# Data Collection and Preprocessing Phase

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| Date | 04 July 2024 |
| Team ID | 739938 |
| Project Title | Anticipating Business Bankruptcy |
| Maximum Marks | 6 Marks |

## Data Exploration and Preprocessing Report

Dataset variables will be statistically analyzed to identify patterns and outliers, with Python employed for preprocessing tasks like normalization and feature engineering. Data cleaning will address missing values and outliers, ensuring quality for subsequent analysis and modeling, and forming a strong foundation for insights and predictions.

| Section | Description |
|---|---|
| Data Overview | <u>Dimension:</u><br>7012 rows × 65 columns<br><br>Shape of Data: (7012, 65)<br>number of Rows: 7012<br>Number of Columns: 65<br><br><u>Descriptive statistics:</u> |

| | Attr1 | Attr2 | Attr3 | Attr4 | Attr5 | Attr6 | Attr7 | Attr8 | Attr9 | Attr10 | ... | Attr56 | Attr57 | Attr58 | Attr59 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| count | 2164.000000 | 2164.000000 | 2164.000000 | 2164.000000 | 2164.000000 | 2164.000000 | 2164.000000 | 2164.000000 | 2164.000000 | 2164.000000 | ... | 2164.000000 | 2164.000000 | 2164.000000 | 2164.000000 |
| mean | -0.125994 | 0.467473 | 0.221102 | 3.207731 | 462.125375 | 0.214679 | 0.247490 | 2.809016 | 7.317679 | 2.447815 | ... | -0.222496 | 0.203481 | 1.223497 | 0.203927 |
| std | 7.849027 | 0.274810 | 0.261004 | 22.253505 | 21311.744355 | 6.532040 | 8.660704 | 7.707624 | 124.652580 | 36.765993 | ... | 15.103528 | 1.692055 | 15.103503 | 7.182671 |
| min | -256.890000 | -2.421800 | -1.313700 | 0.000000 | -14103.000000 | -2.978700 | -189.560000 | -141.410000 | 0.000098 | -0.933580 | ... | -701.630000 | -47.491000 | -0.004194 | -256.990000 |
| 25% | 0.032137 | 0.255955 | 0.055365 | 1.139975 | -36.989500 | 0.000000 | 0.040002 | 0.515637 | 1.057525 | 0.332850 | ... | 0.033924 | 0.070866 | 0.834657 | 0.000000 |
| 50% | 0.092146 | 0.448395 | 0.212050 | 1.634900 | 1.177700 | 0.000000 | 0.112020 | 1.179050 | 1.276700 | 0.532470 | ... | 0.085960 | 0.200275 | 0.916725 | 0.013458 |
| 75% | 0.188475 | 0.651275 | 0.393360 | 2.794175 | 45.836250 | 0.176522 | 0.223020 | 2.809016 | 2.074400 | 0.716457 | ... | 0.168387 | 0.388195 | 0.968518 | 0.228502 |
| max | 2.249400 | 1.933600 | 1.000000 | 1017.800000 | 990900.000000 | 303.670000 | 203.450000 | 208.880000 | 3876.100000 | 973.550000 | ... | 1.000000 | 24.354000 | 702.630000 | 112.880000 |

8 rows × 65 columns

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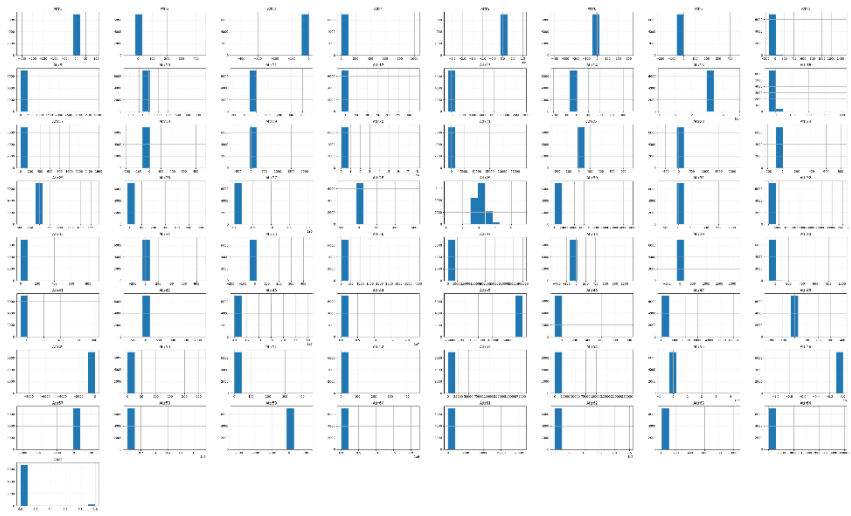
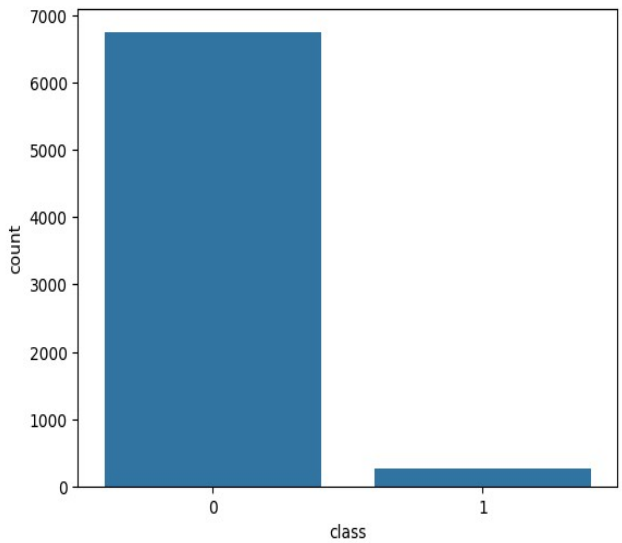
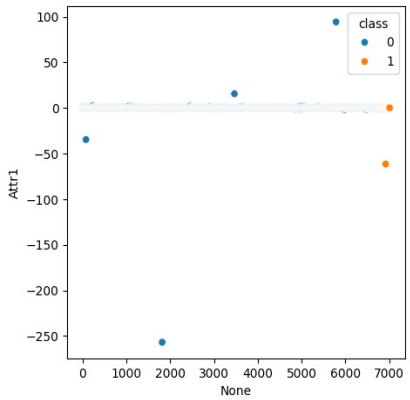
| Univariate Analysis | |

| | |
|---|---|
| |  <br>  |
| Bivariate Analysis |  |

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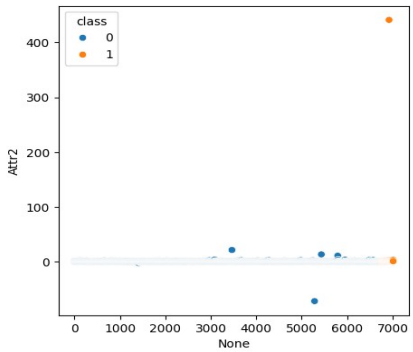
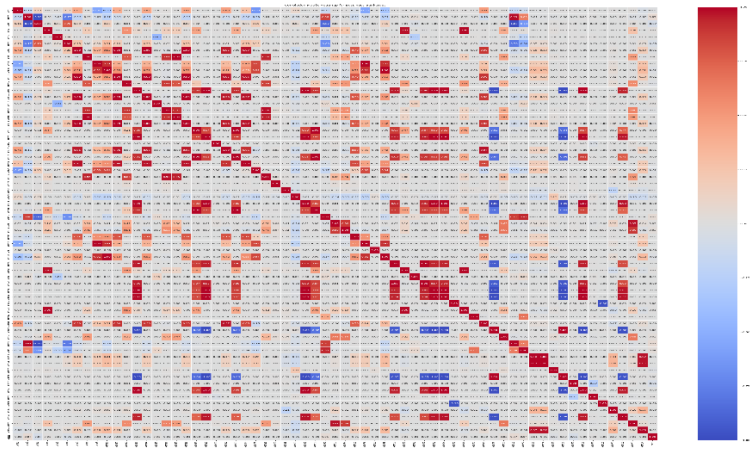
|---|---|
| |  |
| Multivariate Analysis |  |

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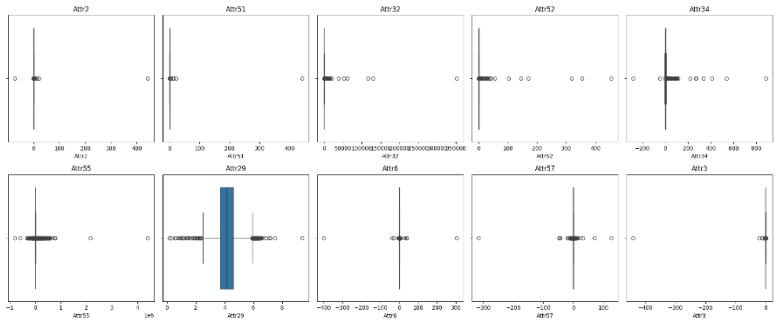
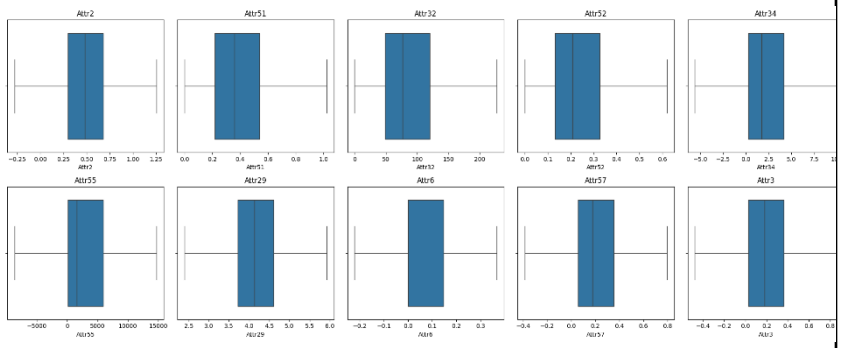
| Outliers and Anomalies |  <br>q1=data.quantile(0.25)<br>q3=data.quantile(0.75)<br>IQR=q3-q1<br>upper_limit=q3+1.5*IQR<br>lower_limit=q1-1.5*IQR<br>k=["Attr2","Attr51","Attr32","Attr52", "Attr34","Attr55","Attr29","Attr6","Attr57","Attr3"]<br>for i in k:<br>data[i]=np.where(data[i]>upper_limit[i],upper_limit[i],data[i])<br>data[i]=np.where(data[i]<lower_limit[i],lower_limit[i],data[i]) |




## Data Preprocessing Code Screenshots

### Loading Data

```
data = pd.read_csv("/content/drive/MyDrive/1year.csv")
```

```
data.head()
```

| | Attr1 | Attr2 | Attr3 | Attr4 | Attr5 | Attr6 | Attr7 | Attr8 | Attr9 | Attr10 | ... | Attr56 | Attr57 | Attr58 | Attr59 | Attr60 | Attr61 | Attr62 | Attr63 | Attr64 | class |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.20055 | 0.37951 | 0.39641 | 2.0472 | 32.351 | 0.38825 | 0.24976 | 1.3305 | 1.1389 | 0.50494 | ... | 0.121960 | 0.39718 | 0.87804 | 0.001924 | 8.416 | 5.1372 | 82.658 | 4.4158 | 7.4277 | 0 |
| 1 | 0.20912 | 0.49988 | 0.47225 | 1.9447 | 14.786 | 0 | 0.25834 | 0.99601 | 1.6996 | 0.49788 | ... | 0.121300 | 0.42002 | 0.85300 | 0 | 4.1486 | 3.2732 | 107.350 | 3.4 | 60.987 | 0 |
| 2 | 0.24866 | 0.69592 | 0.26713 | 1.5548 | -1.1523 | 0 | 0.30906 | 0.43695 | 1.309 | 0.30408 | ... | 0.241140 | 0.81774 | 0.76599 | 0.69484 | 4.9909 | 3.951 | 134.270 | 2.7185 | 5.2078 | 0 |
| 3 | 0.081483 | 0.30734 | 0.45879 | 2.4928 | 51.952 | 0.14988 | 0.092704 | 1.8661 | 1.0571 | 0.57353 | ... | 0.054015 | 0.14207 | 0.94598 | 0 | 4.5746 | 3.6147 | 86.435 | 4.2228 | 5.5497 | 0 |
| 4 | 0.18732 | 0.61323 | 0.2296 | 1.4063 | -7.3128 | 0.18732 | 0.18732 | 0.6307 | 1.1559 | 0.38677 | ... | 0.134850 | 0.48431 | 0.86515 | 0.12444 | 6.3985 | 4.3158 | 127.210 | 2.8692 | 7.898 | 0 |

5 rows × 65 columns

### Handling Missing Data

```
(data.eq('?').any()
```

```
Attr1     True
Attr2     True
Attr3     True
Attr4     True
Attr5     True
          ...
Attr61    True
Attr62   False
Attr63    True
Attr64    True
class    False
Length: 65, dtype: bool
```

```
data.replace('?',np.NAN,inplace=True)
```

```
data.isnull().sum()
```

```
Attr1     3
Attr2     3
Attr3     3
Attr4    30
Attr5     8
         ..
Attr61   22
Attr62    0
Attr63   30
Attr64   34
class     0
Length: 65, dtype: int64
```

```
data.isnull().sum().sum()
```

```
5818
```

```
for i in range(1, 65):
    data[f'Attr{i}'] = pd.to_numeric(data[f'Attr{i}'], errors='coerce')
```

```
data=data.fillna(data.mean())
```

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| | ```python<br>data.isnull().sum().sum()<br>```<br>```<br>0<br>```<br>```python<br>data.isnull().any()<br>```<br>```<br>Attr1 False<br>Attr2 False<br>Attr3 False<br>Attr4 False<br>Attr5 False<br>...<br>Attr61 False<br>Attr62 False<br>Attr63 False<br>Attr64 False<br>class False<br>Length: 65, dtype: bool<br>```<br>```python<br>x=selected_variable<br>y=data['class']<br>```<br>```python<br>x_scaled=pd.DataFrame(StandardScaler(copy=False).fit_transform(x))<br>x_scaled.columns=x.columns<br>```<br>```python<br>x.head()<br>```<br>| | Attr2 | Attr51 | Attr32 | Attr52 | Attr34 | Attr55 | Attr29 | Attr6 | Attr57 | Attr3 |<br>|---|---|---|---|---|---|---|---|---|---|---|<br>| 0 | 0.37951 | 0.37854 | 94.14 | 0.25792 | 0.56393 | 348690.0 | 5.9443 | 0.38825 | 0.39718 | 0.39641 |<br>| 1 | 0.49988 | 0.49988 | 122.17 | 0.33472 | 2.98760 | 2304.6 | 3.6884 | 0.00000 | 0.42002 | 0.47225 |<br>| 2 | 0.69592 | 0.48152 | 176.93 | 0.48474 | 1.42740 | 6332.7 | 4.3749 | 0.00000 | 0.81774 | 0.26713 |<br>| 3 | 0.30734 | 0.30734 | 91.37 | 0.25033 | 0.37581 | 20545.0 | 4.6511 | 0.14988 | 0.14207 | 0.45879 |<br>| 4 | 0.61323 | 0.56511 | 147.04 | 0.40285 | 0.32340 | 3186.6 | 4.1424 | 0.18732 | 0.48431 | 0.22960 |<br>SMOTE<br>```python<br>!pip install imblearn<br>from imblearn.over_sampling import SMOTE<br><br>sm=SMOTE(random_state=123) # Now SMOTE is defined<br>x_sm, y_sm = sm.fit_resample(x_scaled, y)<br>print(f'''Shape of X before SMOTE: {x_scaled.shape}<br>Shape of X after SMOTE: {x_sm.shape}''','\n\n')<br>print(f'''Target Class dstribution before SMOTE;\n{y.value_counts(normalize=True)}<br>Target Class distribution after SMOTE :\n{y_sm.value_counts(normalize=True)}''')<br>```<br>```<br>Requirement already satisfied: imblearn in /usr/local/lib/python3.10/dist-packages (0.0)<br>Requirement already satisfied: imbalanced-learn in /usr/local/lib/python3.10/dist-packages (from imblearn) (0.10.1)<br>Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.10/dist-packages (from imbalanced-learn->imblearn) (1.25.2)<br>Requirement already satisfied: scipy>=1.3.2 in /usr/local/lib/python3.10/dist-packages (from imbalanced-learn->imblearn) (1.11.4)<br>Requirement already satisfied: scikit-learn>=1.0.2 in /usr/local/lib/python3.10/dist-packages (from imbalanced-learn->imblearn) (1.2.2)<br>Requirement already satisfied: joblib>=1.1.1 in /usr/local/lib/python3.10/dist-packages (from imbalanced-learn->imblearn) (1.4.2)<br>Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.10/dist-packages (from imbalanced-learn->imblearn) (3.5.0)<br>Shape of X before SMOTE: (7012, 10)<br>Shape of X after SMOTE: (13512, 10)<br><br>Target Class dstribution before SMOTE;<br>class<br>0 0.963491<br>1 0.036509<br>Name: proportion, dtype: float64<br>Target Class distribution after SMOTE :<br>class<br>0 0.5<br>1 0.5<br>Name: proportion, dtype: float64<br>```<br>Data Transformation |
| Feature Engineering | Attached the codes in final submission. |
| Save Processed Data | - |