



Assignment: SQL Notebook for Peer Assignment

Estimated time needed: **60** minutes.

Introduction

Using this Python notebook you will:

1. Understand the SpaceX DataSet
2. Load the dataset into the corresponding table in a Db2 database
3. Execute SQL queries to answer assignment questions

Overview of the DataSet

SpaceX has gained worldwide attention for a series of historic milestones.

It is the only private company ever to return a spacecraft from low-earth orbit, which it first accomplished in December 2010. SpaceX advertises Falcon 9 rocket launches on its website with a cost of 62 million dollars whereas other providers cost upward of 165 million dollars each, much of the savings is because Space X 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.

This dataset includes a record for each payload carried during a SpaceX mission into outer space.

Download the datasets

This assignment requires you to load the spacex dataset.

In many cases the dataset to be analyzed is available as a .CSV (comma separated values) file, perhaps on the internet. Click on the link below to download and save the dataset (.CSV file):

Spacex DataSet

```
In [1]: !pip install sqlalchemy==1.3.9
```

Collecting sqlalchemy==1.3.9

Downloading SQLAlchemy-1.3.9.tar.gz (6.0 MB)

00  6.0/6.0 MB 78.9 MB/s eta 0:00:

Preparing metadata (setup.py) ... one

Building wheels for collected packages: sqlalchemy

Building wheel for sqlalchemy (setup.py) ..done

Created wheel for sqlalchemy: filename=SQLAlchemy-1.3.9-cp312-cp312-linux_x86_64.whl size=1160111 sha256=4aaa09e5a94f3cf8e40282814827de7a830427b2141b88828a812bae30b3ee10

Stored in directory: /home/jupyterlab/.cache/pip/wheels/b3/1c/42/0e26b8d512adc6bce10ff71a05229366b4ccec641cd3b42111

Successfully built sqlalchemy

Installing collected packages: sqlalchemy

Attempting uninstall: sqlalchemy

Found existing installation: SQLAlchemy 2.0.37

Uninstalling SQLAlchemy-2.0.37:

Successfully uninstalled SQLAlchemy-2.0.37

ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source of the following dependency conflicts.

jupyterhub 5.2.1 requires SQLAlchemy>=1.4.1, but you have sqlalchemy 1.3.9 which is incompatible.

Successfully installed sqlalchemy-1.3.9

Connect to the database

Let us first load the SQL extension and establish a connection with the database

```
In [2]: !pip install ipython-sql
!pip install ipython-sql prettytable
```

Collecting ipython-sql

Downloading ipython_sql-0.5.0-py3-none-any.whl.metadata (17 kB)

Collecting prettytable (from ipython-sql)

Downloading prettytable-3.15.1-py3-none-any.whl.metadata (33 kB)

Requirement already satisfied: ipython in /opt/conda/lib/python3.12/site-packages (from ipython-sql) (8.31.0)

Collecting sqlalchemy>=2.0 (from ipython-sql)

Downloading SQLAlchemy-2.0.38-cp312-cp312-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (9.6 kB)

Collecting sqlparse (from ipython-sql)

Downloading sqlparse-0.5.3-py3-none-any.whl.metadata (3.9 kB)

Requirement already satisfied: six in /opt/conda/lib/python3.12/site-packages (from ipython-sql) (1.17.0)

Requirement already satisfied: ipython-genutils in /opt/conda/lib/python3.12/site-packages (from ipython-sql) (0.2.0)

Requirement already satisfied: greenlet!=0.4.17 in /opt/conda/lib/python3.12/site-packages (from sqlalchemy>=2.0->ipython-sql) (3.1.1)

Requirement already satisfied: typing-extensions>=4.6.0 in /opt/conda/lib/python3.12/site-packages (from sqlalchemy>=2.0->ipython-sql) (4.12.2)

Requirement already satisfied: decorator in /opt/conda/lib/python3.12/site-packages (from ipython->ipython-sql) (5.1.1)

Requirement already satisfied: jedi>=0.16 in /opt/conda/lib/python3.12/site-packages (from ipython->ipython-sql) (0.19.2)

Requirement already satisfied: matplotlib-inline in /opt/conda/lib/python3.12/site-packages (from ipython->ipython-sql) (0.1.7)

Requirement already satisfied: pexpect>4.3 in /opt/conda/lib/python3.12/site-packages (from ipython->ipython-sql) (4.9.0)

Requirement already satisfied: prompt_toolkit<3.1.0,>=3.0.41 in /opt/conda/lib/python3.12/site-packages (from ipython->ipython-sql) (3.0.50)

Requirement already satisfied: pygments>=2.4.0 in /opt/conda/lib/python3.12/site-packages (from ipython->ipython-sql) (2.19.1)

Requirement already satisfied: stack_data in /opt/conda/lib/python3.12/site-packages (from ipython->ipython-sql) (0.6.3)

Requirement already satisfied: traitlets>=5.13.0 in /opt/conda/lib/python3.12/site-packages (from ipython->ipython-sql) (5.14.3)

Requirement already satisfied: wcwidth in /opt/conda/lib/python3.12/site-packages (from prettytable->ipython-sql) (0.2.13)

Requirement already satisfied: parso<0.9.0,>=0.8.4 in /opt/conda/lib/python3.12/site-packages (from jedi>=0.16->ipython->ipython-sql) (0.8.4)

Requirement already satisfied: ptyprocess>=0.5 in /opt/conda/lib/python3.12/site-packages (from pexpect>4.3->ipython->ipython-sql) (0.7.0)

Requirement already satisfied: executing>=1.2.0 in /opt/conda/lib/python3.12/site-packages (from stack_data->ipython->ipython-sql) (2.1.0)

Requirement already satisfied: asttokens>=2.1.0 in /opt/conda/lib/python3.12/site-packages (from stack_data->ipython->ipython-sql) (3.0.0)

Requirement already satisfied: pure_eval in /opt/conda/lib/python3.12/site-packages (from stack_data->ipython->ipython-sql) (0.2.3)

Downloading ipython_sql-0.5.0-py3-none-any.whl (20 kB)

Downloading SQLAlchemy-2.0.38-cp312-cp312-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (3.3 MB)

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Downloading prettytable-3.15.1-py3-none-any.whl (33 kB)

Downloading sqlparse-0.5.3-py3-none-any.whl (44 kB)

Installing collected packages: sqlparse, sqlalchemy, prettytable, ipython-sql

```

Attempting uninstall: sqlalchemy
Found existing installation: SQLAlchemy 1.3.9
Uninstalling SQLAlchemy-1.3.9:
Successfully uninstalled SQLAlchemy-1.3.9
Successfully installed ipython-sql-0.5.0 prettytable-3.15.1 sqlalchemy-2.0.3
8 sqlparse-0.5.3
Requirement already satisfied: ipython-sql in /opt/conda/lib/python3.12/site
-packages (0.5.0)
Requirement already satisfied: prettytable in /opt/conda/lib/python3.12/site
-packages (3.15.1)
Requirement already satisfied: ipython in /opt/conda/lib/python3.12/site-pac
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site-packages (from ipython-sql) (2.0.38)
Requirement already satisfied: sqlparse in /opt/conda/lib/python3.12/site-pa
ckages (from ipython-sql) (0.5.3)
Requirement already satisfied: six in /opt/conda/lib/python3.12/site-package
s (from ipython-sql) (1.17.0)
Requirement already satisfied: ipython-genutils in /opt/conda/lib/python3.1
2/site-packages (from ipython-sql) (0.2.0)
Requirement already satisfied: wcwidth in /opt/conda/lib/python3.12/site-pac
kages (from prettytable) (0.2.13)
Requirement already satisfied: greenlet!=0.4.17 in /opt/conda/lib/python3.1
2/site-packages (from sqlalchemy>=2.0->ipython-sql) (3.1.1)
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thon3.12/site-packages (from sqlalchemy>=2.0->ipython-sql) (4.12.2)
Requirement already satisfied: decorator in /opt/conda/lib/python3.12/site-p
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Requirement already satisfied: matplotlib-inline in /opt/conda/lib/python3.1
2/site-packages (from ipython->ipython-sql) (0.1.7)
Requirement already satisfied: pexpect>4.3 in /opt/conda/lib/python3.12/site
-packages (from ipython->ipython-sql) (4.9.0)
Requirement already satisfied: prompt_toolkit<3.1.0,>=3.0.41 in /opt/conda/l
ib/python3.12/site-packages (from ipython->ipython-sql) (3.0.50)
Requirement already satisfied: pygments>=2.4.0 in /opt/conda/lib/python3.12/
site-packages (from ipython->ipython-sql) (2.19.1)
Requirement already satisfied: stack_data in /opt/conda/lib/python3.12/site-
packages (from ipython->ipython-sql) (0.6.3)
Requirement already satisfied: traitlets>=5.13.0 in /opt/conda/lib/python3.1
2/site-packages (from ipython->ipython-sql) (5.14.3)
Requirement already satisfied: parso<0.9.0,>=0.8.4 in /opt/conda/lib/python
3.12/site-packages (from jedi>=0.16->ipython->ipython-sql) (0.8.4)
Requirement already satisfied: ptyprocess>=0.5 in /opt/conda/lib/python3.12/
site-packages (from pexpect>4.3->ipython->ipython-sql) (0.7.0)
Requirement already satisfied: executing>=1.2.0 in /opt/conda/lib/python3.1
2/site-packages (from stack_data->ipython->ipython-sql) (2.1.0)
Requirement already satisfied: asttokens>=2.1.0 in /opt/conda/lib/python3.1
2/site-packages (from stack_data->ipython->ipython-sql) (3.0.0)
Requirement already satisfied: pure_eval in /opt/conda/lib/python3.12/site-p
ackages (from stack_data->ipython->ipython-sql) (0.2.3)

```

In [3]: `%load_ext sql`

```
In [4]: import csv, sqlite3
import prettytable
prettytable.DEFAULT = 'DEFAULT'

con = sqlite3.connect("my_data1.db")
cur = con.cursor()
```

```
In [5]: !pip install -q pandas
```

```
In [6]: %sql sqlite:///my_data1.db
```

```
In [7]: import pandas as pd
df = pd.read_csv("https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/coursera-data-science-toolbox-2/SpaceX_launch_data.csv")
df.to_sql("SPACEXTBL", con, if_exists='replace', index=False, method="multi")
```

```
Out[7]: 101
```

```
In [9]: df['Launch_Site'].value_counts()
```

```
Out[9]: Launch_Site
CCAFS SLC-40      34
CCAFS LC-40       26
KSC LC-39A        25
VAFB SLC-4E       16
Name: count, dtype: int64
```

Note: This below code is added to remove blank rows from table

```
In [10]: #DROP THE TABLE IF EXISTS

%sql DROP TABLE IF EXISTS SPACEXTABLE;

* sqlite:///my_data1.db
Done.
```

```
Out[10]: []
```

```
In [11]: %sql create table SPACEXTABLE as select * from SPACEXTBL where Date is not null

* sqlite:///my_data1.db
Done.
```

```
Out[11]: []
```

Tasks

Now write and execute SQL queries to solve the assignment tasks.

Note: If the column names are in mixed case enclose it in double quotes For Example "Landing_Outcome"

Task 1

Display the names of the unique launch sites in the space mission

In [12]: `%sql SELECT DISTINCT "Landing_Outcome" FROM SPACEXTBL`

* sqlite:///my_data1.db

Done.

Out [12]: **Landing_Outcome**

Failure (parachute)

No attempt

Uncontrolled (ocean)

Controlled (ocean)

Failure (drone ship)

Precluded (drone ship)

Success (ground pad)

Success (drone ship)

Success

Failure

No attempt

Task 2

Display 5 records where launch sites begin with the string 'CCA'

In [13]: `%sql SELECT * FROM SPACEXTBL WHERE "Launch_Site" LIKE "CCA%" LIMIT 5`

* sqlite:///my_data1.db

Done.

Out [13]:

Date	Time (UTC)	Booster_Version	Launch_Site	Payload	PAYLOAD_MASS__KG_	Outcome
2010-06-04	18:45:00	F9 v1.0 B0003	CCAFS LC-40	Dragon Spacecraft Qualification Unit	0	L
2010-12-08	15:43:00	F9 v1.0 B0004	CCAFS LC-40	Dragon demo flight C1, two CubeSats, barrel of Brouere cheese	0	L (I
2012-05-22	7:44:00	F9 v1.0 B0005	CCAFS LC-40	Dragon demo flight C2	525	L (I
2012-10-08	0:35:00	F9 v1.0 B0006	CCAFS LC-40	SpaceX CRS-1	500	L (I
2013-03-01	15:10:00	F9 v1.0 B0007	CCAFS LC-40	SpaceX CRS-2	677	L (I

Task 3

Display the total payload mass carried by boosters launched by NASA (CRS)

In [14]: `%sql SELECT SUM(PAYLOAD_MASS__KG_) FROM SPACEXTBL WHERE "Customer" LIKE "NAS`

* sqlite:///my_data1.db
Done.

Out [14]: `SUM(PAYLOAD_MASS__KG_)`
45596

Task 4

Display average payload mass carried by booster version F9 v1.1

In [15]: `%sql SELECT AVG(PAYLOAD_MASS__KG_) FROM SPACEXTBL WHERE "Booster_Version" LI`

* sqlite:///my_data1.db
Done.

Out [15]: `AVG(PAYLOAD_MASS__KG_)`
2534.6666666666665

Task 5

List the date when the first succesful landing outcome in ground pad was acheived.

Hint: Use min function

```
In [16]: %sql SELECT MIN("Date") FROM SPACEXTBL WHERE "Landing_Outcome" LIKE "Success"
* sqlite:///my_data1.db
Done.
```

```
Out[16]: MIN("Date")
2015-12-22
```

Task 6

List the names of the boosters which have success in drone ship and have payload mass greater than 4000 but less than 6000

```
In [17]: %sql SELECT "Booster_Version" FROM SPACEXTBL WHERE "Landing_Outcome" LIKE "S"
* sqlite:///my_data1.db
Done.
```

```
Out[17]: Booster_Version
F9 FT B1021.1
F9 FT B1022
F9 FT B1023.1
F9 FT B1026
F9 FT B1029.1
F9 FT B1021.2
F9 FT B1029.2
F9 FT B1036.1
F9 FT B1038.1
F9 B4 B1041.1
F9 FT B1031.2
F9 B4 B1042.1
F9 B4 B1045.1
F9 B5 B1046.1
```

Task 7

List the total number of successful and failure mission outcomes

```
In [18]: %sql SELECT "Mission_Outcome", COUNT(*) FROM SPACEXTBL GROUP BY "Mission_Out"
* sqlite:///my_data1.db
Done.
```


Out [18]:

Mission_Outcome	COUNT(*)
Failure (in flight)	1
Success	98
Success	1
Success (payload status unclear)	1

Task 8

List the names of the booster_versions which have carried the maximum payload mass. Use a subquery

In [19]:

```
%sql SELECT "Booster_Version" FROM SPACEXTBL WHERE PAYLOAD_MASS__KG_ = (SELECT
* sqlite:///my_data1.db
Done.
```

Out [19]: **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

Task 9

List the records which will display the month names, failure landing_outcomes in drone ship ,booster versions, launch_site for the months in year 2015.

Note: SQLite does not support monthnames. So you need to use substr(Date, 6,2) as month to get the months and substr(Date,0,5)='2015' for year.

In [28]:

```
%%sql
SELECT
CASE substr(Date, 6, 2)
WHEN '01' THEN 'January'
WHEN '02' THEN 'February'
```

```

        WHEN '03' THEN 'March'
        WHEN '04' THEN 'April'
        WHEN '05' THEN 'May'
        WHEN '06' THEN 'June'
        WHEN '07' THEN 'July'
        WHEN '08' THEN 'August'
        WHEN '09' THEN 'September'
        WHEN '10' THEN 'October'
        WHEN '11' THEN 'November'
        WHEN '12' THEN 'December'
    END AS MonthName,
    Landing_Outcome,
    Booster_Version,
    Launch_Site
FROM SPACEXTBL
WHERE substr(Date, 0, 5) = '2015'
AND Landing_Outcome LIKE '%Failure%'
AND Landing_Outcome LIKE '%drone ship%'

```

* sqlite:///my_data1.db
Done.

Out[28]:

MonthName	Landing_Outcome	Booster_Version	Launch_Site
January	Failure (drone ship)	F9 v1.1 B1012	CCAFS LC-40
April	Failure (drone ship)	F9 v1.1 B1015	CCAFS LC-40

Task 10

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.

In [27]:

```

%%sql SELECT Landing_Outcome, COUNT(*) AS Outcome_Count
FROM SPACEXTBL
WHERE Date BETWEEN '2010-06-04' AND '2017-03-20'
GROUP BY Landing_Outcome
ORDER BY Outcome_Count DESC

```

* sqlite:///my_data1.db
Done.

Out[27]:

Landing_Outcome	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

Reference Links

- [Hands-on Lab : String Patterns, Sorting and Grouping](#)
- [Hands-on Lab: Built-in functions](#)
- [Hands-on Lab : Sub-queries and Nested SELECT Statements](#)
- [Hands-on Tutorial: Accessing Databases with SQL magic](#)
- [Hands-on Lab: Analyzing a real World Data Set](#)

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