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Assignment-3

Programming elements:
Classification

Assignment:
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.

Question 1

1. Find the correlation between 'survived' (target column) and 'sex' column for the Titanic use case in class.

In [20]:
```
import pandas as pd
import seaborn as sns
from sklearn import preprocessing
import matplotlib.pyplot as plt
```

In [2]:
```
df=pd.read_csv("train.csv")
```

In [3]:
```
df.head()
```

Out[3]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

In [4]:
```
le = preprocessing.LabelEncoder()
df['Sex'] = le.fit_transform(df.Sex.values)
df['Survived'].corr(df['Sex'])
```

Out[4]:
```
-0.5433513806577553
```

```
a. Do you think we should keep this feature?

Yes
```

```
2. Do at least two visualizations to describe or show correlations

Showing correlations
```

In [5]:
```
matrix = df.corr()
print(matrix)
```

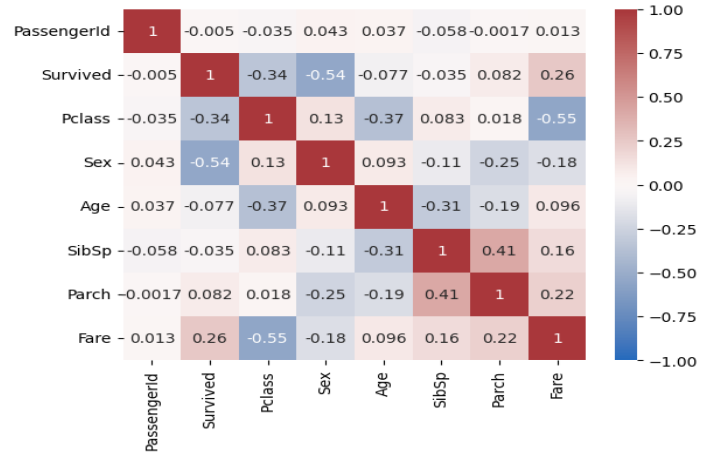
```
             PassengerId  Survived    Pclass       Sex       Age     SibSp  \
PassengerId     1.000000 -0.005007 -0.035144  0.042939  0.036847 -0.057527
Survived       -0.005007  1.000000 -0.338481 -0.543351 -0.077221 -0.035322
Pclass         -0.035144 -0.338481  1.000000  0.131900 -0.369226  0.083081
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
```

In [6]:
```
df.corr().style.background_gradient(cmap="Greens")
```

Out[6]:

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

In [7]:
```
sns.heatmap(matrix, annot=True, vmax=1, vmin=-1, center=0, cmap='vlag')
plt.show()
```



3. Implement Naïve Bayes method using scikit-learn library and report the accuracy.

In [8]:
```
#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'
```

```
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')
```

```
C:\Users\Dell\AppData\Local\Temp\ipykernel_17516\2426976890.py:9: FutureWarning: The frame.append method is deprecated and will
be removed from pandas in a future version. Use pandas.concat instead.
  df = train_raw.append(test_raw, sort=False)
```

In [9]:

```
# 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)
```

```
C:\Users\Dell\AppData\Local\Temp\ipykernel_17516\1665642328.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-versus-a-copy
  train.dropna(axis=0, inplace=True)
C:\Users\Dell\AppData\Local\Temp\ipykernel_17516\1665642328.py:6: 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-versus-a-copy
  train.drop(['train', target, 'Pclass'], axis=1, inplace=True)
C:\Users\Dell\AppData\Local\Temp\ipykernel_17516\1665642328.py:7: 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-versus-a-copy
  test.drop(['train', target, 'Pclass'], axis=1, inplace=True)
```

In [10]:

```
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)
```

In [11]:

```
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_matrix

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

```
C:\Users\Dell\AppData\Local\Temp\ipykernel_17516\720350211.py:6: DeprecationWarning: Please use `pearsonr` from the `scipy.stats` namespace, the `scipy.stats.stats` namespace is deprecated.
  from scipy.stats.stats import pearsonr
```

In [12]:

```
classifier = GaussianNB()

classifier.fit(X_train, Y_train)
```

Out[12]:

```
GaussianNB()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [13]:

```
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
```

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?

Question 2

```
Implement Naive Bayes method using scikit-learn library.

a. Use the glass dataset available in Link also provided in your assignment
```

In [14]:
```
glass=pd.read_csv("glass.csv")
```

In [15]:
```
glass.head()
```

Out[15]:

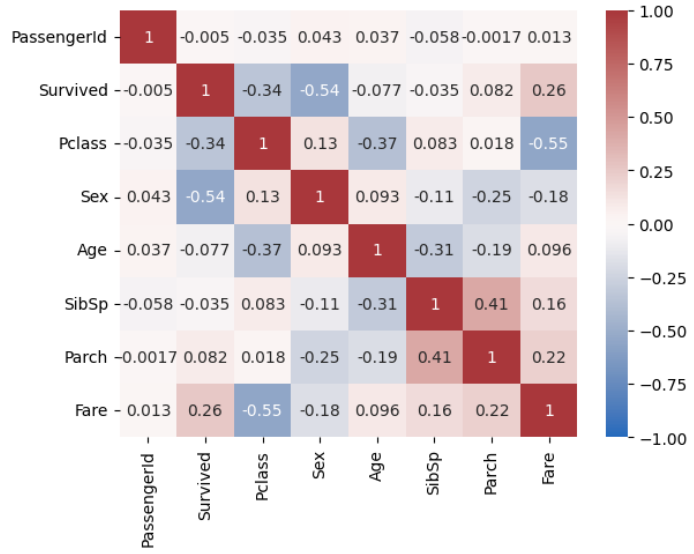
	RI	Na	Mg	Al	Si	K	Ca	Ba	Fe	Type
0	1.52101	13.64	4.49	1.10	71.78	0.06	8.75	0.0	0.0	1
1	1.51761	13.89	3.60	1.36	72.73	0.48	7.83	0.0	0.0	1
2	1.51618	13.53	3.55	1.54	72.99	0.39	7.78	0.0	0.0	1
3	1.51766	13.21	3.69	1.29	72.61	0.57	8.22	0.0	0.0	1
4	1.51742	13.27	3.62	1.24	73.08	0.55	8.07	0.0	0.0	1

In [16]:
```
glass.corr().style.background_gradient(cmap="Greens")
```

Out[16]:

	RI	Na	Mg	Al	Si	K	Ca	Ba	Fe	Type
RI	1.000000	-0.191885	-0.122274	-0.407326	-0.542052	-0.289833	0.810403	-0.000386	0.143010	-0.164237
Na	-0.191885	1.000000	-0.273732	0.156794	-0.069809	-0.266087	-0.275442	0.326603	-0.241346	0.502898
Mg	-0.122274	-0.273732	1.000000	-0.481799	-0.165927	0.005396	-0.443750	-0.492262	0.083060	-0.744993
Al	-0.407326	0.156794	-0.481799	1.000000	-0.005524	0.325958	-0.259592	0.479404	-0.074402	0.598829
Si	-0.542052	-0.069809	-0.165927	-0.005524	1.000000	-0.193331	-0.208732	-0.102151	-0.094201	0.151565
K	-0.289833	-0.266087	0.005396	0.325958	-0.193331	1.000000	-0.317836	-0.042618	-0.007719	-0.010054
Ca	0.810403	-0.275442	-0.443750	-0.259592	-0.208732	-0.317836	1.000000	-0.112841	0.124968	0.000952
Ba	-0.000386	0.326603	-0.492262	0.479404	-0.102151	-0.042618	-0.112841	1.000000	-0.058692	0.575161
Fe	0.143010	-0.241346	0.083060	-0.074402	-0.094201	-0.007719	0.124968	-0.058692	1.000000	-0.188278
Type	-0.164237	0.502898	-0.744993	0.598829	0.151565	-0.010054	0.000952	0.575161	-0.188278	1.000000

In [17]:
```
sns.heatmap(matrix, annot=True, vmax=1, vmin=-1, center=0, cmap='vlag')
plt.show()
```



2. Evaluate the model on testing part using score and Classification

In [21]:
```
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)
```

```
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

           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
```

Do at least two visualizations to describe or show correlations in the Glass Dataset.

Showing Correlations

In [22]:
```
from sklearn.svm import SVC, LinearSVC

classifier = LinearSVC()

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))
```

In [22]:
```
from sklearn.svm import SVC, LinearSVC

classifier = LinearSVC()

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))
```

```
              precision    recall  f1-score   support

           1       1.00      0.95      0.97        19
           2       1.00      0.08      0.15        12
           3       0.25      1.00      0.40         6
           5       0.00      0.00      0.00         1
           6       0.00      0.00      0.00         1
           7       0.00      0.00      0.00         4

    accuracy                           0.58        43
   macro avg       0.38      0.34      0.25        43
weighted avg       0.76      0.58      0.53        43

[[18  0  1  0  0  0]
 [ 0  1 11  0  0  0]
 [ 0  0  6  0  0  0]
 [ 0  0  1  0  0  0]
 [ 0  0  1  0  0  0]
 [ 0  0  4  0  0  0]]
accuracy is 0.5813953488372093
```

Which algorithm you got better accuracy? Can you justify why?

In [23]:
```
# After analyzing results got from training data with Naives Bayes and SVM model, from the above results of accuracy
# We can say Naives Bayes Algorithm is better than SVM
# Accuracy of Naive Bayes > (greater)  Accuracy of SVM
```

Video link: https://drive.google.com/file/d/1y8HrVRPfAAqTS8lQ6BsK3SQF9jlZxdmz/view?usp=sharing

GitHub link: https://github.com/niryarjessy22/Assignment-3.git