01. data_cleaning

October 8, 2024

1 Data Cleaning and Preprocessing

[6]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

import httpimport

from pathlib import Path
```

[7]:

```
# Import personal library
with httpimport.github_repo("junclemente", "jcds", ref="master"):
    import jcds.eda as jq
```

[8]:

```
datasets = Path("../datasets/")
df_file = "maven_business_school/MavenBusinessSchool(final).xlsx"
df = pd.read_excel(datasets / df_file)
df.head()
```

[8]:

```
   Student ID  Undergrad Degree  Undergrad Grade  MBA Grade Work Experience  \
0           1          Business             68.4       90.2              No
1           2          Business             62.1       92.8              No
2           3  Computer Science             70.2       68.7             Yes
3           4       Engineering             75.1       80.7              No
4           5           Finance             60.9       74.9              No

   Employability (Before)  Employability (After)      Status  Annual Salary
0                   252.0                  276.0      Placed       111000.0
1                   423.0                  410.0  Not Placed            NaN
2                   101.0                  119.0      Placed       107000.0
3                   288.0                  334.0  Not Placed            NaN
4                   248.0                  252.0  Not Placed            NaN
```

1.1 Data Quality Reports

```
[9]: jq.quick_report(df)
```

```
============================================
Quick Report - info(memory_usage='deep')
Total cols: 9
Rows missing all values: 0 (0.0%)
Total Rows: 1200
Cols with missing values: 4 (44.44%)
Total missing values in dataset: 4
============================================
Categorical features: 3
- Undergrad Degree: 5 unique values
- Work Experience: 2 unique values
- Status: 2 unique values
============================================
Continuous features: 6
- Student ID: 1200 unique values
- Undergrad Grade: 762 unique values
- MBA Grade: 837 unique values
- Employability (Before): 1182 unique values
- Employability (After): 776 unique values
- Annual Salary: 89 unique values
```

1.1.1 Categorical Features

```
[10]: jq.dqr_cat(df)
```

```
The categorical features are:
['Undergrad Degree', 'Work Experience', 'Status']
Data Quality Report for Categorical Features
Total features: 3 / 1200 rows
============================================
Stats
-----

            Feature  Count  Missing  % Missing  Cardinality
0  Undergrad Degree   1200        0        0.0            5
1   Work Experience   1200        0        0.0            2
2            Status   1200        0        0.0            2



Mode 1
------

            Feature    Mode 1  Mode 1 Freq.  Mode 1 %
0  Undergrad Degree  Business           257     21.42
1   Work Experience        No          1066     88.83
```

```
2            Status    Placed           716     59.67



Mode 2
------

            Feature            Mode 2  Mode 2 Freq.  Mode 2 %
0  Undergrad Degree  Computer Science           240     20.00
1   Work Experience               Yes           134     11.17
2            Status        Not Placed           484     40.33



Descriptive Stats
-----------------

                 count unique       top  freq
Undergrad Degree  1200      5  Business   257
Work Experience   1200      2        No  1066
Status            1200      2    Placed   716
```

1.1.2 Continuous Features

[11]:

```
jq.dqr_cont(df)
```

```
The non-categorical features are:
['Student ID', 'Undergrad Grade', 'MBA Grade', 'Employability (Before)',
'Employability (After)', 'Annual Salary']
Data Quality for Continous Features
Total Features: 6 / 1200 rows

                  Feature  Count  Missing  % missing  Cardinality
0              Student ID   1200        0       0.00         1200
1         Undergrad Grade   1164       36       3.00          762
2               MBA Grade   1200        0       0.00          837
3  Employability (Before)   1193        7       0.58         1182
4   Employability (After)   1195        5       0.42          776
5           Annual Salary    716      484      40.33           89



Descriptive Stats

                         count       mean       std      min        25%  \
Student ID              1200.0     600.50    346.55      1.0     300.75
Undergrad Grade         1164.0      56.56     22.31     10.0      39.88
MBA Grade               1200.0      52.83     23.49      0.0      35.72
Employability (Before)  1193.0     216.31     36.28     62.0     189.96
Employability (After)   1195.0     288.08    124.53     62.0     197.86
Annual Salary            716.0  125285.71  49343.71  20000.0  100500.00
```

```
                               50%        75%        max
Student ID                  600.50     900.25    1200.00
Undergrad Grade              56.91      75.02     100.00
MBA Grade                    53.20      72.47      96.10
Employability (Before)      215.24     239.66     423.00
Employability (After)       260.93     349.00     697.39
Annual Salary            100500.00  148000.00  470333.33
```

[12]:

```
# Verify that all 484 missing values in Annual Salary is due to Status == Not␣
  ↪Placed
nan_annual_salary = df[
    (df.Status == "Not Placed") & (df["Annual Salary"].isna())
].shape[0]
print(
    f"Number of NaN values in Annual Salary where Status == 'Not Placed':␣
  ↪{nan_annual_salary}."
)
```

```
Number of NaN values in Annual Salary where Status == 'Not Placed': 484.
```

1.2 Clean missing values

[13]:

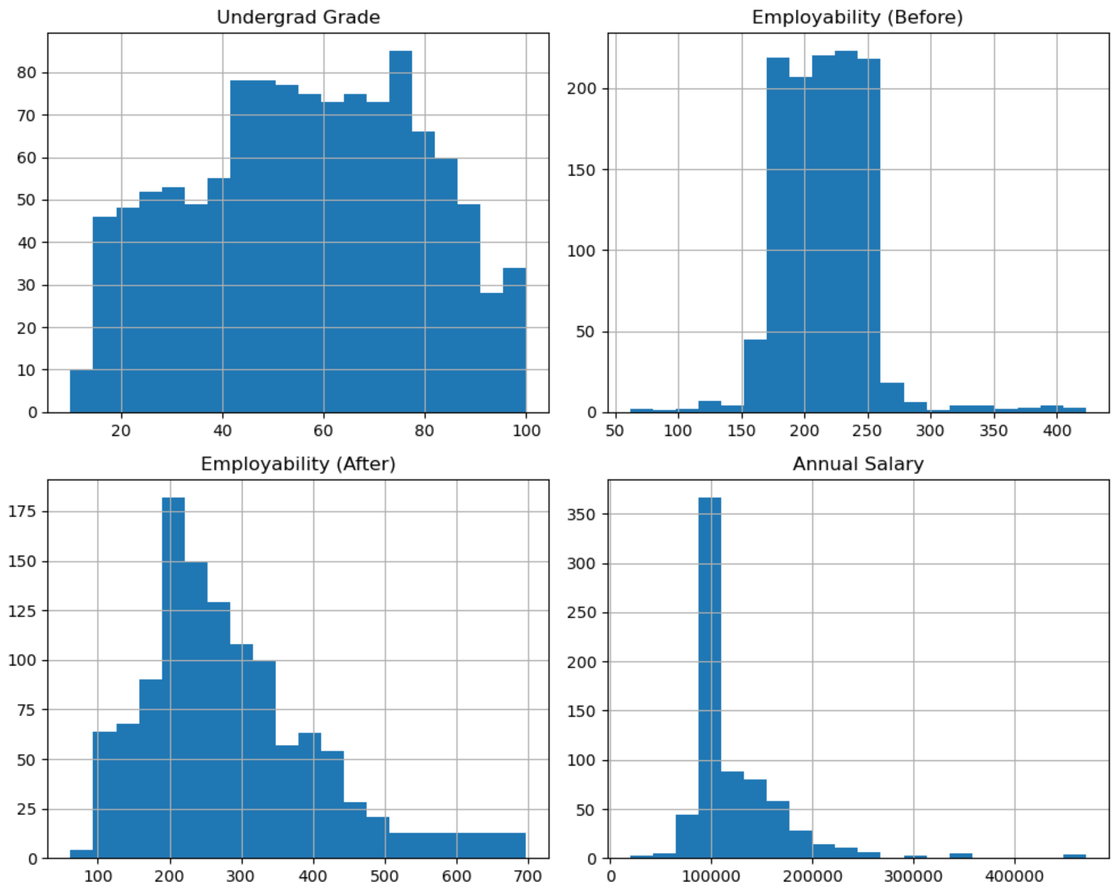
```
cols = df.columns.tolist()
cols
```

[13]:

```
['Student ID',
 'Undergrad Degree',
 'Undergrad Grade',
 'MBA Grade',
 'Work Experience',
 'Employability (Before)',
 'Employability (After)',
 'Status',
 'Annual Salary']
```

[14]:

```
missing_cols = [
    "Undergrad Grade",
    "Employability (Before)",
    "Employability (After)",
    "Annual Salary",
]
df[missing_cols].hist(bins=20, figsize=(10, 8))
plt.tight_layout()
plt.show()
```



Based on the skewness of the distribution shown in the charts, the median will be used to impute missing values.

Missing values in Annual Salary will be imputed with 0.

1.2.1 Impute Missing Values

[15]:

```
df["Undergrad Grade"].fillna(df["Undergrad Grade"].median(), inplace=True)
df["Employability (Before)"].fillna(df["Employability (Before)"].median(),␣
  ↪inplace=True)
df["Employability (After)"].fillna(df["Employability (After)"].median(),␣
  ↪inplace=True)
# Replace missing values with 0 for Annual Salary.
df["Annual Salary"].fillna(0, inplace=True)
```

[16]:

```
jq.dqr_cont(df)
```

```
The non-categorical features are:
['Student ID', 'Undergrad Grade', 'MBA Grade', 'Employability (Before)',
'Employability (After)', 'Annual Salary']
```

```
Data Quality for Continous Features
Total Features: 6 / 1200 rows

                  Feature  Count  Missing  % missing  Cardinality
0              Student ID   1200        0        0.0         1200
1          Undergrad Grade   1200        0        0.0          762
2               MBA Grade   1200        0        0.0          837
3  Employability (Before)   1200        0        0.0         1181
4   Employability (After)   1200        0        0.0          775
5           Annual Salary   1200        0        0.0           89



Descriptive Stats

                         count      mean       std   min     25%        50%  \
Student ID              1200.0    600.50    346.55   1.0  300.75     600.50
Undergrad Grade         1200.0     56.57     21.97  10.0   40.50      56.91
MBA Grade               1200.0     52.83     23.49   0.0   35.72      53.20
Employability (Before)  1200.0    216.30     36.17  62.0  190.11     215.24
Employability (After)   1200.0    287.97    124.28  62.0  197.96     260.93
Annual Salary           1200.0  74753.81  72336.36   0.0    0.00  100500.00

                              75%        max
Student ID                 900.25    1200.00
Undergrad Grade             74.53     100.00
MBA Grade                   72.47      96.10
Employability (Before)     239.52     423.00
Employability (After)      348.40     697.39
Annual Salary           109000.00  470333.33
```

2 Export Clean Dataset

[17]:

```
# Rename columns to remove spaces and brackets
df.columns = df.columns.str.replace(" ", "_").str.replace("(", "").str.
 ↪replace(")", "")
print(df.columns)
```

```
Index(['Student_ID', 'Undergrad_Degree', 'Undergrad_Grade', 'MBA_Grade',
       'Work_Experience', 'Employability_Before', 'Employability_After',
       'Status', 'Annual_Salary'],
      dtype='object')
```

[18]:

```
df_clean = df.copy()
df_clean.to_csv(datasets / "school_clean.csv", index=False)
```

[19]:

```
dfc = pd.read_csv(datasets / "school_clean.csv")
dfc.head()
```

[19]:

```
   Student_ID  Undergrad_Degree  Undergrad_Grade  MBA_Grade Work_Experience  \
0           1          Business             68.4       90.2              No
1           2          Business             62.1       92.8              No
2           3  Computer Science             70.2       68.7             Yes
3           4       Engineering             75.1       80.7              No
4           5           Finance             60.9       74.9              No

   Employability_Before  Employability_After      Status  Annual_Salary
0                 252.0                276.0      Placed       111000.0
1                 423.0                410.0  Not Placed            0.0
2                 101.0                119.0      Placed       107000.0
3                 288.0                334.0  Not Placed            0.0
4                 248.0                252.0  Not Placed            0.0
```

[ ]:

```

```