ass2

February 13, 2024

[2]:
```
import numpy as np
import pandas as pd
import seaborn as sns

df = pd.read_csv(r"C:\Users\abhib\Desktop\ml_project\Untitled␣
 ↪Folder\Academic_Performance.csv")
```

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

[3]:
```
          STUDENT_ID GENDER PLACEMENT HONOR_OPTED_OR_NOT EDUCATION_TYPE  \
0  SB11201210000129      F       Yes                Yes       ACADEMIC
1  SB11201210000137      F       Yes                Yes       ACADEMIC
2  SB11201210005154      M        No                Yes       ACADEMIC
3  SB11201210007504      F       Yes                Yes       ACADEMIC
4  SB11201210007548      M       Yes                Yes       ACADEMIC

          ACADEMIC_PROGRAM  COURSE 1 MARKS  COURSE 2 MARKS  COURSE 3 MARKS  \
0  INDUSTRIAL ENGINEERING            71.0            93.0            71.0
1  INDUSTRIAL ENGINEERING            97.0            38.0            86.0
2  ELECTRONIC ENGINEERING            17.0             1.0            18.0
3  INDUSTRIAL ENGINEERING            65.0            35.0            76.0
4  INDUSTRIAL ENGINEERING            94.0            94.0            98.0

   COURSE 4 MARKS  COURSE 5 MARKS  PERCENTILE OVEARLL_GRADE
0            93.0            79.0          91   FIRST CLASS
1            98.0            78.0          92   THIRD CLASS
2            43.0            22.0           7   DISTINCTION
3            80.0            48.0          67   FIRST CLASS
4           100.0            71.0          98   FIRST CLASS
```

[4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 12411 entries, 0 to 12410
Data columns (total 13 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   STUDENT_ID          12411 non-null  object
 1   GENDER              12389 non-null  object
 2   PLACEMENT           12396 non-null  object
 3   HONOR_OPTED_OR_NOT  12397 non-null  object
 4   EDUCATION_TYPE      12396 non-null  object
 5   ACADEMIC_PROGRAM    12377 non-null  object
 6   COURSE 1 MARKS      12400 non-null  float64
 7   COURSE 2 MARKS      12403 non-null  float64
 8   COURSE 3 MARKS      12397 non-null  float64
 9   COURSE 4 MARKS      12397 non-null  float64
 10  COURSE 5 MARKS      12389 non-null  float64
 11  PERCENTILE          12411 non-null  int64
 12  OVEARLL_GRADE       12411 non-null  object
dtypes: float64(5), int64(1), object(7)
memory usage: 1.2+ MB
```

[5]:

```python
missing_values=df.isnull().sum()
print(missing_values)
```

```
STUDENT_ID             0
GENDER                22
PLACEMENT             15
HONOR_OPTED_OR_NOT    14
EDUCATION_TYPE        15
ACADEMIC_PROGRAM      34
COURSE 1 MARKS        11
COURSE 2 MARKS         8
COURSE 3 MARKS        14
COURSE 4 MARKS        14
COURSE 5 MARKS        22
PERCENTILE             0
OVEARLL_GRADE          0
dtype: int64
```

[6]:

```python
df.dropna(subset=['GENDER'], inplace=True)
df.isnull().sum()
```

[6]:

```
STUDENT_ID             0
GENDER                 0
PLACEMENT             15
HONOR_OPTED_OR_NOT    14
EDUCATION_TYPE        14
ACADEMIC_PROGRAM      28
COURSE 1 MARKS        11
COURSE 2 MARKS         8
COURSE 3 MARKS        13
COURSE 4 MARKS        12
COURSE 5 MARKS        21
```

```
PERCENTILE              0
OVEARLL_GRADE           0
dtype: int64
```

[7]:

```
df['COURSE 1 MARKS']=df['COURSE 1 MARKS'].replace(np.NaN,df['COURSE 1 MARKS'].
 ↪median())
df['COURSE 2 MARKS']=df['COURSE 2 MARKS'].replace(np.NaN,df['COURSE 2 MARKS'].
 ↪median())
df['COURSE 3 MARKS']=df['COURSE 3 MARKS'].replace(np.NaN,df['COURSE 3 MARKS'].
 ↪median())
df['COURSE 4 MARKS']=df['COURSE 4 MARKS'].replace(np.NaN,df['COURSE 4 MARKS'].
 ↪median())
df['COURSE 5 MARKS']=df['COURSE 5 MARKS'].replace(np.NaN,df['COURSE 5 MARKS'].
 ↪median())

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

[7]:

```
STUDENT_ID              0
GENDER                  0
PLACEMENT              15
HONOR_OPTED_OR_NOT     14
EDUCATION_TYPE         14
ACADEMIC_PROGRAM       28
COURSE 1 MARKS          0
COURSE 2 MARKS          0
COURSE 3 MARKS          0
COURSE 4 MARKS          0
COURSE 5 MARKS          0
PERCENTILE              0
OVEARLL_GRADE           0
dtype: int64
```

[8]:

```
from sklearn.impute import SimpleImputer
imputer = SimpleImputer(strategy='constant', fill_value='missing')
x = imputer.fit_transform(df[['ACADEMIC_PROGRAM']])
print(x)

pd.isnull(x).sum()
```

```
[['INDUSTRIAL ENGINEERING']
 ['INDUSTRIAL ENGINEERING']
 ['ELECTRONIC ENGINEERING']
 …
 ['INDUSTRIAL ENGINEERING']
 ['missing']
 ['INDUSTRIAL ENGINEERING']]
```

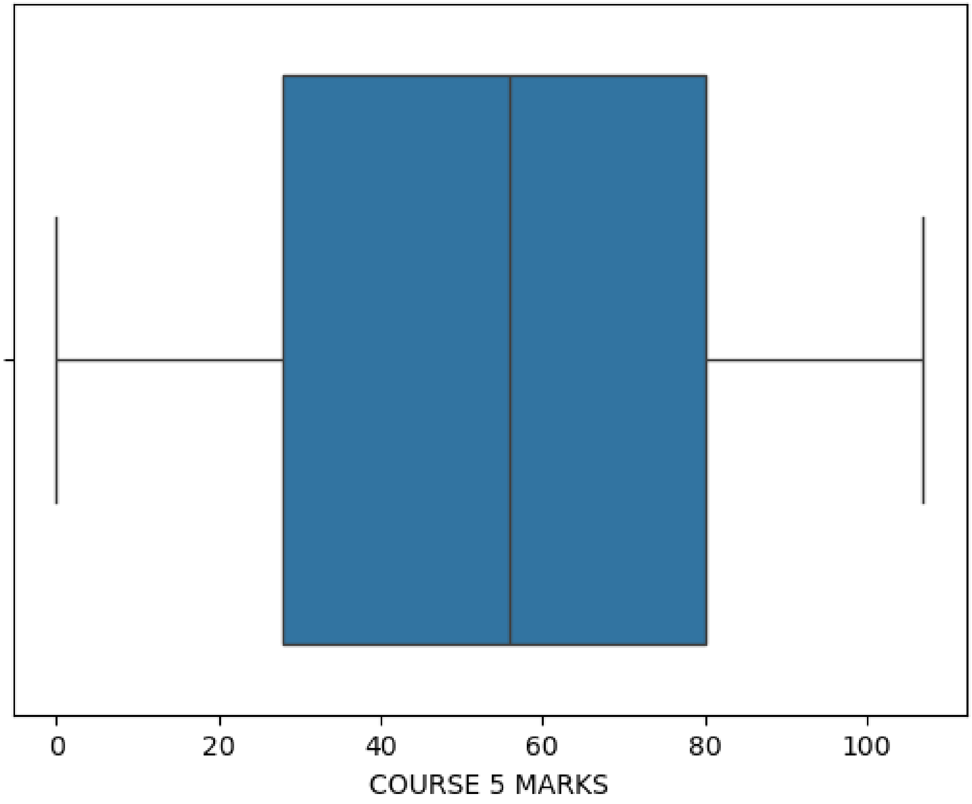
[8]: 0

[9]:
```
imputer = SimpleImputer(strategy='most_frequent')
y = imputer.fit_transform(df[['EDUCATION_TYPE']])
print(y)

pd.isnull(y).sum()
```

```
[['ACADEMIC']
 ['ACADEMIC']
 ['ACADEMIC']
 …
 ['ACADEMIC']
 ['ACADEMIC']
 ['ACADEMIC']]
```

[9]: 0

[10]:
```
import seaborn as sns
import matplotlib.pyplot as plt
sns.boxplot(data=df,x=df['COURSE 5 MARKS'])

plt.show()
```



[11]:

```
#Detecting Outliers with Z-scores
import numpy as np
outliers = []

def outliers_zscore(data):
    thres = 3
    mean = np.mean(data)
    std = np.std(data)
    for i in data:
        z_score = (i-mean)/std
        if (np.abs(z_score) > thres):
            outliers.append(i)
    return outliers

col_outliers = outliers_zscore(df['COURSE 1 MARKS'])
print("Outliers from Z-scores method: ", col_outliers)
```

```
Outliers from Z-scores method:  [6.0, 3.0, 1.0, 5.0, 2.0, 8.0, 7.0, 2.0, 8.0,
6.0, 9.0, 2.0, 9.0, 8.0, 1.0, 9.0, 2.0, 2.0, 1.0, 6.0, 7.0, 4.0, 5.0, 9.0, 7.0,
9.0, 1.0, 2.0, 8.0, 5.0, 2.0, 8.0, 8.0, 1.0, 4.0, 7.0, 4.0, 7.0, 8.0, 3.0, 8.0,
5.0, 9.0, 7.0, 8.0, 7.0, 1.0, 9.0, 2.0, 7.0, 5.0, 3.0, 7.0, 3.0, 8.0, 6.0, 9.0,
8.0, 9.0, 6.0, 1.0, 7.0, 8.0, 1.0, 9.0, 1.0, 7.0, 8.0, 9.0, 6.0, 7.0, 7.0, 8.0,
4.0, 6.0, 6.0, 5.0, -1.0, 8.0, 8.0, 3.0, 1.0, 3.0, 3.0, 2.0, 9.0, 8.0, 3.0, 6.0,
3.0, 2.0, 7.0, 8.0, 4.0, 8.0, 3.0, 7.0, 9.0, 9.0, 3.0, 7.0, 6.0, 1.0, 1.0, 1.0,
-1.0, 9.0, 4.0, 8.0, 7.0, 1.0, 6.0]
```

[12]:

```
#Detecting Outliers with IQR
outliers = []
def outliers_iqr(data):
    data = sorted(data)
    q1 = np.percentile(data, 25)
    q3 = np.percentile(data, 75)
    IQR = q3-q1
    lwr_bound = q1-(1.5*IQR)
    upr_bound = q3+(1.5*IQR)
    print(lwr_bound, upr_bound)
    for i in data:
         if (i<lwr_bound or i>upr_bound):
            outliers.append(i)
    return outliers

marks_outliers = outliers_iqr(df['COURSE 2 MARKS'])
print("Outliers from IQR method: ", marks_outliers)
```

```
-24.0 152.0
```

```
Outliers from IQR method:  []
```

[13]:

```python
categorical = df.select_dtypes(exclude=[np.number])
categorical
```

[13]:

```
             STUDENT_ID GENDER PLACEMENT HONOR_OPTED_OR_NOT EDUCATION_TYPE  \
0      SB11201210000129     F       Yes                Yes       ACADEMIC
1      SB11201210000137     F       Yes                Yes       ACADEMIC
2      SB11201210005154     M        No                Yes       ACADEMIC
3      SB11201210007504     F       Yes                Yes       ACADEMIC
4      SB11201210007548     M       Yes                Yes       ACADEMIC
…                 …    …       …                …            …
12406  SB11201420568705     M       Yes                Yes       ACADEMIC
12407  SB11201420573045     M       Yes                Yes       ACADEMIC
12408  SB11201420578809     M       Yes                 No       ACADEMIC
12409  SB11201420578812     F       Yes                Yes       ACADEMIC
12410  SB11201420583232     M        No                 No       ACADEMIC

               ACADEMIC_PROGRAM OVEARLL_GRADE
0        INDUSTRIAL ENGINEERING   FIRST CLASS
1        INDUSTRIAL ENGINEERING   THIRD CLASS
2        ELECTRONIC ENGINEERING   DISTINCTION
3        INDUSTRIAL ENGINEERING   FIRST CLASS
4        INDUSTRIAL ENGINEERING   FIRST CLASS
…                            …          …
12406  MECHATRONICS ENGINEERING   FIRST CLASS
12407    INDUSTRIAL ENGINEERING   FIRST CLASS
12408    INDUSTRIAL ENGINEERING   FIRST CLASS
12409                       NaN   FIRST CLASS
12410    INDUSTRIAL ENGINEERING   THIRD CLASS

[12389 rows x 7 columns]
```

[14]:

```python
categorical.PLACEMENT.value_counts()
```

[14]:

```
PLACEMENT
Yes    9720
No     2654
Name: count, dtype: int64
```

[15]:

```python
categorical.PLACEMENT.replace({"Yes":1, "No":0}, inplace= True)
categorical.head()
```

[15]:

```
         STUDENT_ID GENDER  PLACEMENT HONOR_OPTED_OR_NOT EDUCATION_TYPE  \
0  SB11201210000129      F        1.0                Yes       ACADEMIC
1  SB11201210000137      F        1.0                Yes       ACADEMIC
2  SB11201210005154      M        0.0                Yes       ACADEMIC
```

```
3  SB11201210007504      F        1.0                Yes       ACADEMIC
4  SB11201210007548      M        1.0                Yes       ACADEMIC

         ACADEMIC_PROGRAM OVEARLL_GRADE
0  INDUSTRIAL ENGINEERING   FIRST CLASS
1  INDUSTRIAL ENGINEERING   THIRD CLASS
2  ELECTRONIC ENGINEERING   DISTINCTION
3  INDUSTRIAL ENGINEERING   FIRST CLASS
4  INDUSTRIAL ENGINEERING   FIRST CLASS
```

[16]:

```
#Label Encoding
categorical = categorical.drop('STUDENT_ID',axis=1)
categorical.head()
```

[16]:

```
  GENDER  PLACEMENT HONOR_OPTED_OR_NOT EDUCATION_TYPE        ACADEMIC_PROGRAM  \
0      F        1.0                Yes       ACADEMIC  INDUSTRIAL ENGINEERING
1      F        1.0                Yes       ACADEMIC  INDUSTRIAL ENGINEERING
2      M        0.0                Yes       ACADEMIC  ELECTRONIC ENGINEERING
3      F        1.0                Yes       ACADEMIC  INDUSTRIAL ENGINEERING
4      M        1.0                Yes       ACADEMIC  INDUSTRIAL ENGINEERING

  OVEARLL_GRADE
0   FIRST CLASS
1   THIRD CLASS
2   DISTINCTION
3   FIRST CLASS
4   FIRST CLASS
```

[17]:

```
column_category = categorical.select_dtypes(exclude=[np.number]).columns
column_category
```

[17]:

```
Index(['GENDER', 'HONOR_OPTED_OR_NOT', 'EDUCATION_TYPE', 'ACADEMIC_PROGRAM',
       'OVEARLL_GRADE'],
      dtype='object')
```

[18]:

```
from sklearn.preprocessing import LabelEncoder
label_encoder = LabelEncoder()
for i in column_category:
    categorical[i] = label_encoder.fit_transform(categorical[i])
print("Label Encoded Data: ")
categorical.head()
```

```
Label Encoded Data:
```

[18]:

```
   GENDER  PLACEMENT  HONOR_OPTED_OR_NOT  EDUCATION_TYPE  ACADEMIC_PROGRAM  \
0       0        1.0                   1               0                13
1       0        1.0                   1               0                13
```

```
2       1        0.0                   1               0                10
3       0        1.0                   1               0                13
4       1        1.0                   1               0                13

   OVEARLL_GRADE
0              1
1              3
2              0
3              1
4              1
```

[19]:
```
#One Hot Encoding
from sklearn.preprocessing import OneHotEncoder
onehot_encoder = OneHotEncoder(sparse_output=False)
onehot_encoded = onehot_encoder.fit_transform(categorical[column_category])

onehot_encoded
```

[19]:
```
array([[1., 0., 0., …, 1., 0., 0.],
       [1., 0., 0., …, 0., 0., 1.],
       [0., 1., 0., …, 0., 0., 0.],
       …,
       [0., 1., 1., …, 1., 0., 0.],
       [1., 0., 0., …, 1., 0., 0.],
       [0., 1., 1., …, 0., 0., 1.]])
```

[21]:
```
onehot_encoded_frame = pd.DataFrame(onehot_encoded, columns = onehot_encoder.
 ↪get_feature_names_out(column_category))

onehot_encoded_frame.head()
```

[21]:
```
   GENDER_0  GENDER_1  HONOR_OPTED_OR_NOT_0  HONOR_OPTED_OR_NOT_1  \
0       1.0       0.0                   0.0                   1.0
1       1.0       0.0                   0.0                   1.0
2       0.0       1.0                   0.0                   1.0
3       1.0       0.0                   0.0                   1.0
4       0.0       1.0                   0.0                   1.0

   HONOR_OPTED_OR_NOT_2  EDUCATION_TYPE_0  EDUCATION_TYPE_1  EDUCATION_TYPE_2  \
0                   0.0               1.0               0.0               0.0
1                   0.0               1.0               0.0               0.0
2                   0.0               1.0               0.0               0.0
3                   0.0               1.0               0.0               0.0
4                   0.0               1.0               0.0               0.0

   EDUCATION_TYPE_3  EDUCATION_TYPE_4  …  ACADEMIC_PROGRAM_16  \
0               0.0               0.0  …                  0.0
```

```
1               0.0               0.0  …                  0.0
2               0.0               0.0  …                  0.0
3               0.0               0.0  …                  0.0
4               0.0               0.0  …                  0.0

   ACADEMIC_PROGRAM_17  ACADEMIC_PROGRAM_18  ACADEMIC_PROGRAM_19  \
0                  0.0                  0.0                  0.0
1                  0.0                  0.0                  0.0
2                  0.0                  0.0                  0.0
3                  0.0                  0.0                  0.0
4                  0.0                  0.0                  0.0

   ACADEMIC_PROGRAM_20  ACADEMIC_PROGRAM_21  OVEARLL_GRADE_0  OVEARLL_GRADE_1  \
0                  0.0                  0.0              0.0              1.0
1                  0.0                  0.0              0.0              0.0
2                  0.0                  0.0              1.0              0.0
3                  0.0                  0.0              0.0              1.0
4                  0.0                  0.0              0.0              1.0

   OVEARLL_GRADE_2  OVEARLL_GRADE_3
0              0.0              0.0
1              0.0              1.0
2              0.0              0.0
3              0.0              0.0
4              0.0              0.0

[5 rows x 36 columns]
```

[ ]: