Machine Learning Assginment -3

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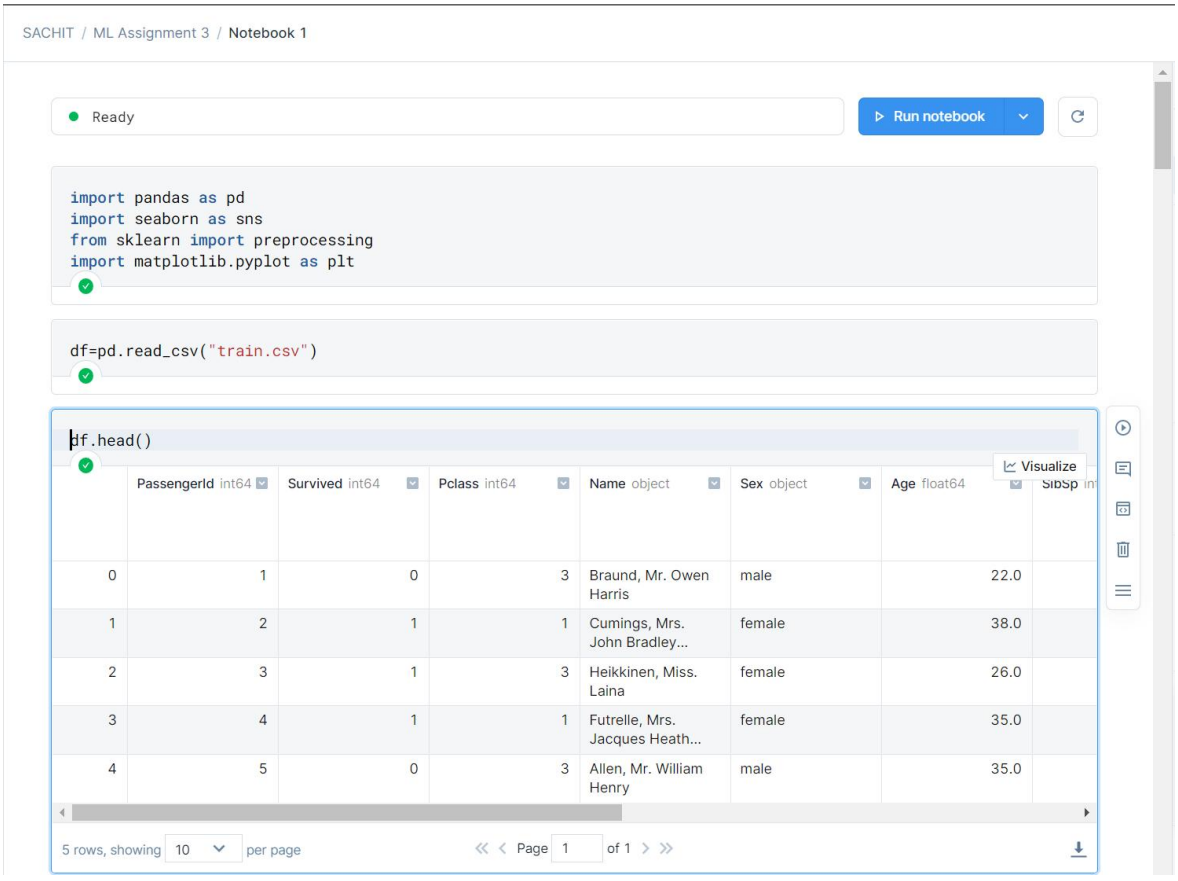
Video Link :
https://drive.google.com/drive/folders/1VaVURBgs7nKCOVkoRkmDaWgoR3VZ_kMq?usp=sharing

Git Hub Link :
https://github.com/sachit46820/ML-Assignment

Question 1 :

1. (Titanic Dataset)

1. Find the correlation between 'survived' (target column) and 'sex' column for the Titanic use case in class.
a. Do you think we should keep this feature?
2. Do at least two visualizations to describe or show correlations.
3. Implement Naïve Bayes method using scikit-learn library and report the accuracy.



SACHIT / ML Assignment 3 / Notebook 1

Ready

Run notebook

```
le = preprocessing.LabelEncoder()
df['Sex'] = le.fit_transform(df.Sex.values)
df['Survived'].corr(df['Sex'])
```

```
-0.5433513806577551
```

```
matrix = df.corr()
print(matrix)
```

```
             PassengerId  Survived    Pclass       Sex       Age     SibSp  \
PassengerId     1.000000 -0.005007 -0.035144  0.042939  0.036847 -0.057527
Survived       -0.005007  1.000000 -0.338481 -0.543351 -0.077221 -0.035322
Pclass         -0.035144 -0.338481  1.000000  0.131900 -0.369226  0.083081
Sex             0.042939 -0.543351  0.131900  1.000000  0.093254 -0.114631
Age             0.036847 -0.077221 -0.369226  0.093254  1.000000 -0.308247
SibSp          -0.057527 -0.035322  0.083081 -0.114631 -0.308247  1.000000
Parch          -0.001652  0.081629  0.018443 -0.245489 -0.189119  0.414838
Fare            0.012658  0.257307 -0.549500 -0.182333  0.096067  0.159651

                Parch      Fare
PassengerId -0.001652  0.012658
Survived     0.081629  0.257307
Pclass       0.018443 -0.549500
Sex         -0.245489 -0.182333
Age         -0.189119  0.096067
SibSp        0.414838  0.159651
Parch        1.000000  0.216225
Fare         0.216225  1.000000
```

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Ready

Run notebook

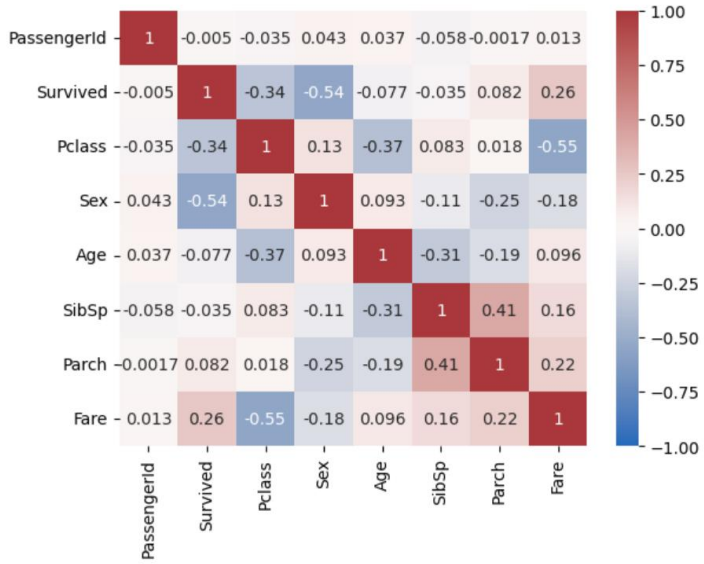
```
df.corr().style.background_gradient(cmap="Greens")
```

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Fare
PassengerId	1.000000	-0.005007	-0.035144	0.042939	0.036847	-0.057527	-0.001652	0.01
Survived	-0.005007	1.000000	-0.338481	-0.543351	-0.077221	-0.035322	0.081629	0.25
Pclass	-0.035144	-0.338481	1.000000	0.131900	-0.369226	0.083081	0.018443	-0.5
Sex	0.042939	-0.543351	0.131900	1.000000	0.093254	-0.114631	-0.245489	-0.1
Age	0.036847	-0.077221	-0.369226	0.093254	1.000000	-0.308247	-0.189119	0.09
SibSp	-0.057527	-0.035322	0.083081	-0.114631	-0.308247	1.000000	0.414838	0.15
Parch	-0.001652	0.081629	0.018443	-0.245489	-0.189119	0.414838	1.000000	0.21
Fare	0.012658	0.257307	-0.549500	-0.182333	0.096067	0.159651	0.216225	1.00

Machine offline. Restore variables from last session.

Run notebook

```
sns.heatmap(matrix, annot=True, vmax=1, vmin=-1, center=0, cmap='vlag')
plt.show()
```



Ready

Run notebook

```
#NAive bais

train_raw = pd.read_csv('train.csv')
test_raw = pd.read_csv('test.csv')
# Join data to analyse and process the set as one.
train_raw['train'] = 1
test_raw['train'] = 0
df = train_raw.append(test_raw, sort=False)
features = ['Age', 'Embarked', 'Fare', 'Parch', 'Pclass', 'Sex', 'SibSp']
target = 'Survived'

df = df[features + [target] + ['train']]
# Categorical values need to be transformed into numeric.
df['Sex'] = df['Sex'].replace(["female", "male"], [0, 1])
df['Embarked'] = df['Embarked'].replace(['S', 'C', 'Q'], [1, 2, 3])
train = df.query('train == 1')
test = df.query('train == 0')
```

```
# Drop missing values from the train set.
train.dropna(axis=0, inplace=True)
labels = train[target].values


train.drop(['train', target, 'Pclass'], axis=1, inplace=True)
test.drop(['train', target, 'Pclass'], axis=1, inplace=True)
```

Ready

Run notebook

```
/tmp/ipykernel_81/3785606277.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versu
  train.dropna(axis=0, inplace=True)
/shared-libs/python3.9/py/lib/python3.9/site-packages/pandas/core/frame.py:4308: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versu
  return super().drop(
```

```
from sklearn.model_selection import train_test_split, cross_validate

X_train, X_val, Y_train, Y_val = train_test_split(train, labels, test_size=0.2, random_state=1)
```

```
import warnings
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from scipy.stats.stats import pearsonr
from sklearn.naive_bayes import GaussianNB
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, recall_score, precision_score, classification_report, confusion_ma

%matplotlib inline
# Suppress warnings
warnings.filterwarnings("ignore")
```

```
/tmp/ipykernel_81/720350211.py:6: DeprecationWarning: Please use `pearsonr` from the `scipy.stats` namespace, the `scipy.stats.sta
  from scipy.stats.stats import pearsonr
```

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Ready

Run notebook

```
classifier = GaussianNB()

classifier.fit(X_train, Y_train)
```

GaussianNB

GaussianNB()

```
y_pred = classifier.predict(X_val)

# Summary of the predictions made by the classifier
print(classification_report(Y_val, y_pred))
print(confusion_matrix(Y_val, y_pred))
# Accuracy score
from sklearn.metrics import accuracy_score
print('accuracy is',accuracy_score(Y_val, y_pred))
```

```
              precision    recall  f1-score   support

         0.0       0.79      0.80      0.80        85
         1.0       0.70      0.69      0.70        58

    accuracy                           0.76       143
   macro avg       0.75      0.74      0.75       143
weighted avg       0.75      0.76      0.75       143

[[68 17]
 [18 40]]
accuracy is 0.7552447552447552
```

Question 2 :

2. (Glass Dataset)

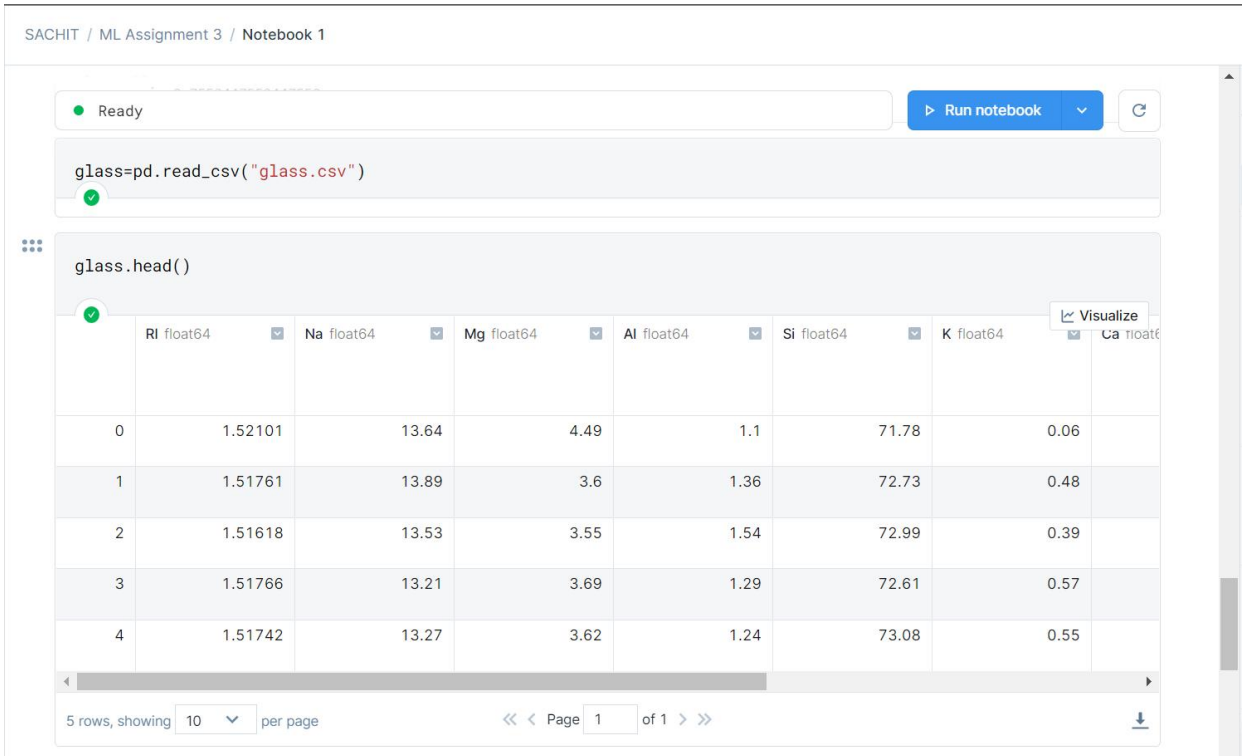
1. Implement Naïve Bayes method using scikit-learn library.
a. Use the glass dataset available in Link also provided in your assignment.
b. Use train_test_split to create training and testing part.

2. Evaluate the model on testing part using score and
classification_report(y_true, y_pred)

1. Implement linear SVM method using scikit library
a. Use the glass dataset available in Link also provided in your assignment.
b. Use train_test_split to create training and testing part.

2. Evaluate the model on testing part using score and
classification_report(y_true, y_pred)

Do at least two visualizations to describe or show correlations in the Glass Dataset.
Which algorithm you got better accuracy? Can you justify why?



Ready

Run notebook

```
glass.corr().style.background_gradient(cmap="Greens")
```

	RI	Na	Mg	Al	Si	K	Ca	Ba
RI	1.000000	-0.191885	-0.122274	-0.407326	-0.542052	-0.289833	0.810403	-0.000386
Na	-0.191885	1.000000	-0.273732	0.156794	-0.069809	-0.266087	-0.275442	0.326603
Mg	-0.122274	-0.273732	1.000000	-0.481799	-0.165927	0.005396	-0.443750	-0.492262
Al	-0.407326	0.156794	-0.481799	1.000000	-0.005524	0.325958	-0.259592	0.479404
Si	-0.542052	-0.069809	-0.165927	-0.005524	1.000000	-0.193331	-0.208732	-0.102151
K	-0.289833	-0.266087	0.005396	0.325958	-0.193331	1.000000	-0.317836	-0.042618
Ca	0.810403	-0.275442	-0.443750	-0.259592	-0.208732	-0.317836	1.000000	-0.112841
Ba	-0.000386	0.326603	-0.492262	0.479404	-0.102151	-0.042618	-0.112841	1.000000
Fe	0.143010	-0.241346	0.083060	-0.074402	-0.094201	-0.007719	0.124968	-0.058692
Type	-0.164237	0.502898	-0.744993	0.598829	0.151565	-0.010054	0.000952	0.575161

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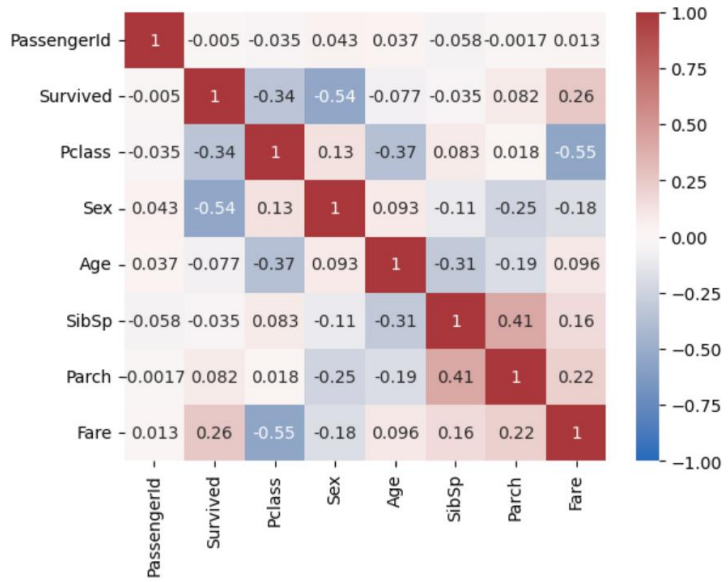
Ready

Run notebook

```
sns.heatmap(matrix, annot=True, vmax=1, vmin=-1, center=0, cmap='vlag')
plt.show()
```



SACHIT / ML Assignment 3 / Notebook 1

Setting up notebook

Run notebook

```
features = ['Rl', 'Na', 'Mg', 'Al', 'Si', 'K', 'Ca', 'Ba', 'Fe']
target = 'Type'


X_train, X_val, Y_train, Y_val = train_test_split(glass[::-1], glass['Type'],test_size=0.2, random_state=1)

classifier = GaussianNB()

classifier.fit(X_train, Y_train)


y_pred = classifier.predict(X_val)

# Summary of the predictions made by the classifier
print(classification_report(Y_val, y_pred))
print(confusion_matrix(Y_val, y_pred))
# Accuracy score
from sklearn.metrics import accuracy_score
print('accuracy is',accuracy_score(Y_val, y_pred))
```

SACHIT / ML Assignment 3 / Notebook 1

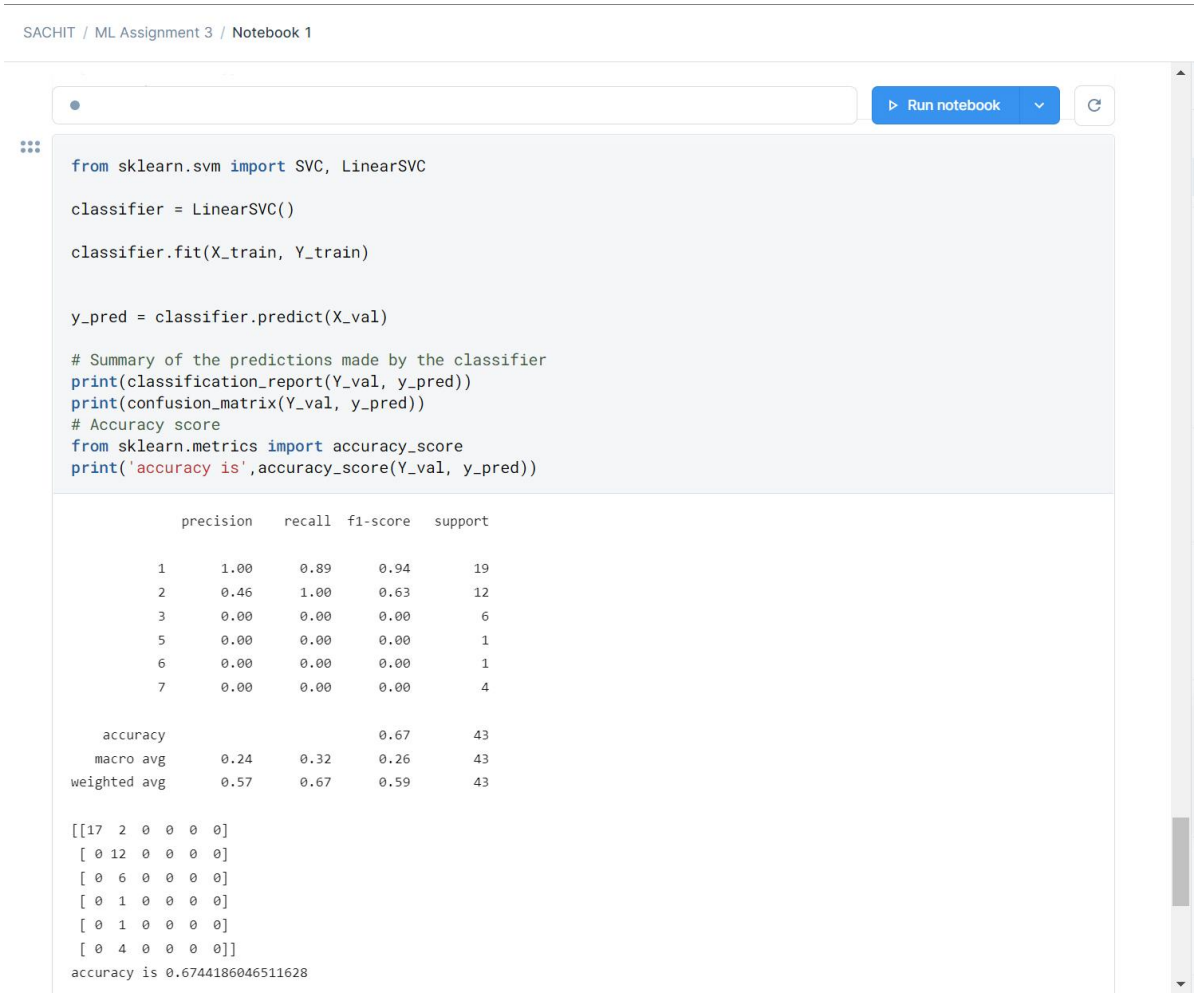
Run notebook

```
              precision    recall  f1-score   support

           1       0.90      0.95      0.92        19
           2       0.92      0.92      0.92        12
           3       1.00      0.50      0.67         6
           5       0.00      0.00      0.00         1
           6       1.00      1.00      1.00         1
           7       0.75      0.75      0.75         4

    accuracy                           0.84        43
   macro avg       0.76      0.69      0.71        43
weighted avg       0.89      0.84      0.85        43

[[18  1  0  0  0  0]
 [ 1 11  0  0  0  0]
 [ 1  0  3  2  0  0]
 [ 0  0  0  0  0  1]
 [ 0  0  0  0  1  0]
 [ 0  0  0  1  0  3]]
accuracy is 0.8372093023255814
```



Accuracy of Naive Bayes > Accuracy of SVM Method

* Naive Bayes has got the better accuracy as each variable or function is independent of each other in this algorithm and performs well for problems like spam detection and text classification which is why the accuracy increases, whereas SVM is dependent or related to each other and typically don't output easily interpretable probabilities , hence has has lower accuracy compared to Naive Bayes.