

# Space Missions Analysis

Detailed analysis of space companies and their history of launches to determine the best company for our mission.



**Nabijonov Kamoliddin**

22.01.2022

# Our Agenda

All stages of our presentation:

01

## Task description

The goal of research

02

## Data

Data loading and  
pre-processing

03

## Analysis

Data analysis and  
result visualization

04

## Conclusion

Answer to the main  
question

05

## Q&A

Q&A with the mentor

# Task description

Detailed analysis of space companies and their history of launches to determine the best company for our mission.

**TASK:** Find space company that will get the contract to launch our company's satellite into the orbit successfully and as cheap as possible.



Find public dataset of launch history



Analyze data and answer the questions



Find best performing candidate company



Prepare and offer the contract to the winner company

# Data

Dataset, Pre-processing and Final database model.



Dataset

## All Space Missions from 1957

by Agirlcoding

a year ago • 103 kB • 364

All [Space](#) Missions from 1957

**URL:** <https://www.kaggle.com/agirlcoding/all-space-missions-from-1957>

### Usage Information

License

Unknown

Visibility

Public

### Provenance

Sources

<https://nextspaceflight.com/launches/past/?page=1>

Collection methodology

BeautifulSoup

### Maintainers

Dataset owner



Agirlcoding

### Updates

Expected update frequency

Monthly

Last updated

2020-08-13

Date created

2020-08-13

Current version

Version 6

### Date Coverage

Temporal coverage

1957-10-03 to 2020-08-13

## Description:

Initial dataset is in .csv (comma separated values) format and of size 103 kB.

File consists of 4323 unique records with 8 columns. 5 of them are categorical, 1 of date type and 1 of numerical.





# Data

Dataset ( from 1957 to 2020 )



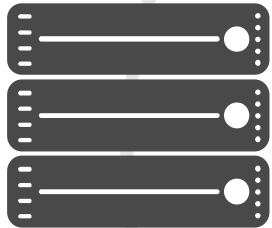
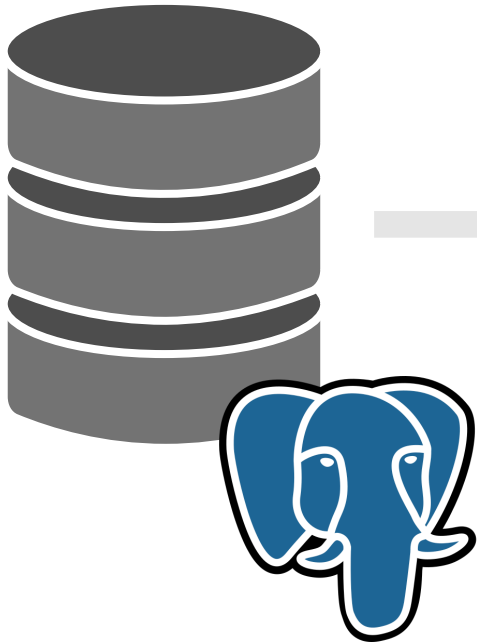
Unnamed: 0 ▼	Company Name ▼	Location ▼	Datum ▼	Detail ▼	Status Rocket ▼	Rocket ▼	Status Mission ▼
0	SpaceX	LC-39A, Kennedy Space Center, Florida, USA	Fri Aug 07, 2020 05:12 UTC	Falcon 9 Block 5   Pers	StatusActive	50	Success
1	CASC	Site 9401 (SLS-2), Jiuquan Satellite Launch Center, China	Thu Aug 06, 2020 04:01 UTC	Long March 2D   C	StatusActive	29.75	Success
2	SpaceX	Pad A, Boca Chica, Texas, USA	Tue Aug 04, 2020 23:57 UTC	Starship Prototyp	StatusActive		Success
3	Roscosmos	Site 200/39, Baikonur Cosmodrome, Kazakhstan	Thu Jul 30, 2020 21:25 UTC	Proton-M/Briz-M	StatusActive	65	Success
4	ULA	SLC-41, Cape Canaveral AFS, Florida, USA	Thu Jul 30, 2020 11:50 UTC	Atlas V 541   Pers	StatusActive	145	Success
5	CASC	LC-9, Taiyuan Satellite Launch Center, China	Sat Jul 25, 2020 03:13 UTC	Long March 4B   2	StatusActive	64.68	Success
6	Roscosmos	Site 31/6, Baikonur Cosmodrome, Kazakhstan	Thu Jul 23, 2020 14:26 UTC	Soyuz 2.1a   Progr	StatusActive	48.5	Success
7	CASC	LC-101, Wenchang Satellite Launch Center, China	Thu Jul 23, 2020 04:41 UTC	Long March 5   Ti	StatusActive		Success
8	SpaceX	SLC-40, Cape Canaveral AFS, Florida, USA	Mon Jul 20, 2020 21:30 UTC	Falcon 9 Block 5	StatusActive	50	Success
9	JAXA	LA-Y1, Tanegashima Space Center, Japan	Sun Jul 19, 2020 21:58 UTC	H-IIA 202   Hope I	StatusActive	90	Success
10	Northrop	LP-0B, Wallops Flight Facility, Virginia, USA	Wed Jul 15, 2020 13:46 UTC	Minotaur IV   NRO	StatusActive	46	Success
11	ExPace	Site 95, Jiuquan Satellite Launch Center, China	Fri Jul 10, 2020 04:17 UTC	Kuaizhou 11   Jilin	StatusActive	28.3	Failure
12	CASC	LC-3, Xichang Satellite Launch Center, China	Thu Jul 09, 2020 12:11 UTC	Long March 3B/E	StatusActive	29.15	Success
13	IAI	Pad 1, Palmachim Airbase, Israel	Mon Jul 06, 2020 01:00 UTC	Shavit-2   Ofek-16	StatusActive		Success
14	CASC	Site 9401 (SLS-2), Jiuquan Satellite Launch Center, China	Sat Jul 04, 2020 23:44 UTC	Long March 2D   S	StatusActive	29.75	Success
15	Rocket Lab	Rocket Lab LC-1A, Mahia Peninsula, New Zealand	Sat Jul 04, 2020 21:19 UTC	Electron/Curie   P	StatusActive	7.5	Failure
16	CASC	LC-9, Taiyuan Satellite Launch Center, China	Fri Jul 03, 2020 03:10 UTC	Long March 4B   C	StatusActive	64.68	Success
17	SpaceX	SLC-40, Cape Canaveral AFS, Florida, USA	Tue Jun 30, 2020 20:10 UTC	Falcon 9 Block 5	StatusActive	50	Success
18	CASC	LC-2, Xichang Satellite Launch Center, China	Tue Jun 23, 2020 01:43 UTC	Long March 3B/E	StatusActive	29.15	Success
19	CASC	Site 9401 (SLS-2), Jiuquan Satellite Launch Center, China	Wed Jun 17, 2020 07:19 UTC	Long March 2D   C	StatusActive	29.75	Success
20	SpaceX	SLC-40, Cape Canaveral AFS, Florida, USA	Sat Jun 13, 2020 09:21 UTC	Falcon 9 Block 5	StatusActive	50	Success

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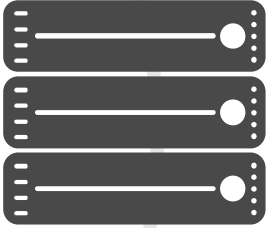


### Load csv into Postgres

Used DataGrip's data import wizard



Null values  
Wrong values  
Outliers



company
company_id integer
company varchar
created_at date

company\_id

mission
mission_id integer
status varchar(20)
mission_date date
cost numeric
company_id integer
mission_location_id integer
rocket_id integer

mission\_location\_id

mission_location
mission_location_id integer
mission_location varchar
created_at date

rocket
rocket_id integer
rocket varchar
created_at date
is_rocket_active boolean

rocket\_id

### company (dimension table)

owners of the rockets

### rocket (dimension table )

rocket models in dataset and whether the rocket is active or not

### mission\_location (dimension table)

location where rockets, where launched from

### mission (fact table)

launch data with all references to dimension tables.



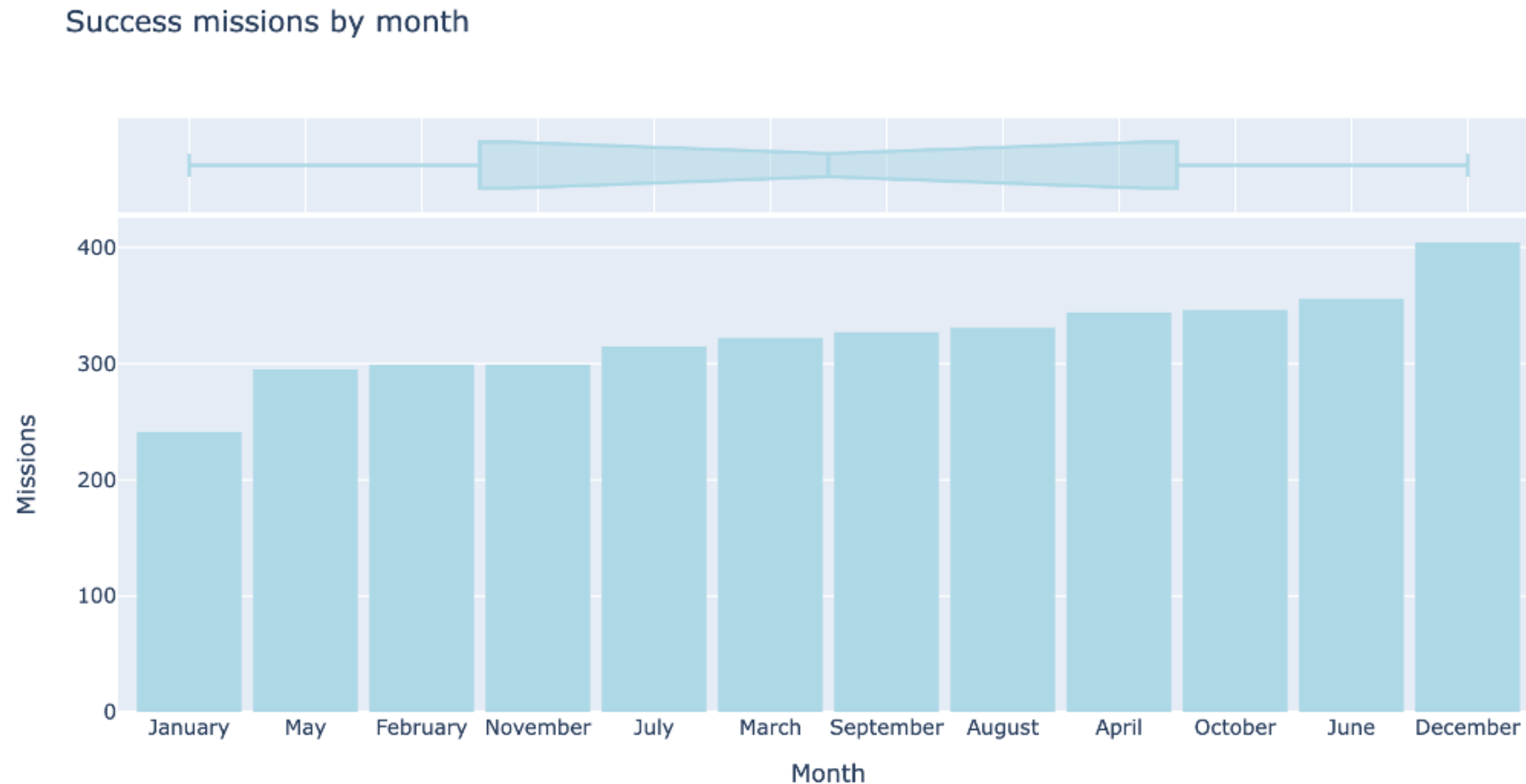
# Data analysis

IN WHICH MONTH THE LAUNCH HAS HIGHEST POSSIBILITY TO SUCCEED ?

	month	total_success_missions	total_missions	percentage
0	January	241	3879	6.21
1	May	295	3879	7.61
2	February	299	3879	7.71
3	November	299	3879	7.71
4	July	315	3879	8.12

# Data analysis

IN WHICH MONTH THE LAUNCH HAS HIGHEST POSSIBILITY TO SUCCEED ?



## RESULT:

We can clearly see that we should schedule our launch to December as it will have the highest chance to succeed.



# Data analysis

TOP 10 COMPANIES BY NUMBER OF LAUNCHES:

	company	status	total_missions_by_status	total_missions_by_company
0	RVSN USSR	Failure	121	1777
1	RVSN USSR	Prelaunch Failure	1	1777
2	RVSN USSR	Partial Failure	41	1777
3	RVSN USSR	Success	1614	1777
4	Arianespace	Partial Failure	3	279

# Data analysis

TOP 10 COMPANIES BY NUMBER OF LAUNCHES:

# of missions by company



## RESULT:

We can see that we have 10 companies as RVSN USSR with 1777 launches (highest) and Martin Marietta with 114 launches (lowest).

# Data analysis

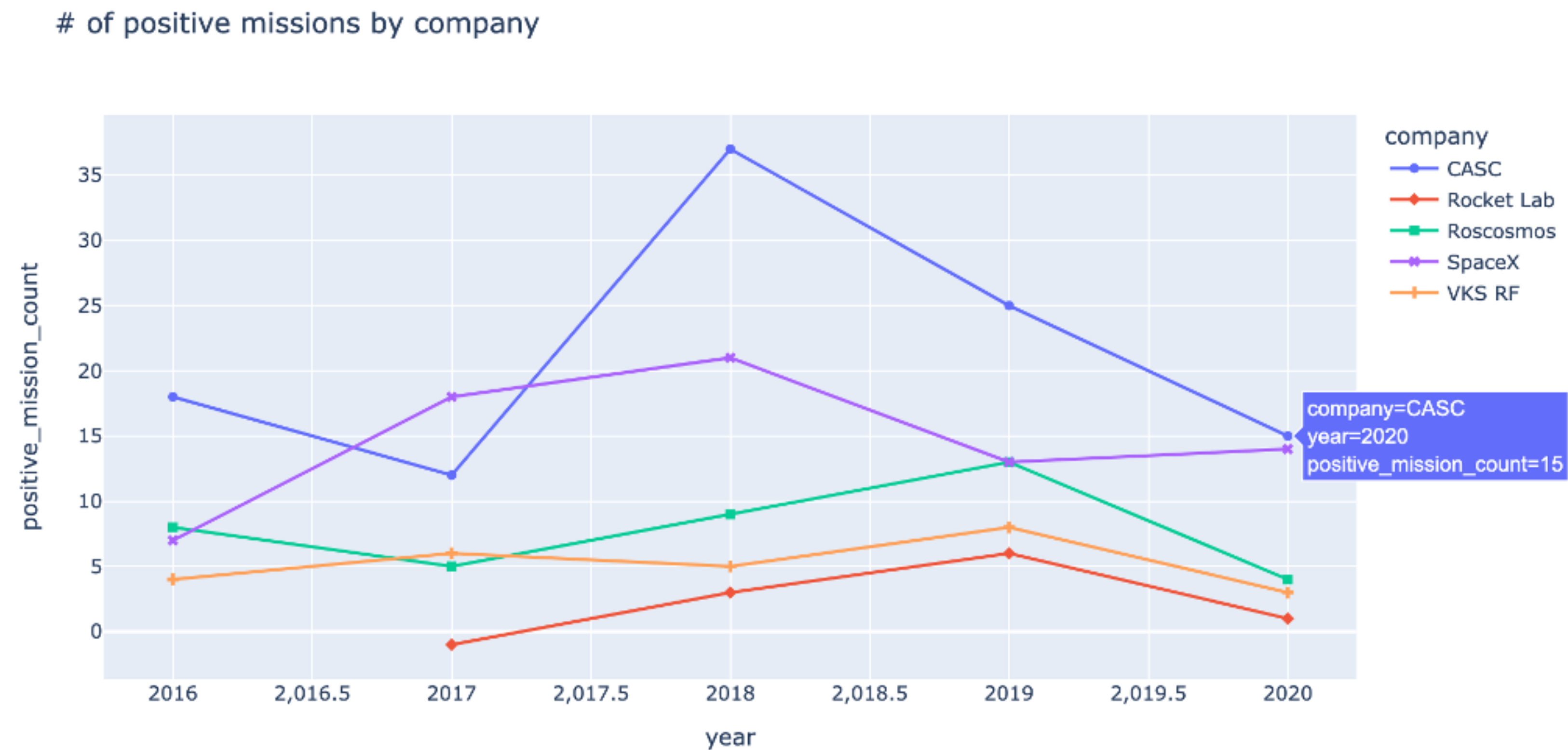
TOP COMPANIES BY YEARLY INCREASE IN MISSION COUNT IN 5 YEAR PERIOD:

**positive\_mission\_count:** `successful_missions - failed_missions`  
**change\_from\_first\_year:** `successful_missions (current_year) - successful_missions (first_year in group)`  
**total\_increase:** `total increase in 5 years period`

	year	company	positive_mission_count	change_from_first_year	total_increase
0	2016	CASC	18	16	97
1	2017	CASC	12	10	97
2	2018	CASC	37	35	97
3	2019	CASC	25	23	97
4	2020	CASC	15	13	97

# Data analysis

TOP COMPANIES BY YEARLY INCREASE IN MISSION COUNT IN 5 YEAR PERIOD:



## RESULT:

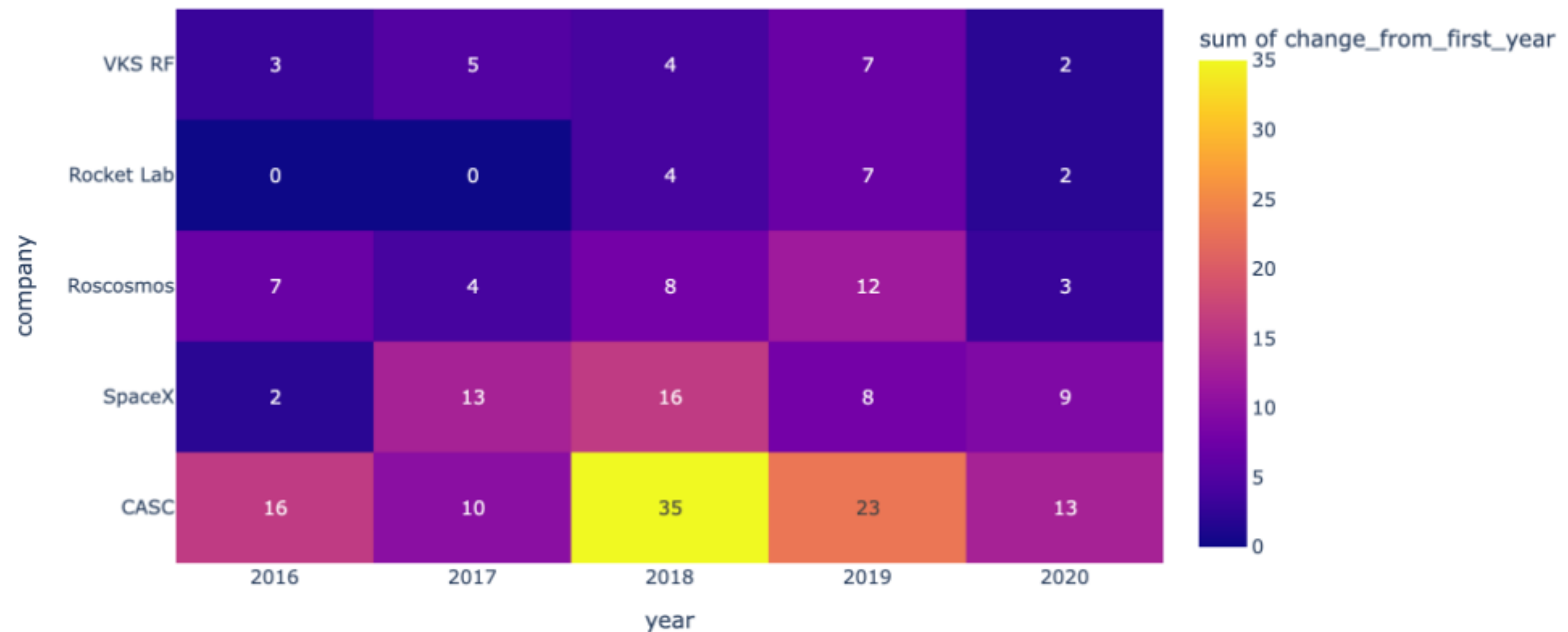
From line chart we can see that CASC and Space X both have highest positive launch history. In addition, Space X in 2020 approaches CASC and has positive slope that indicates rise of performance.



# Data analysis

TOP COMPANIES BY YEARLY INCREASE IN MISSION COUNT IN 5 YEAR PERIOD:

year vs change in positive mission count



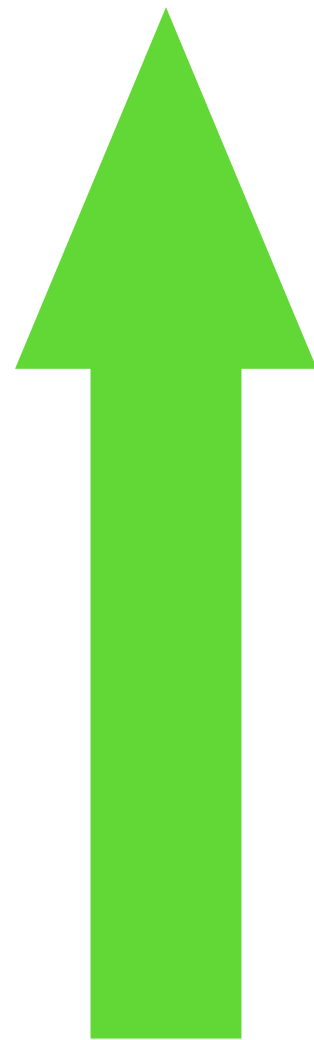
## RESULT:

Heatmap we see that again CASC and Space X both have the highest increase from 2016 in positive launch counts reaching 13 and 9 respectively.

# Data analysis

TOP COMPANIES BY YEARLY INCREASE IN MISSION COUNT IN 5 YEAR PERIOD:

SPACEX



yearly  
change  
rate



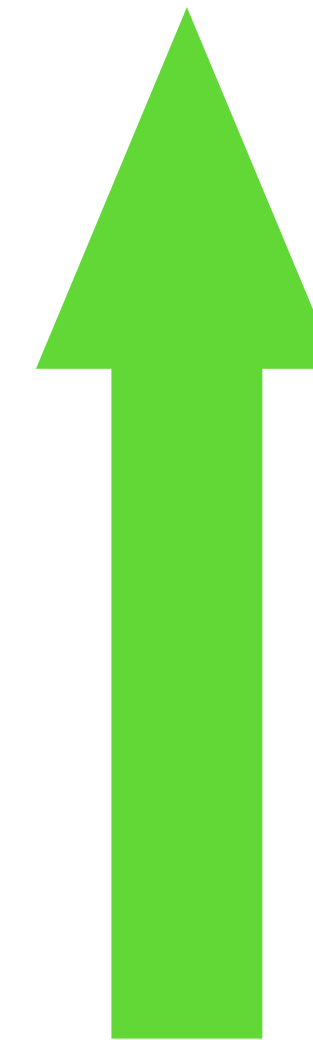
Total  
increase in  
5 years

## RESULT:

Based on results above, I have decided to consider only Space X and CASC (China Aerospace Science and Technology Corporation) for further analysis.



yearly  
change  
rate



Total  
increase in  
5 years



CHINA AEROSPACE SCIENCE AND TECHNOLOGY  
CORPORATION (CASC)

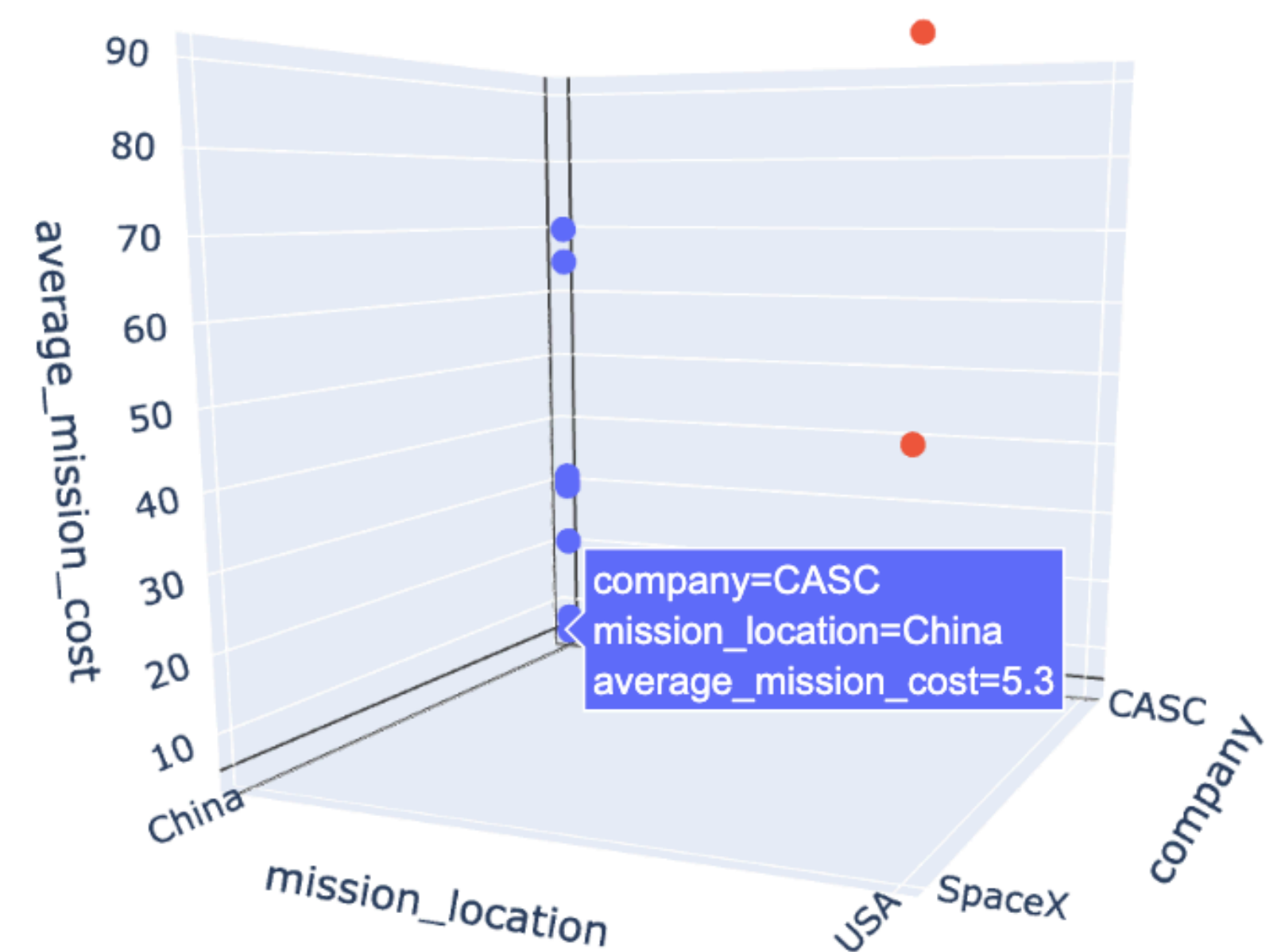
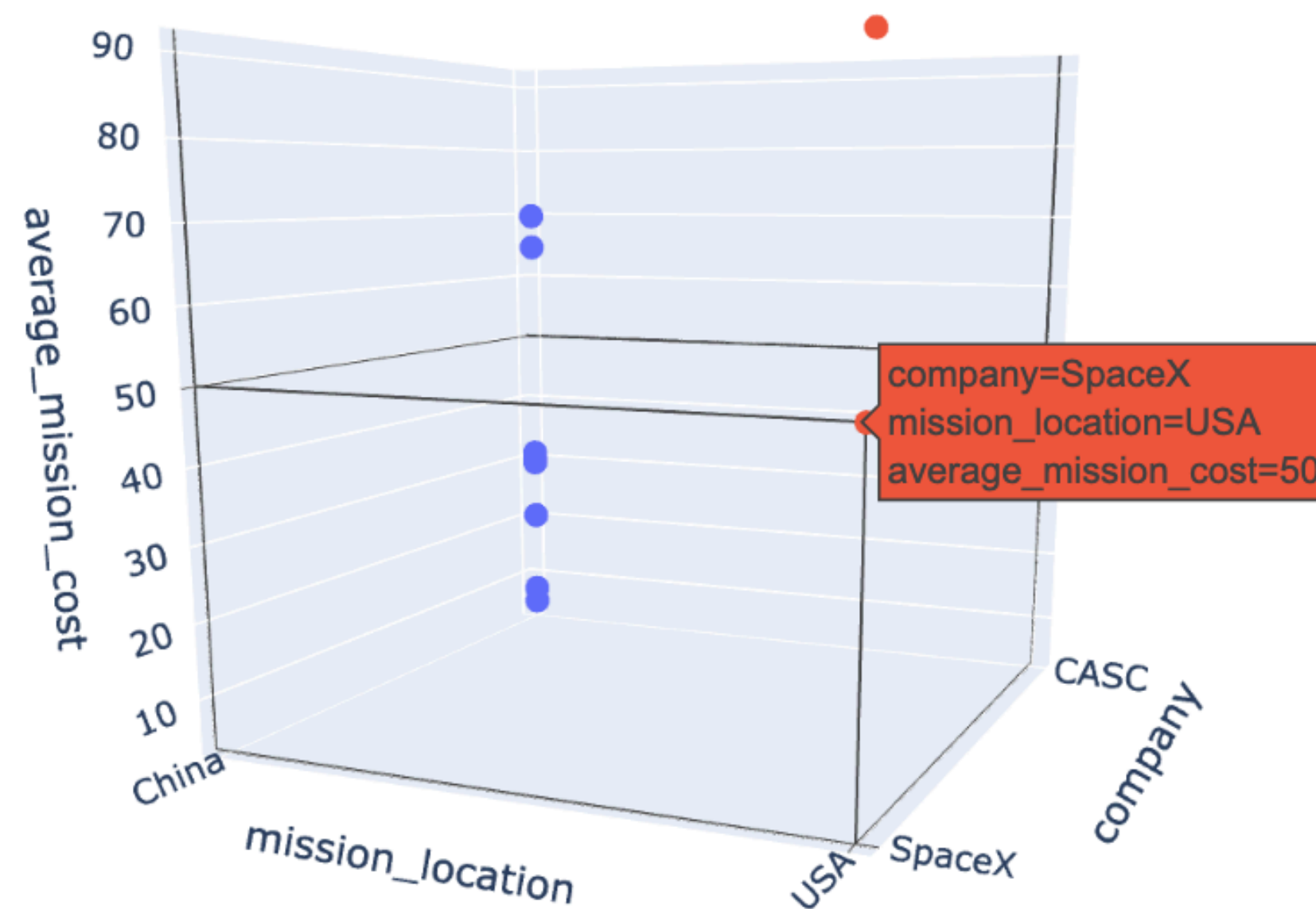
# Data analysis

MISSION COST FOR SpaceX AND CASC:

	company	mission_location	year	rocket	average_mission_cost
0	CASC	China	1982	Long March 2C	30.800000000000000000
1	CASC	China	1983	Long March 2C	30.800000000000000000
2	CASC	China	1984	Long March 2C	30.800000000000000000
3	CASC	China	1985	Long March 2C	30.800000000000000000
4	CASC	China	1986	Long March 2C	30.800000000000000000

# Data analysis

MISSION **COST** FOR **SpaceX** AND **CASC** (LOCATION):



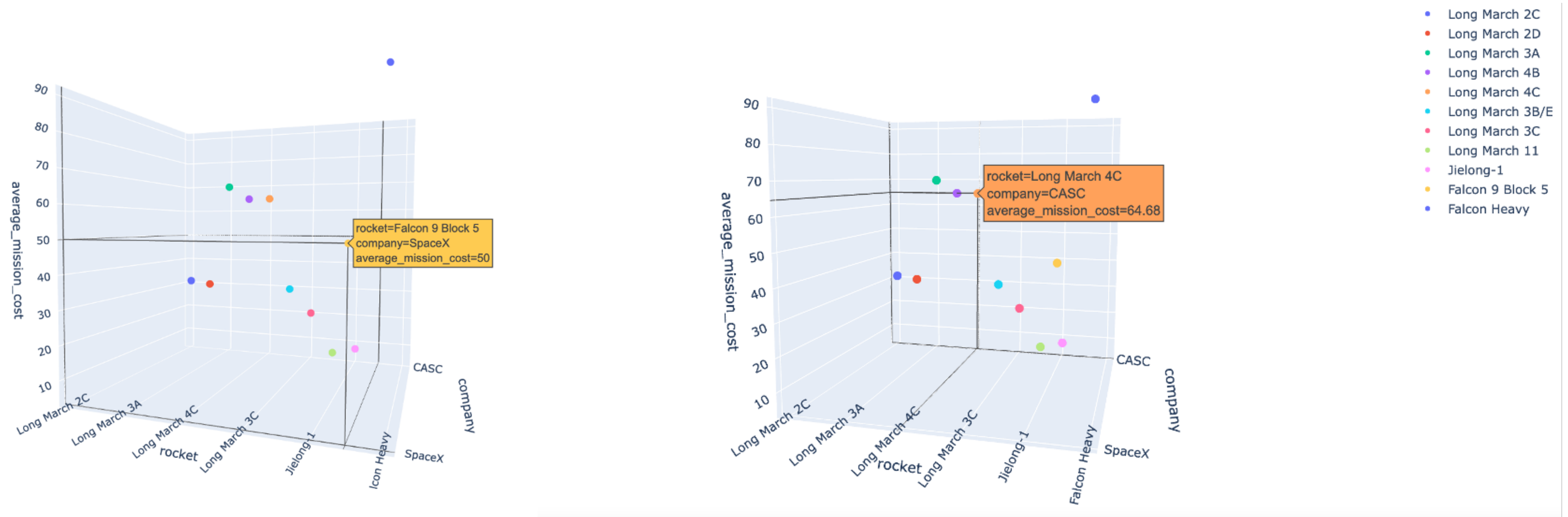
## RESULT:

From above 3d scatter plots we can see that we have two option in terms of country namely China and USA. As we are located in Uzbekistan, it seems that China is a good option for us in terms of logistics. It's costly to transfer our payload to USA.



# Data analysis

MISSION COST FOR SpaceX AND CASC (LOCATION):



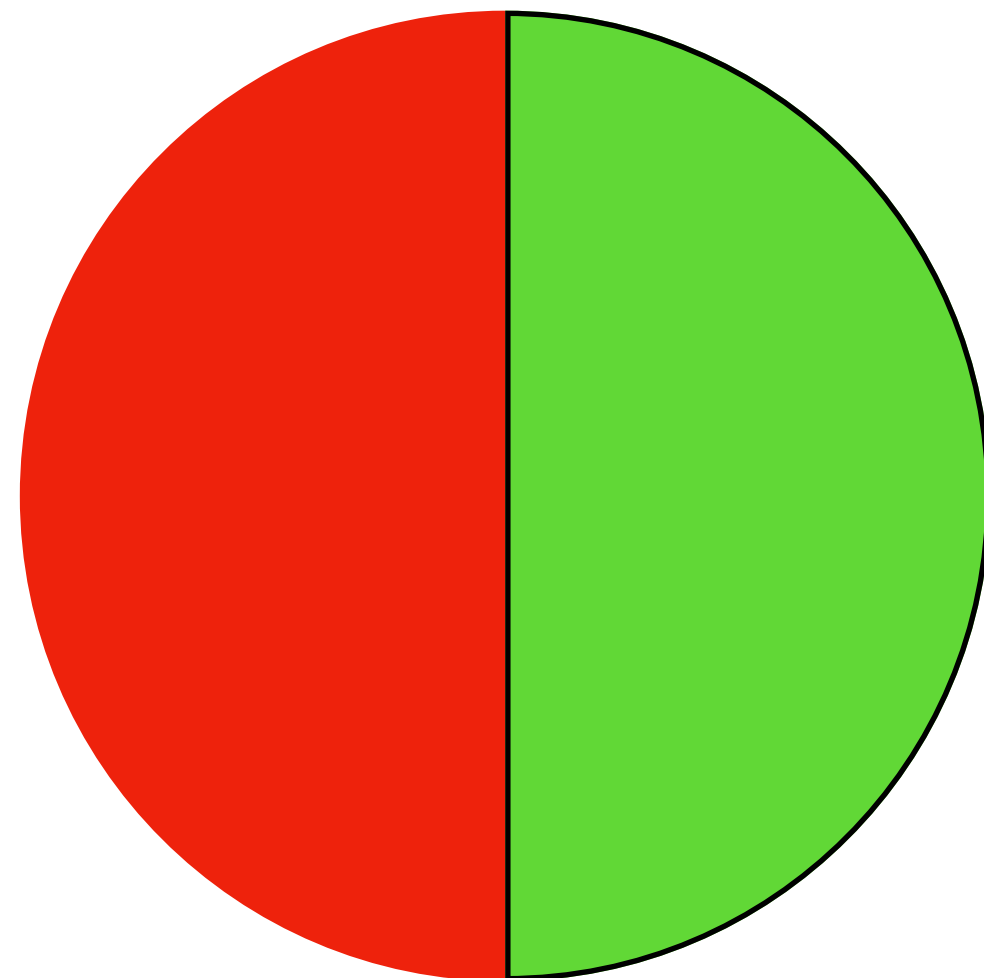
## RESULT:

However, In terms of rockets and overall cost, Falcon 9 by Space X is a best option in terms of price (50 millions) compared to Long March 4C and 4B (64.88 millions). I am comparing only these to rockets because they are all in the same class and are best suited for our task.

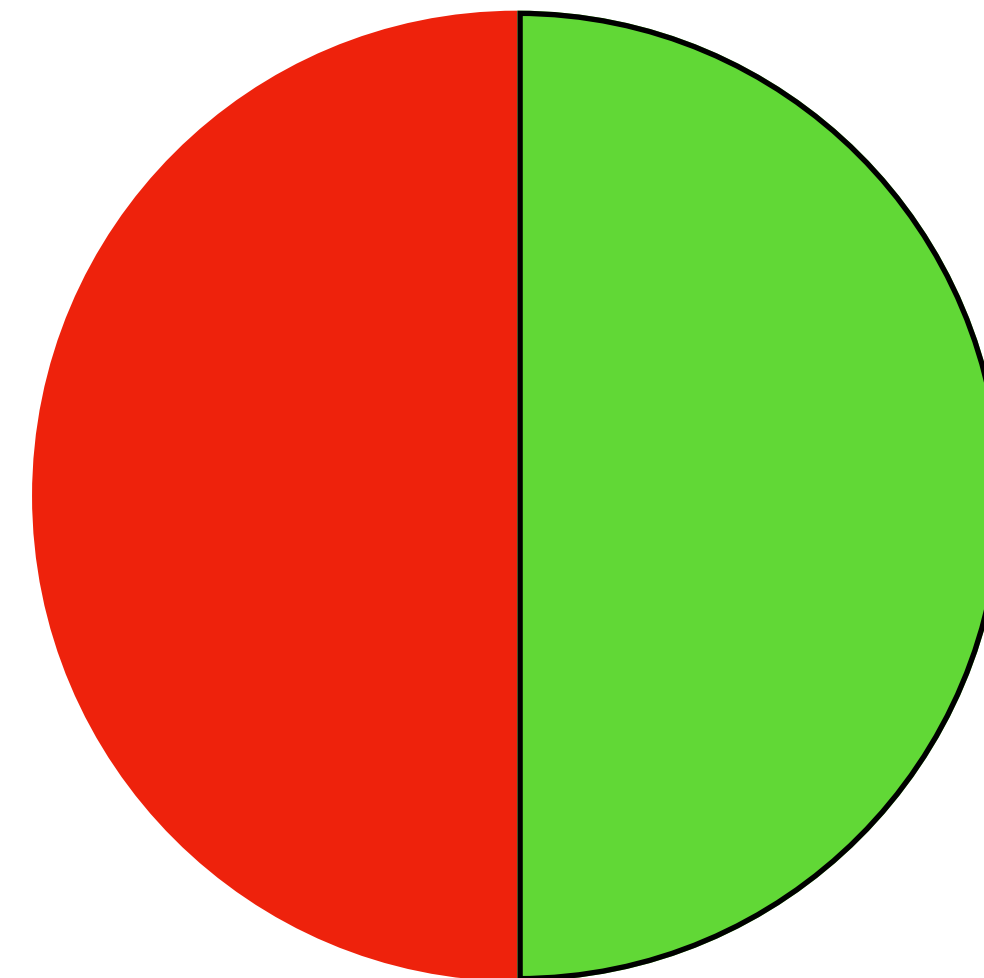
# Summary

Overall stats of each company

SPACEX



VS



CHINA AEROSPACE SCIENCE AND TECHNOLOGY  
CORPORATION (CASC)

YEARLY GROWTH

TOTAL GROWTH

LOCATION

ROCKETS \$

YEARLY GROWTH

TOTAL GROWTH

LOCATION

ROCKETS \$

# Conclusion

Based on above research and analysis, we pointed our 2 companies for our mission. They both have 2 advantages and 2 disadvantages in 4 main metrics.

However, our main goal was to complete the mission with lowest spendings as possible. Based on above analysis, the company that will get the contract is SpaceX.



# Space Missions Analysis



**Nabijonov Kamoliddin**

22.01.2022