD_MASS__KG_)/count(*) from NLM13978.SPACEX WHERE BOOSTER_VERSION='F9 v1.1'
* ibm_db_sa://nlm13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90l08kqb1od8lcg.databases.appdomain.cloud:31198/bludb
Done.

9]: 1
2928
```

- Ibhutrq#ER R VWHU bYHUVIR Q#cq#I<#y4 14 Aq# khuh#f00xvh
- Dj juhj dw#SD \ OR DG bP DVVbbNJb#xvlqj #VXP

Iluw#Vxffhwixg#Jurxqg#Ddqg lqj #G dwh

```
%%sql
select MIN(DATE) from NLM13978.SPACEX WHERE LANDING__OUTCOME='Success'

* ibm_db_sa://nlm13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90l08kqb1od8lcg.databases.appdomain.cloud:31198/bludb
Done.

[]: 1
2018-07-22
```

- Ibhuh#DDQGIQJbbR XWFR P H rq#VxffhwA#lq#z khuh#folxvh
- Ibgg#Iluw#xvlqj #P IQ #ixqfwlrq#rq#G DWH

VxffhvvixdGurqh#Vkl\\$#Ddgg\\$qj # lk\\$d | ardg#ehwz hhq#7333 #dgg#9333

```
%%sql
select BOOSTER_VERSION,PAYLOAD_MASS__KG_,MISSION_OUTCOME from NLM13978.SPACEX WHERE PAYLOAD_MASS__KG_ BETWEEN 4000 AND 6000 AND MISSION_OUTCOME='Success'
* ibm_db_sa://n1m13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90l08kqb1od81cg.databases.appdomain.cloud:31198/bludb
Done.

.]:
```

booster_version	payload_mass_kg_	mission_outcome
F9 v1.1	4535	Success
F9 v1.1 B1011	4428	Success
F9 v1.1 B1014	4159	Success
F9 v1.1 B1016	4707	Success
F9 FT B1020	5271	Success
F9 FT B1022	4696	Success
F9 FT B1026	4600	Success
F9 FT B1030	5600	Success
F9 FT B1021.2	5300	Success
F9 FT B1032.1	5300	Success

- Ibhutrq#SD \OR DG bP DVbbNJb#rq#ehwz hhq#7333 #dgg#9333 #q#z khuh#folxvh
- Dgg#Ibhutrq#P IVVIR QbR XWFR P H#htxdd#Vxffhvvi

WrwdQxp ehuh#Vffhvix#dgg#Idbxuh P lvrlq#R xwfrp hv

```
%%sql
select count(MISSION_OUTCOME) from NLM13978.SPACEX WHERE MISSION_OUTCOME='Success' union select count(MISSION_OUTCOME) from NLM13978.SPACEX WHERE MISSION_OUTCOME<>'Success'

* ibm_db_sa://nlm13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90l08kqb1od8lcg.databases.appdomain.cloud:31198/bludb
Done.

]: 1
2
99
```

- xqlrq#r##ErxqwfP IVVIR QbR XWFR P H#htxdopVffhvwa#dgg#Erxqwf#
P IVVIR QbR XWFR P H#grw#htxdopVffhvwa

Errwhuv#Fduhg#P d{b xp Sd|ardg

```
%%sql
select BOOSTER_VERSION from NLM13978.SPACEX WHERE PAYLOAD_MASS__KG_=(select max(PAYLOAD_MASS__KG_) from NLM13978.SPACEX)
]: 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
```

- VHOHFW ER R VWHUBYHUVIR Q z khuh SD \OR DG bP DVVbbNJb#vkh#p d{#
D \OR DG bP DVVbbNJb#vbj #d#xetxhu|

5 3 4 8 #Dxqfk#Jhfrugv

```
%>sql
select LANDING__OUTCOME, BOOSTER_VERSION, LAUNCH_SITE, MISSION_OUTCOME from NLM13978.SPACEX WHERE LANDING__OUTCOME NOT LIKE 'Success%' AND YEAR(DATE)=2015
* ibm_db_sa://nlm13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90108kqb1od8lcg.databases.appdomain.cloud:31198/bludb
Done.

]: landing__outcome booster_version launch_site mission_outcome
Failure (drone ship) F9 v1.1 B1012 CCAFS LC-40 Success
Controlled (ocean) F9 v1.1 B1013 CCAFS LC-40 Success
No attempt F9 v1.1 B1014 CCAFS LC-40 Success
Failure (drone ship) F9 v1.1 B1015 CCAFS LC-40 Success
No attempt F9 v1.1 B1016 CCAFS LC-40 Success
Precluded (drone ship) F9 v1.1 B1018 CCAFS LC-40 Failure (in flight)
```

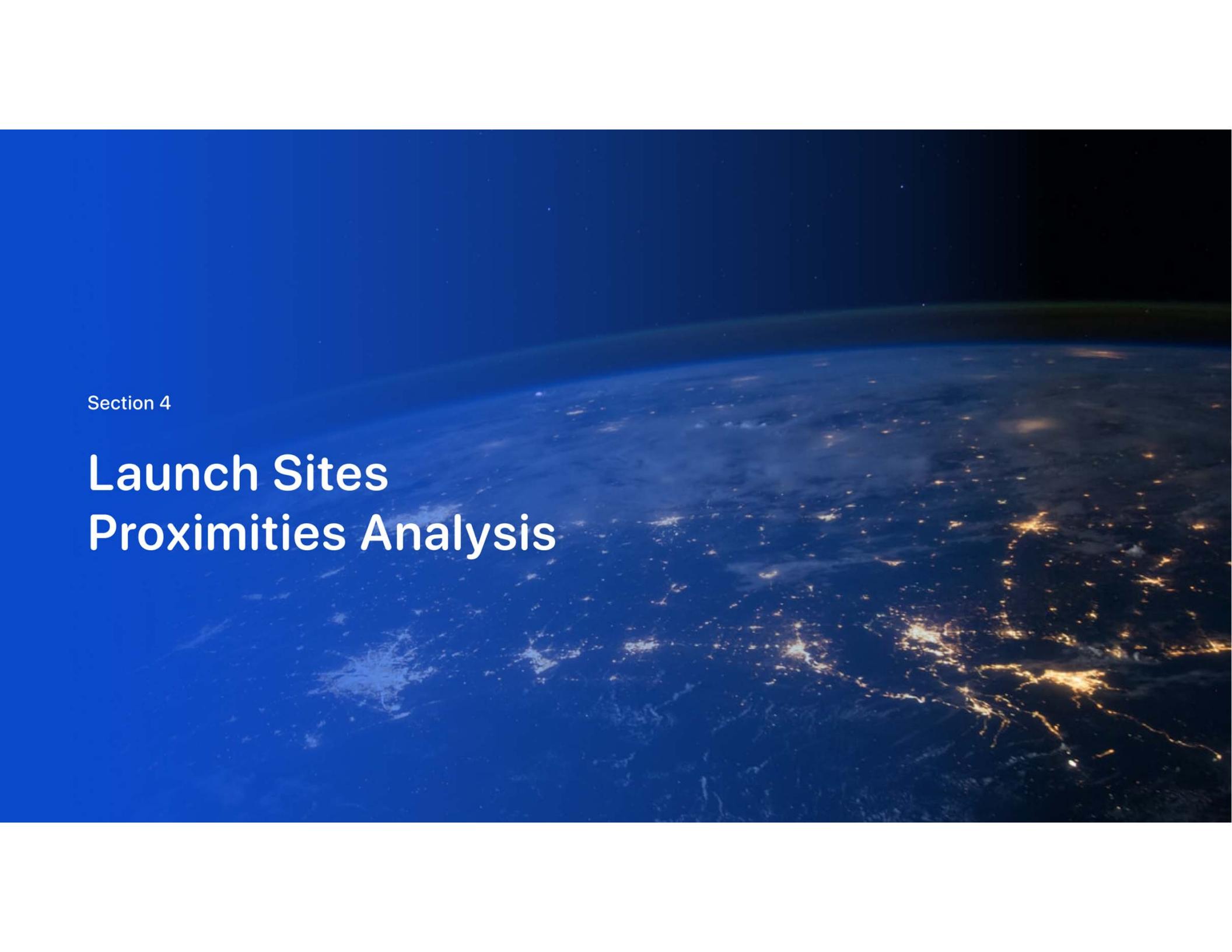
- Ibhuh#hdutrq#5 3 4 8 #Dxqfk#Jhfrugv

Udqnt#Ddggbjj #R xwfrp hv#Ehwz hhq#5343039037#dgg#534 : 036053

```
%sql
select LANDING__OUTCOME,COUNT(LANDING__OUTCOME) from NLM13978.SPACEX GROUP BY LANDING__OUTCOME
* ibm_db_sa://nlm13978:***@0c77d6f2-5da9-48a9-81f8-86b520b87518.bs2io90l08kqb1od81cg.databases.appdomain.cloud:31198/bludb
Done.

]: landing__outcome 2
    Controlled (ocean) 5
        Failure 3
    Failure (drone ship) 5
    Failure (parachute) 2
        No attempt 22
    Precluded (drone ship) 1
        Success 38
    Success (drone ship) 14
    Success (ground pad) 9
    Uncontrolled (ocean) 2
```

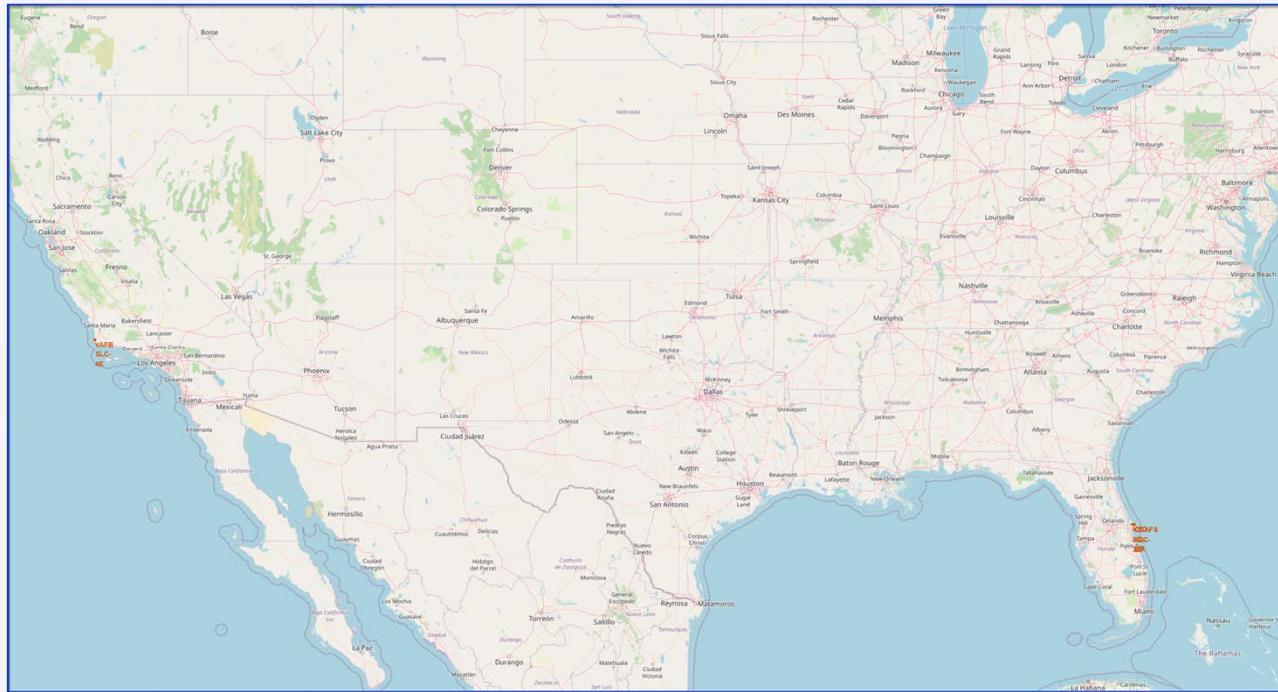
- Ikdgt#r#uhdwh#d#ghz #dffrxqwt#hfdxvh#fh{fhhg#p |#p rqwkj#p l#l#q#ghz #dffrxqwt#dqqrw#j hw#frqqhfwhg#r#ghz #gdwdedvh#dqqrw#fruhfw# #huxq#txhu| #Vkrxoj#eh#tv#irorZ v=
- vhdifw#ODQG IQ JbbR XWFR P H#FR XQW#ODQG IQ JbbR XWFR P H,#urp #QOP 4 6 < : ; VSDFH [# KUH#GDWH#ehwz hhq#9 0
3 7 05 3 4 3 #dgg#6 05 3 05 3 4 : #JUR XS#E \#ODQG IQ JbbR XWFR P H#R UGHU#E \#FR XQW#ODQG IQ JbbR XWFR P H,#G HVF

The background of the slide is a photograph taken from space at night. It shows the curvature of the Earth's horizon against the dark void of space. City lights are visible as numerous small white and yellow dots, primarily concentrated in the lower right quadrant where major urban centers like North America are located. In the upper left quadrant, the green and blue glow of the aurora borealis (Northern Lights) is visible in the atmosphere.

Section 4

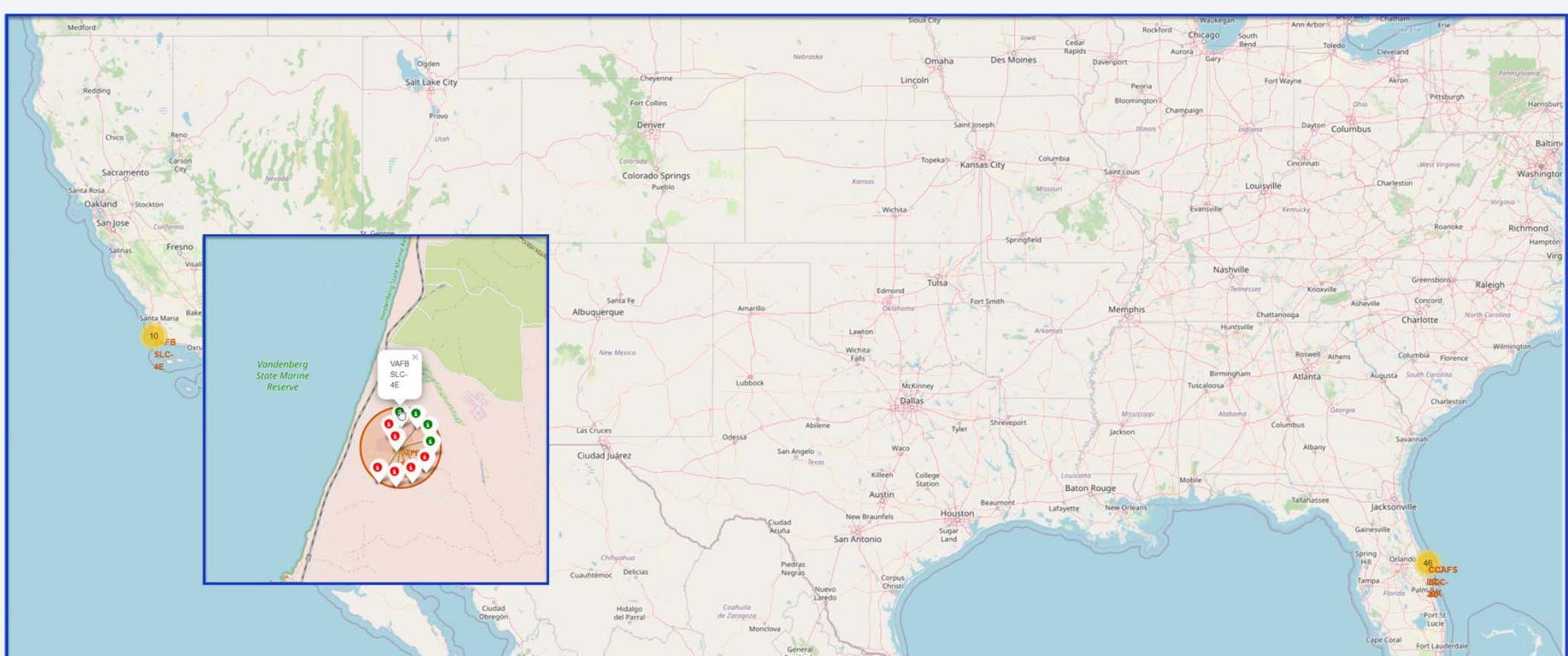
Launch Sites Proximities Analysis

Odxqfk#Vlh#Orfdwlrqv



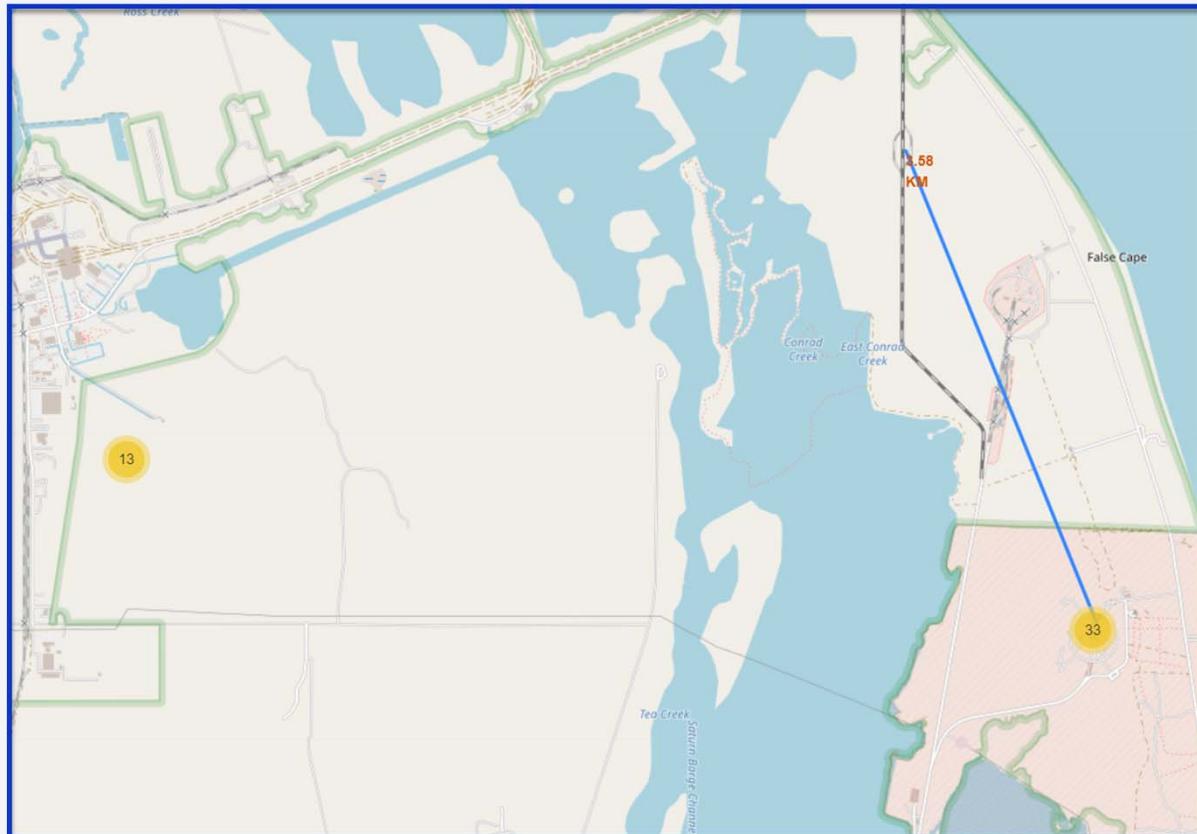
- Odqfk v\hv#kdyh#hhq#p dunhg#rq#p ds#

Odxqfk#Foxwhuv



- Odxqfkhv#dunh#p dunhg#rq#p ds#z lk#Foxwhuv#p dunhu
-] rrp #fq#r#vh#hdfk#oxqfk#p dunhg#z lk#Juhq#vxfhhw,#ru#Jhg#Idb#p dunhu

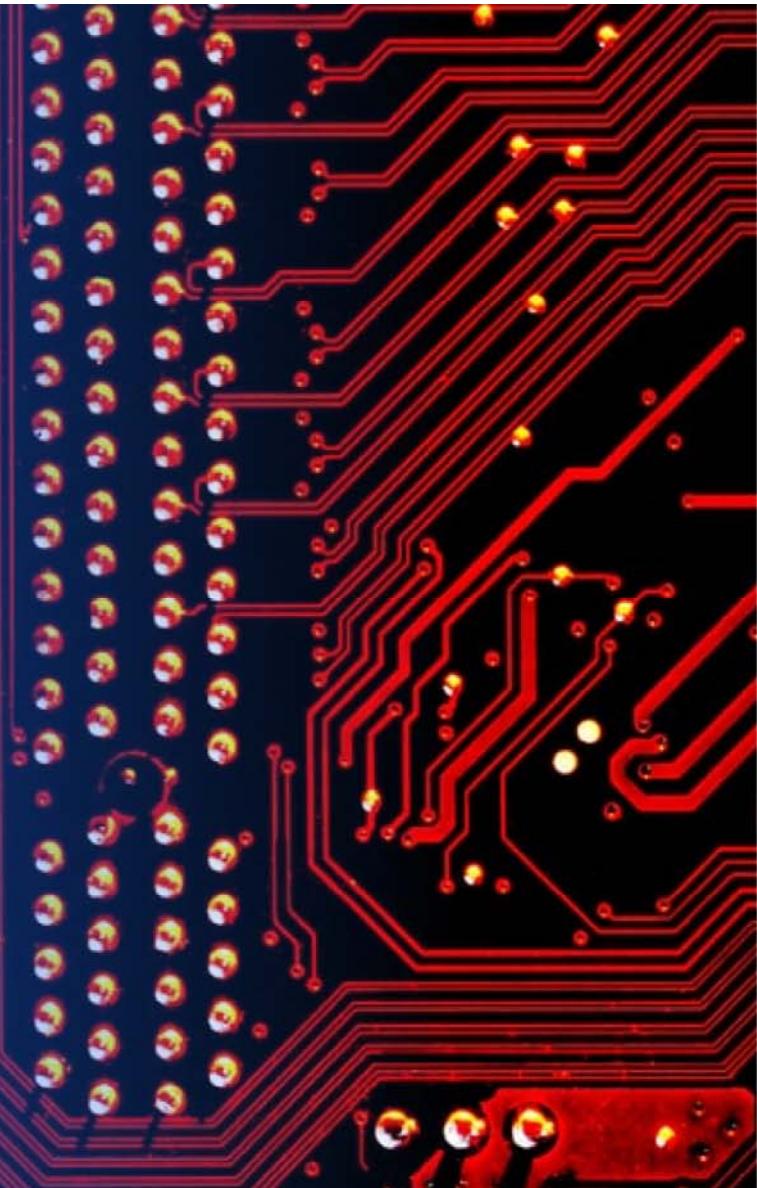
Sorw#G lwdqfhv#Ehwz hhq#d#Ddxqfk#Vlwh#wr#lw#Sur{lp lwhv



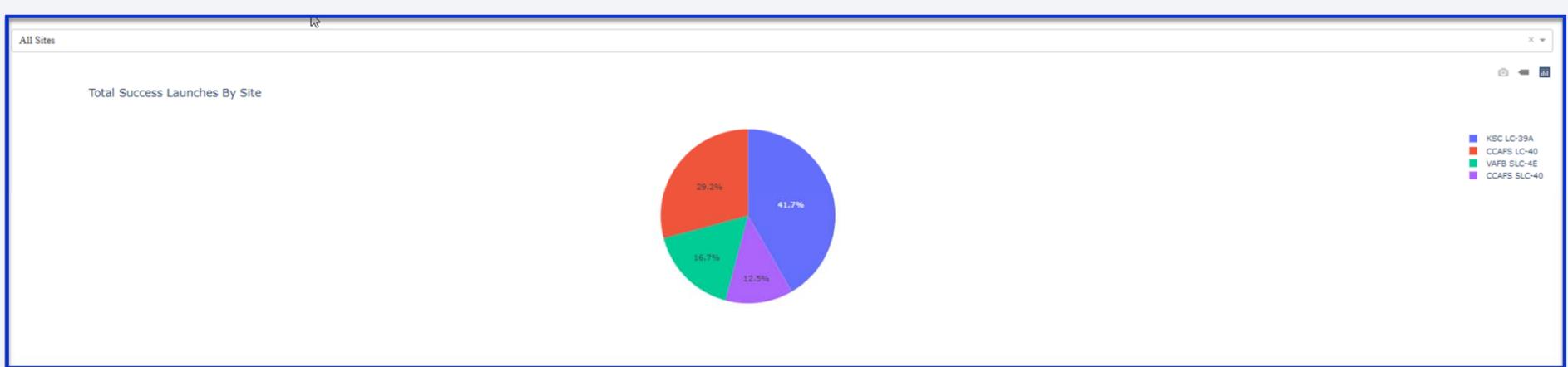
- Olqhvh#fdq#eh#dgghg#wr#krz #g lwdqfhv# ehwz hhq#d#Ddxqfk#Vlwh#lw#Sur{lp lwhv# vxfk#dv#ulcz d| #k1j kz d| #frdw#dqh

Section 5

Build a Dashboard with Plotly Dash

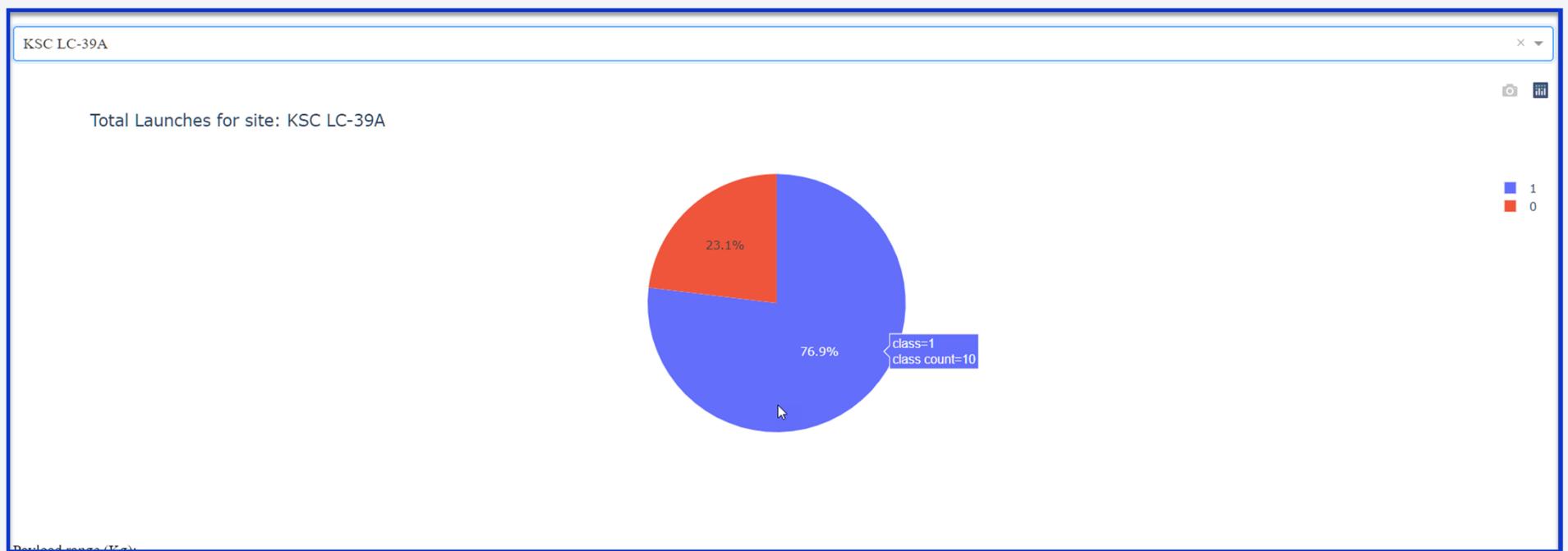


Vxffhv#Jdwh# | #Ddxqfk#Vlh



- NVF#OF06<D#kdv#kh#kjkhv#Vxffhv#Jdwh

Odxqfk Vlh z lk KljkhvwVxffhw Udwr



- NVF#OF 06 < D#kdv#kh#kj khvw#xffhwv#udwr #
- 43 #ri 46 #rfnhw#odxfk hg#z huh#xffhwvixo

Fruhodwlrq#Ehwz hhq#Khdy| #Sd| ardgv#dqg#Vxffhv#



- E7#dqg#IW#duh#kh#khdyhw#sd|ardgv#Wkhuh#kdyh rqd ehhq 6 vxffhvixd#lxqfkhv#
5#IW#dqg#1#E71

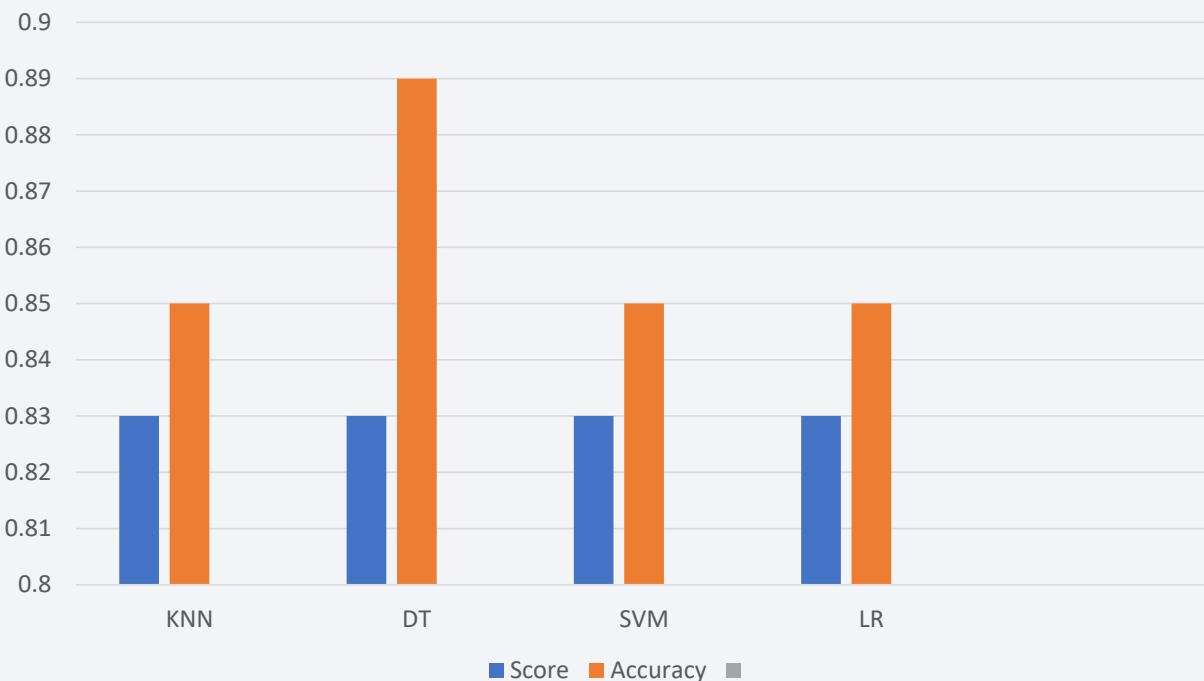
The background of the slide features a dynamic, abstract design. It consists of several curved, overlapping bands of color. The primary colors are shades of blue, transitioning from dark blue on the left to light blue and then white on the right. Interspersed among these blue bands are thin, bright yellow lines that follow the curves of the blue bands. The overall effect is one of motion and depth, suggesting a tunnel or a path through a digital space.

Section 6

Predictive Analysis (Classification)

Foðvvilifdwraq#Diffxudf |

Classification Accuracy



- Edvhg#rq#kh#vfruh#dot#p hwkrgv#shuirup hg#kh#vdp h
- Xvlqj #Diffxudf | #GW#lv#vdj kwj#ehwhut#kdq#kh#rwkhup hwkrgv

Fraqixvlrq#P dwul{# NQQ#hv#Ehw



- NQQ#Fraqixvlrq#P dwul{#hv#kh#ehw#hf dxvh#hv#surylghv#kh#juhdwhu#qxp ehut#bffExudwh#fowlvli lfdwlrqv#iru#hg lg#qrw#olqg#z kbn#wlrq#p lvfowlvli|bj #5#r#kh#olqg#hg
- NQQ fowlvli hg4 8 fruhfw# dv#g g#kh#rwkhut#p hwkrgv#

Frqfoxvrlqv

- Xvlqj P O z h#fdq#suhg lfw#z lk# ; 8 (#dffxudf | #z khwkhu#ru#qrwd#olxqfkA#iluw# vwdjh#errwhu#z lodd#
- J lyhq#kh#kij k#wdnhv#r#p dnlqj #d#edg#ghflvrlq#p ruh#dqddq vlv#wr#ghwhup bjh# xqghu#z klfk#flufxp wdqfhv#kh#p rghov#d#lwr#suhg lfw#xfhvv#dffxudwhq # fkhfnbj#iru#rxwdhuw
- Khdy| #sd| ardgv kdyh kij k idbxuh#dwh dqg vkrxog eh bjhwhg b j z lk#h{whp h fdxwlrq

Dsshqg1{

- G dwd#Fronfwlrq#dgg#Z udqj dqj
 - G dwd#Fronfwlrq#Mks |whuQrwherrn#[kws v-22gdws@wirup Ifaxg1ep Ifrp 2dgddwfv2qrwherrn v2y523 : i56 : gh0f9 : f0767 : 0<7d305<6d3 : h5<7162yhz Bdffhvwbnhq@ee7749edfhn56egd4d7 : 14 : 16 ih8hd6 ; f5ef ; h157 : 8f ; de6f<5fegh335f : 3](#)
 - [kws v-22ds l1vsdfh {gdwd1frp 2y72urfnhw](#)
 - [kws v-22ds l1vsdfh {gdwd1frp 2y720xfksdgv](#)
 - [kws v-22ds l1vsdfh {gdwd1frp 2y72sd |ordgv](#)
 - [kws v-22ds l1vsdfh {gdwd1frp 2y72fruhv](#)
 - [kws v-22ds l1vsdfh {gdwd1frp 2y72sdvw](#)
 - Z he#Vfuds lgj #Mks |whuQrwherrn#[kws v-22gdws@wirup Ifaxg1ep Ifrp 2dgddwfv2qrwherrn v2y52ff4933de07h3 i07d : g0e768079 i5149dneqq2yhz Bdffhvwbnhq@h67 < , d464375d33hd : 73 < 6 < 6 : if4e : 98dq7ffh7673f4 << 6 < h < 6f9 ; 4 edf5967](#)
 - [kws v-22hg1z h1shg1d1ruj z2_2bhg {1sksbwlh@Olvbr1b1dfrgb<bdqgb1dfrgbKhdy|ba0xqfkhv\) r0gl@435 : 9 ; 9 < 55](#)
 - G dwd#Z udqj dqj #Mks |whuQrwherrn#[kws v-22gdws@wirup Ifaxg1ep Ifrp 2dgddwfv2qrwherrn v2y52b9 ; 4 : f : i0f495076f50d36e046f46h ; g < i : 2yhz Bdffhvwbnhq@839h3h8564g3if5 < e3849eeq8g656 ; g5 < : < 7653fe : 65538e176h3f9 : 438](#)
- HGD
 - HGD#Y lxxdd}dwlrq#Mks |whuQrwherrn#[kws v-22gdws@wirup Ifaxg1ep Ifrp 2dgddwfv2qrwherrn v2y52fe694g3d08hh < 079 : 30 ; 6h4076geee : d ; d : 2yhz Bdffhvwbnhq@ff8fg4639 < < d6ie39i556 < 39d ; i : 87e9he8g5 : 7ef54 ; 79e ; 94eiiq < 9i ; 47h](#)
 - HGD#VT O#Mks |whuQrwherrn#[kws v-22gdws@wirup Ifaxg1ep Ifrp 2dgddwfv2qrwherrn v2y52d6 if8e3i093 < 607f5 < 0<6 < g0 ; 5g64e3887gg2yhz Bdffhvwbnhq@8h54h86 < h88 i5796f : d5597g : 77 ; 75 : e ; h < d56 : < 4f4h : e85e33df78geh97654](#)
- [Spacex DataSet](#)

Dsshqg1{

- **Launch Sites Locations Analysis with Folium**

- `!rdxpl #P ds#Mks |whuQrwherrn##0 kws v=22gdws@wirup 1forxg1ep 1frp 2dgddwifv2grwherrnv2y52; f: e8f4hof; hg076 iioigj0 g8g5f7:36jei2ylhz Bdffhvvbwnhg@<16g5755; i:e5d46hdh; f7:e88d9e6eg4i37hgh; 4<9d37<5947e3h<4h<6h89d;`

- **Interactive Dashboard with Plotly Dash**

- https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-DS0321EN-SkillsNetwork/datasets/spacex_launch_dash.csv

- **P O#Suhg1fwtrg**

- `P O#Suhg1fwtrg#Mks |whuQrwherrn##0 kws v=22hx0h1gdws@wirup 1forxg1ep 1frp 2dgddwifv2grwherrnv2y5238i689<0gd4407;490e1740 56;7:3e353972ylhz Bdffhvvbwnhg@34gef6h3<7;777h;7:<:7e8388e78dhh55e:3i:ieg;8ghidhe9fef75gi4:;g`

Thank you!

