In [6]:
```
import pandas as pd
import matplotlib.pyplot as plt
```

In [7]:
```
df=pd.read_csv(r"C:\Users\Jaswanth Reddy\Downloads\Bank_churn_modelling.csv")
df.head()
```

Out[7]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMe
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	1	1	
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0	
2	3	15619304	Onio	502	France	Female	42	8	159660.80	3	1	
3	4	15701354	Boni	699	France	Female	39	1	0.00	2	0	
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	1	1	

In [8]:
```
df=df.drop(['RowNumber','CustomerId','Surname','Gender','Geography'],axis=1)
df
```

Out[8]:

	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	619	42	2	0.00	1	1	1	101348.88	1
1	608	41	1	83807.86	1	0	1	112542.58	0
2	502	42	8	159660.80	3	1	0	113931.57	1
3	699	39	1	0.00	2	0	0	93826.63	0
4	850	43	2	125510.82	1	1	1	79084.10	0
...	...	...	...	...	...	...	...	...	...
9995	771	39	5	0.00	2	1	0	96270.64	0
9996	516	35	10	57369.61	1	1	1	101699.77	0
9997	709	36	7	0.00	1	0	1	42085.58	1
9998	772	42	3	75075.31	2	1	0	92888.52	1
9999	792	28	4	130142.79	1	1	0	38190.78	0

10000 rows × 9 columns

In [9]:
```
# Initializing input and output
x=df.drop(['Exited'],axis=1)
target=df['Exited']
```

In [11]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,target,test_size=0.2,random_state=1)
tf.keras.utils.normalize(x_train)
```

Out[11]:

	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary
2694	0.003729	0.000172	0.000018	0.671818	0.000012	0.000000	0.000006	0.740707
5140	0.005517	0.000256	0.000035	0.932071	0.000018	0.000000	0.000000	0.362235
2568	0.004440	0.000341	0.000044	0.943301	0.000007	0.000007	0.000007	0.331908
3671	0.004931	0.000397	0.000046	0.852993	0.000015	0.000000	0.000008	0.521899
7427	0.003513	0.000162	0.000039	0.600408	0.000005	0.000000	0.000000	0.799686
...	...	...	...	...	...	...	...	...
2895	0.004911	0.000372	0.000055	0.849062	0.000008	0.000008	0.000008	0.528270
7813	0.006392	0.000589	0.000028	0.759222	0.000009	0.000009	0.000000	0.650800
905	0.007302	0.000489	0.000098	0.000000	0.000011	0.000011	0.000011	0.999973
5192	0.006553	0.000385	0.000079	0.000000	0.000020	0.000010	0.000010	0.999978
235	0.007225	0.000398	0.000057	0.948442	0.000009	0.000009	0.000000	0.316867

8000 rows × 8 columns

In [12]:
```
from sklearn.linear_model import LogisticRegression

model = LogisticRegression()
```

In [14]:
```
model.fit(x_train,y_train)
```

Out[14]:
```
LogisticRegression()
```

In [27]:
```
model.predict(x_test)[500]
```

Out[27]:
```
0
```

In [22]:
```
import numpy as np
a=pd.DataFrame([502 ,42,    8   ,159660.80, 3   ,1, 0   ,113931.57  ])
a=np.array(a)
a
```

Out[22]:
```
array([[5.0200000e+02],
       [4.2000000e+01],
       [8.0000000e+00],
       [1.5966080e+05],
       [3.0000000e+00],
       [1.0000000e+00],
       [0.0000000e+00],
       [1.1393157e+05]])
```

In [23]:
```
a=a.reshape(1,-1)
a.shape
```

Out[23]:
```
(1, 8)
```

In [24]:
```
model.predict(a)
```

Out[24]:
```
array([0], dtype=int64)
```

In [37]:
```
import joblib
joblib.dump(model,"churn_prediction.pkl")
```

Out[37]:
```
['churn_prediction.pkl']
```

In [28]:
```
import datetime
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
import joblib
```

In [29]:
```
import azureml.core
from azureml.core import Workspace
from azureml.core.model import Model
from azureml.core import Experiment
from azureml.core.webservice import Webservice
from azureml.core.image import ContainerImage
from azureml.core.webservice import AciWebservice
from azureml.core.conda_dependencies import CondaDependencies
```

In [30]:
```
AZ_SUBSCRIPTION_ID='54c4256e-bb50-4fbd-895d-da32982a5dad'
ws = Workspace.create(name='insurance_data',
 subscription_id=AZ_SUBSCRIPTION_ID,
resource_group='Jaswanth_3',
create_resource_group=True,
location='centralindia'
 )
```

```
UserWarning: The resource group doesn't exist or was not provided. AzureML SDK is creating a resource group=Ja
swanth_3 in location=centralindia using subscription=54c4256e-bb50-4fbd-895d-da32982a5dad.

Deploying KeyVault with name insuranckeyvaultf04aca22.
Deploying StorageAccount with name insurancstorage5976058a5.
Deploying AppInsights with name insurancinsights2aa58cf2.
Deployed AppInsights with name insurancinsights2aa58cf2. Took 7.6 seconds.
Deployed KeyVault with name insuranckeyvaultf04aca22. Took 21.16 seconds.
Deployed StorageAccount with name insurancstorage5976058a5. Took 23.59 seconds.
Deploying Workspace with name insurance_data.
Deployed Workspace with name insurance_data. Took 40.82 seconds.
```

In [31]:
```
ws.write_config()
```

In [32]:
```
exp = Experiment(workspace=ws, name='insexp')
```

In [33]:
```
run = exp.start_logging(snapshot_directory=None)
run.log("Experiment start time", str(datetime.datetime.now()))
```

In [34]:
```
run.log('Intercept :', model.intercept_)
run.log('Slope :', model.coef_[0])
```

In [35]:
```
run.log("Experiment end time", str(datetime.datetime.now()))
run.complete()
```

In [36]:
```
print(run.get_portal_url())
```

```
https://ml.azure.com/experiments/insexp/runs/9f23ba85-3dd4-477b-b944-333c79997ac3?wsid=/subscriptions/54c4256e-bb50-4fbd-895d-da32982a5dad/resourcegroups/Jaswanth_3/workspaces/insurance_data (https://ml.azure.com/experiments/insexp/runs/9f23ba85-3dd4-477b-b944-333c79997ac3?wsid=/subscriptions/54c4256e-bb50-4fbd-895d-da32982a5dad/resourcegroups/Jaswanth_3/workspaces/insurance_data)
```

In [38]:
```
model = Model.register(model_path = "churn_prediction.pkl",
                       model_name = "bank",
                       tags = {"key": "1"},
                       description = "bank_chun Prediction",
                       workspace = ws)
```

```
Registering model bank
```

In [39]:
```
aciconfig = AciWebservice.deploy_configuration(cpu_cores=1,
                                               memory_gb=1,
                                               tags={"data": "bank",  "method" : "sklearn"},
                                               description='Predict bank_chun')
```

In [40]:
```
banknv = CondaDependencies()
banknv.add_conda_package("scikit-learn")

with open("banknv.yml","w") as f:
    f.write(banknv.serialize_to_string())
with open("banknv.yml","r") as f:
    print(f.read())
```

```
# Conda environment specification. The dependencies defined in this file will

# be automatically provisioned for runs with userManagedDependencies=False.


# Details about the Conda environment file format:

# https://conda.io/docs/user-guide/tasks/manage-environments.html#create-env-file-manually (https://conda.io/docs/user-guide/tasks/manage-environments.html#create-env-file-manually)


name: project_environment
dependencies:
  # The python interpreter version.

  # Currently Azure ML only supports 3.5.2 and later.

- python=3.6.2

- pip:
    # Required packages for AzureML execution, history, and data preparation.

  - azureml-defaults

- scikit-learn
channels:
- anaconda
- conda-forge
```

In [41]:
```
%%writefile score.py
import json
import numpy as np
import os
import pickle
import joblib
from sklearn.linear_model import LogisticRegression

from azureml.core.model import Model

def init():
    global model
    # retrieve the path to the model file using the model name
    model_path = Model.get_model_path('bank')
    model = joblib.load(model_path)

def run(raw_data):
    data = np.array(json.loads(raw_data)['data'])
    # make prediction
    y_hat = model.predict(data)
    return json.dumps(y_hat.tolist())
```

```
Writing score.py
```

In [44]:
```
import requests

data={'data':[[619, 42, 2   ,0.00,  1   ,1  ,1, 101348.88]]}
url="http://0c7025e9-31c2-40b8-9e1b-f784f601db8b.centralindia.azurecontainer.io/score"
response=requests.post(url,json=data)
response.json()
```

Out[44]:
```
'[0]'
```

In [ ]: