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Data Classification in Python

```
import pandas as pd
import numpy as np


from matplotlib import pyplot as plt
import seaborn as sns


# read csv file


df=pd.read_csv("/content/Employee.csv", sep=",")
```

```
df.head()    #to print first five lines from the dataset
```

	Education	JoiningYear	City	PaymentTier	Age	Gender	EverBenched	ExperienceInCurrentDomain	LeaveOrNot
0	Bachelors	2017	Bangalore	3	34	Male	No	0	0
1	Bachelors	2013	Pune	1	28	Female	No	3	1
2	Bachelors	2014	New Delhi	3	38	Female	No	2	0
3	Masters	2016	Bangalore	3	27	Male	No	5	1
4	Masters	2017	Pune	3	24	Male	Yes	2	1

```
df.tail()    #to print last five lines from the dataset
```

	Education	JoiningYear	City	PaymentTier	Age	Gender	EverBenched	ExperienceInCurrentDomain	LeaveOrNot
4648	Bachelors	2013	Bangalore	3	26	Female	No	4	0
4649	Masters	2013	Pune	2	37	Male	No	2	1
4650	Masters	2018	New Delhi	3	27	Male	No	5	1
4651	Bachelors	2012	Bangalore	3	30	Male	Yes	2	0
4652	Bachelors	2015	Bangalore	3	33	Male	Yes	4	0

```
df.shape
```

```
(4653, 9)
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4653 entries, 0 to 4652
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype
---  ------                    --------------  -----
 0   Education                 4653 non-null   object
 1   JoiningYear               4653 non-null   int64
 2   City                      4653 non-null   object
 3   PaymentTier               4653 non-null   int64
 4   Age                       4653 non-null   int64
 5   Gender                    4653 non-null   object
 6   EverBenched               4653 non-null   object
 7   ExperienceInCurrentDomain  4653 non-null   int64
 8   LeaveOrNot                4653 non-null   int64
dtypes: int64(5), object(4)
memory usage: 327.3+ KB
```

```
df.describe()
```

	JoiningYear	PaymentTier	Age	ExperienceInCurrentDomain	LeaveOrNot
max	2018.000000	3.000000	41.000000	7.000000	1.000000

```
df.isnull().sum()
```

```
Education                   0
JoiningYear                 0
City                        0
PaymentTier                 0
Age                         0
Gender                      0
EverBenched                 0
ExperienceInCurrentDomain   0
LeaveOrNot                  0
dtype: int64
```

```
from sklearn.preprocessing import LabelEncoder

label_encoder = LabelEncoder()
categorical_columns = ['Gender', 'EverBenched', 'Education','City']

# Apply label encoding to each categorical column
for column in categorical_columns:
    df[column] = label_encoder.fit_transform(df[column])


X = df.drop('LeaveOrNot', axis=1)
y = df['LeaveOrNot']


from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)


from sklearn.ensemble import RandomForestClassifier

model = RandomForestClassifier(n_estimators=100, random_state=42)


model.fit(X_train, y_train)
```

```
RandomForestClassifier
RandomForestClassifier(random_state=42)
```

```
# Make predictions on the test set

y_pred = model.predict(X_test)


from sklearn.metrics import accuracy_score


accuracy = accuracy_score(y_test, y_pred)

print(f"Accuracy: {accuracy * 100:.2f}%")
```

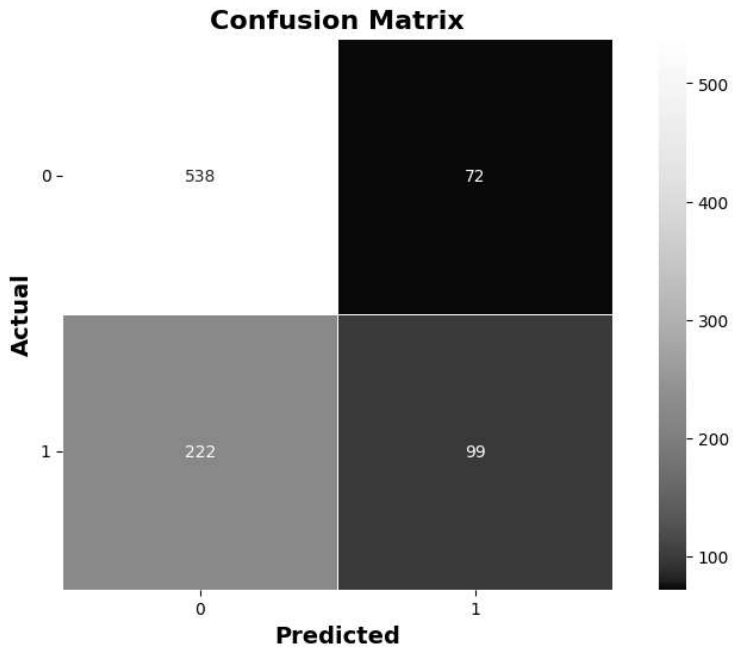
```
Accuracy: 84.96%
```

```
from sklearn.metrics import classification_report


print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.86      0.92      0.89       610
           1       0.82      0.72      0.77       321

    accuracy                           0.85       931
   macro avg       0.84      0.82      0.83       931
weighted avg       0.85      0.85      0.85       931
```

```
from sklearn.metrics import confusion_matrix


cm = confusion_matrix(y_test, y_pred)

plt.figure(figsize=(10, 6))

sns.heatmap(
    cm, annot=True, fmt='d', cmap='pink', linewidths=0.4, square=True, cbar=True,
    xticklabels=["0", "1"],
    yticklabels=["0", "1"]
)

plt.xlabel('Predicted', fontsize=14, fontweight='bold')
plt.ylabel('Actual', fontsize=14, fontweight='bold')
```

```
plt.title('Confusion Matrix', fontsize=16, fontweight='bold')
plt.yticks(rotation=360)

plt.show()
```




```
# Example of a model that may be underfitting
from sklearn.tree import DecisionTreeClassifier

# Assume X_train and y_train are your training features and labels
clf = DecisionTreeClassifier(max_depth=1)
clf.fit(X_train, y_train)
```

```
DecisionTreeClassifier
DecisionTreeClassifier(max_depth=1)
```

```
y_pred = clf.predict(X_test)
```

```
accuracy = accuracy_score(y_test, y_pred)

print(f"Accuracy: {accuracy * 100:.2f}%")
```

```
Accuracy: 74.22%
```

```
print(classification_report(y_test, y_pred))
```

```
                  precision    recall  f1-score   support

               0       0.72      1.00      0.84       610
               1       1.00      0.25      0.40       321

        accuracy                           0.74       931
       macro avg       0.86      0.63      0.62       931
    weighted avg       0.81      0.74      0.69       931
```

```
from sklearn.naive_bayes import GaussianNB

# Build a Gaussian Classifier
model = GaussianNB()

# Model training
model.fit(X_train, y_train)
```

```
GaussianNB
GaussianNB()
```

```
y_pred1 = model.predict(X_test)
```

```
accuracy = accuracy_score(y_test, y_pred1)

print(f"Accuracy: {accuracy * 100:.2f}%")
```

```
Accuracy: 68.53%
```

```
# importing SVM
from sklearn.svm import SVC
model_svm = SVC(kernel = 'linear', random_state = 0)
```

```
model_svm.fit(X_train, y_train)
```

```
SVC
SVC(kernel='linear', random_state=0)
```

```
y_pred = model_svm.predict(X_test)
```

```
accuracy = accuracy_score(y_test, y_pred)
print(f"Accuracy: {accuracy * 100:.2f}%")
```

```
Accuracy: 68.42%
```