Assignment: SQL Notebook for Peer Assignment

Accessing Databases with SQL Magic

Objectives

Understand the Spacex DataSet Load the dataset into the corresponding table in a Db2 database Execute SQL queries to answer assignment questions

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 wheras 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 csv

IBM DB2

- Store the dataset in database table *manually load the table using the database console LOAD tool in DB2*
- Table = SPACEX = HHS83610.SPACEX
- Disable detect datatypes (payload_mass_kg as INT)
- Correctly format date and time in schema (YYYY-MM-DD and HH:MM:SS)
- Upload csv

To communicate with SQL Databases from within a JupyterLab notebook, we can use the SQL "magic" provided by the ipython-sql extension. "Magic" is JupyterLab's term for special commands that start with "%". Below, we'll use the *load_ext* magic to load the ipython-sql extension. In the lab environemnt provided in the course the ipython-sql extension is already installed and so is the ibm_db_sa driver.

The following required modules are pre-installed in the Skills Network Labs environment. However if you run this notebook commands in a different Jupyter environment (e.g. Watson Studio or Ananconda) you may need to install these libraries by removing the `#` sign before `!pip` in the code cell below.

In [ ]:
```
# These libraries are pre-installed in SN Labs. If running in another environment p
# !pip install --force-reinstall ibm_db==3.1.0 ibm_db_sa==0.3.3
# Ensure we don't load_ext with sqlalchemy>=1.4 (incompadible)
# !pip uninstall sqlalchemy==1.4 -y && pip install sqlalchemy==1.3.24
# !pip install ipython-sql
```

In [39]:
```
%load_ext sql
```

```
The sql extension is already loaded. To reload it, use:
  %reload_ext sql
```

Now we have access to SQL magic. With our first SQL magic command, we'll connect to a Db2 database. However, in order to do that, you'll first need to retrieve or create your credentials to access your Db2 database.

This image shows the location of your connection string if you're using Db2 on IBM Cloud. If you're using another host the format is: username:password@hostname:port/database-

name?security=SSL

In [41]:
```
# Enter your Db2 credentials in the connection string below
# Recall you created Service Credentials in Part III of the first lab of the course
# i.e. from the uri field in the Service Credentials copy everything after db2:// (
# for example, if your credentials are as in the screenshot above, you would write:
# %sql ibm_db_sa://my-username:my-password@hostname:port/BLUDB?security=SSL
# Note the ibm_db_sa:// prefix instead of db2://
# This is because JupyterLab's ipython-sql extension uses sqlalchemy (a python SQL
# which in turn uses IBM's sqlalchemy dialect: ibm_db_sa

%sql ibm_db_sa://hhs83610:Kvv178o2BQUYIzsY@9938aec0-8105-433e-8bf9-0fbb7e483086.c1o
```

Out[41]:
```
'Connected: hhs83610@BLUDB'
```

In [43]:
```
# load pandas
!pip install -q pandas==1.1.5
```

In [45]:
```
import pandas as pd
```

In [51]:
```
import matplotlib.pyplot as plt
%matplotlib inline
# uncomment the following line if you get an module error saying seaborn not found
# !pip install seaborn==0.9.0
import seaborn as sns
```

In [6]:
```
%sql select * from SPACEX limit 10
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqd
e00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[6]:

DATE	TIME	booster_version	launch_site	payload	payload_mass_kg	orbit	customer	missio
2020-11-25	02:13:00	F9 B5 B1049.7	CCAFS SLC-40	Starlink 15 v1.0, SpaceX CRS-21	15600	LEO	SpaceX	
2020-11-21	17:17:08	F9 B5B1063.1	VAFB SLC-4E	Sentinel-6 Michael Freilich, Starlink 15 v1.0	1192	LEO	NASA / NOAA / ESA / EUMETSAT	
2020-11-16	00:27:00	F9 B5B1061.1	KSC LC-39A	Crew-1, Sentinel-6 Michael Freilich	12500	LEO (ISS)	NASA (CCP)	
2020-10-24	15:31:34	F9 B5 B1060.3	CCAFS SLC-40	Starlink 14 v1.0, GPS III-04	15600	LEO	SpaceX	
2020-10-18	12:25:57	F9 B5 B1051.6	KSC LC-39A	Starlink 13 v1.0, Starlink 14 v1.0	15600	LEO	SpaceX	
2020-08-30	23:18:00	F9 B5 B1059.4	CCAFS SLC-40	SAOCOM 1B, GNOMES 1, Tyvak-0172	3130	SSO	CONAE, PlanetIQ, SpaceX	
2020-08-18	14:31:00	F9 B5 B1049.6	CCAFS SLC-40	Starlink 10 v1.0, SkySat-19, -20, -21, SAOCOM 1B	15440	LEO	SpaceX, Planet Labs, PlanetIQ	
2020-07-20	21:30:00	F9 B5 B1058.2	CCAFS SLC-40	ANASIS-II, Starlink 9 v1.0	5500	GTO	Republic of Korea Army, Spaceflight Industries (BlackSky)	
2020-07-08	05:12:00	F9 B5 B1051.5	KSC LC-39A	Starlink 9 v1.0, SXRS-1, Starlink 10 v1.0	14932	LEO	SpaceX, Spaceflight Industries (BlackSky), Planet Labs	
2020-07-03	04:50:00	F9 B5 B1059.2	CCAFS SLC-40	SpaceX CRS-20,	1977	LEO (ISS)	NASA (CRS)	

DATE	TIME	booster_version	launch_site	payload	payload_mass_kg	orbit	customer	missio
				Starlink 5				

In [7]:
```
# Display the names of the unique launch sites in the space mission
%sql select distinct LAUNCH_SITE from SPACEX
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[7]:

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

In [8]:
```
# Display 5 records where launch sites begin with the string 'CCA'
%sql select LAUNCH_SITE from SPACEX where LAUNCH_SITE like 'CCA%' limit 5
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[8]:

launch_site
CCAFS SLC-40
CCAFS SLC-40
CCAFS SLC-40
CCAFS SLC-40
CCAFS SLC-40

In [9]:
```
## Display the unique launch sites beginning with CCA
%sql select distinct LAUNCH_SITE from SPACEX where LAUNCH_SITE like 'CCA%'
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[9]:

launch_site
CCAFS LC-40
CCAFS SLC-40

In [10]:
```
# Display the total payload mass carried by boosters launched by NASA (CRS)
%sql select sum(PAYLOAD_MASS_KG) as Total_Payload_Mass_Kg_of_All_Falcon9_Launches f
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[10]:

total_payload_mass_kg_of_all_falcon9_launches
45596

In [11]:
```
# Display average payload mass carried by booster version F9 v1.1
%sql select avg(PAYLOAD_MASS_KG) as average_payload_mass_kg_for_F9_v1_1 from SPACEX
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[11]:

average_payload_mass_kg_for_f9_v1_1
2928

In [7]:
```
# List the date when the first succesful landing outcome in ground pad was acheived
%sql select min(DATE) as "First Landing Success" from SPACEX where LANDING__OUTCOME
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[7]:

First Landing Success
2015-12-22

In [8]:
```
# List the names of the boosters which have success in drone ship and have payload
%sql select distinct BOOSTER_VERSION, LANDING__OUTCOME, PAYLOAD_MASS_KG from SPACEX
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[8]:

booster_version	landing__outcome	payload_mass_kg
F9 FT B1021.2	Success (drone ship)	5300
F9 FT B1031.2	Success (drone ship)	5200
F9 FT B1022	Success (drone ship)	4696
F9 FT B1026	Success (drone ship)	4600

In [10]:
```
#List the total number of successful and failure mission outcomes (mission outcome
%sql select count(*), MISSION_OUTCOME as "Launch and/or Objective Success" from SPA
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[10]:

1	Launch and/or Objective Success
1	Failure (in flight)
99	Success
1	Success (payload status unclear)

In [82]:
```
#List the names of the booster_versions which have carried the maximum payload mass
%sql select distinct BOOSTER_VERSION, PAYLOAD_MASS_KG from SPACEX where PAYLOAD_MAS
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqd
e00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[82]:

booster_version	payload_mass_kg
F9 B5 B1048.4	15600
F9 B5 B1048.5	15600
F9 B5 B1049.4	15600
F9 B5 B1049.5	15600
F9 B5 B1049.7	15600
F9 B5 B1051.3	15600
F9 B5 B1051.4	15600
F9 B5 B1051.6	15600
F9 B5 B1056.4	15600
F9 B5 B1058.3	15600
F9 B5 B1060.2	15600
F9 B5 B1060.3	15600

In [86]:

```
# List the records which will display the month names, failure landing_outcomes in
%sql select month(DATE) as month, year(DATE) as year, BOOSTER_VERSION, LAUNCH_SITE,
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqd
e00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[86]:

MONTH	YEAR	booster_version	launch_site	landing__outcome
1	2015	F9 v1.1 B1012	CCAFS LC-40	Failure (drone ship)
4	2015	F9 v1.1 B1015	CCAFS LC-40	Failure (drone ship)

In [99]:

```
%%sql
-- Rank the count of successful landing_outcomes between the date 04-06-2010 and 20
select count(LANDING__OUTCOME), LANDING__OUTCOME
from (
    select * from SPACEX where DATE between '2010-04-06' and '2017-03-20'
    )
group by LANDING__OUTCOME
having LANDING__OUTCOME like 'Success%'
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqd
e00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[99]:

1	landing__outcome
5	Success (drone ship)
5	Success (ground pad)

Further exploration

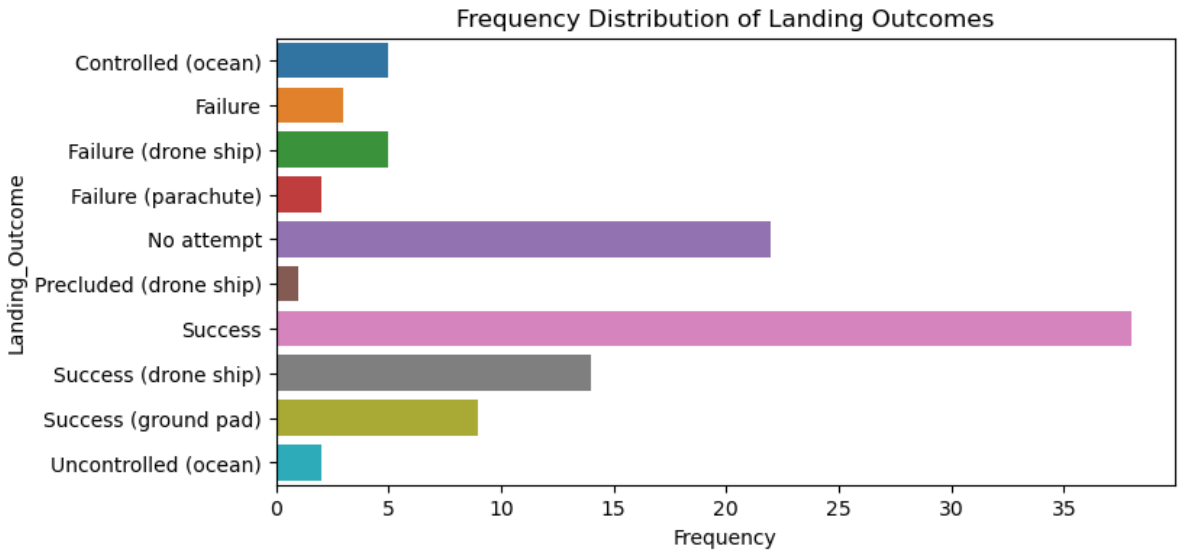
In [101…]
```
landing_outcome_distribution = %sql select LANDING__OUTCOME as "Landing_Outcome", c
landing_outcome_distribution
```

```
 * ibm_db_sa://hhs83610:***@9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqd
e00.databases.appdomain.cloud:32459/BLUDB
Done.
```

Out[101]:

Landing_Outcome	Frequency
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

In [116…]
```
df = landing_outcome_distribution.DataFrame()
plt.figure(figsize=(8,4))
plt.title("Frequency Distribution of Landing Outcomes")
plot = sns.barplot(y='Landing_Outcome',x='Frequency', data=df)
```



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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Change log

2021-07-09 0.2 Lakshmi Holla Changes made in magic sql 2021-05-20 0.1 Lakshmi Holla Created Initial Version

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