random-forest

November 25, 2024

[1]:
```
# Importing the libraries

import pandas as pd # Importing pandas for data manipulation and analysis
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
import scipy as sp
from sklearn import preprocessing
from sklearn.ensemble import␣
 ↪BaggingClassifier,AdaBoostClassifier,RandomForestClassifier
from sklearn.model_selection import KFold,cross_val_score
from sklearn.metrics import accuracy_score
from sklearn.ensemble import GradientBoostingClassifier
```

[2]:
```
data = pd.read_excel("/content/glass.xlsx", sheet_name = "glass")
```

[3]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 214 entries, 0 to 213
Data columns (total 10 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   RI      214 non-null    float64
 1   Na      214 non-null    float64
 2   Mg      214 non-null    float64
 3   Al      214 non-null    float64
 4   Si      214 non-null    float64
 5   K       214 non-null    float64
 6   Ca      214 non-null    float64
 7   Ba      214 non-null    float64
 8   Fe      214 non-null    float64
 9   Type    214 non-null    int64
dtypes: float64(9), int64(1)
memory usage: 16.8 KB
```

[4]:
```
data.isnull().sum()
```

[4]:
```
RI      0
Na      0
Mg      0
Al      0
Si      0
K       0
Ca      0
Ba      0
Fe      0
Type    0
dtype: int64
```

[5]:
```
duplicates = data.duplicated()
duplicates.value_counts()
```

[5]:
```
False    213
True       1
Name: count, dtype: int64
```

[6]:
```
data1 = data.drop_duplicates(keep=False)
```

[7]:
```
duplicates = data1.duplicated()
duplicates.value_counts()
```

[7]:
```
False    212
Name: count, dtype: int64
```

[8]:
```
data1.describe()
```

[8]:

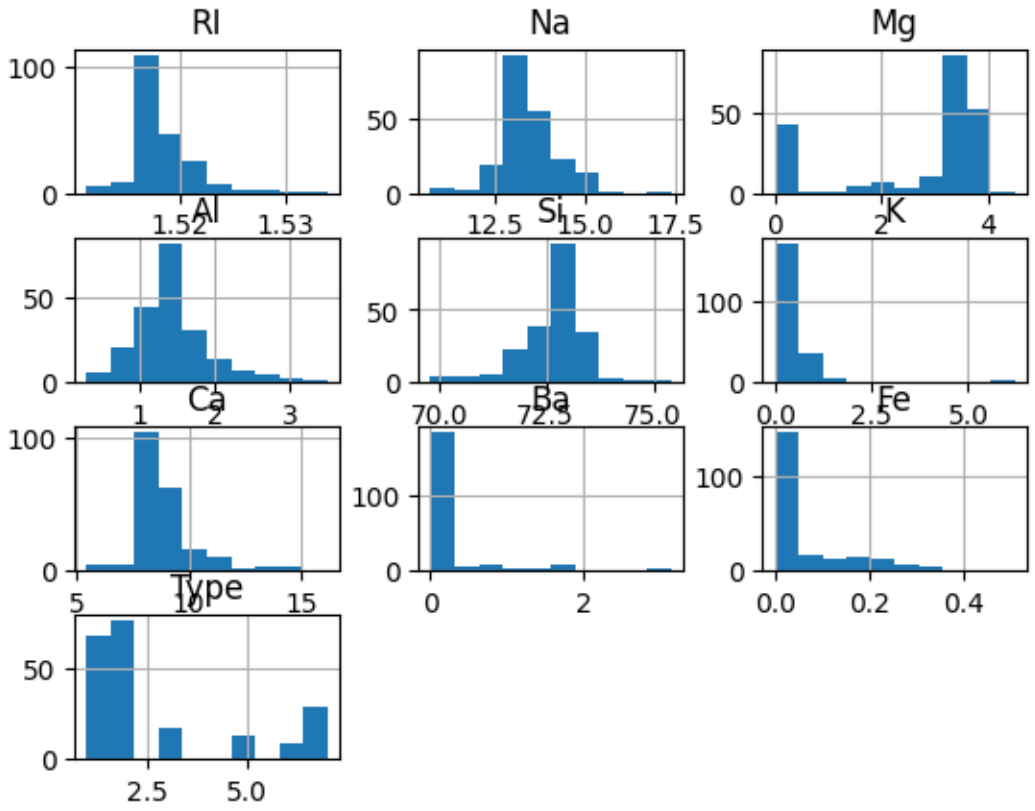
	RI	Na	Mg	Al	Si	K
count	212.000000	212.000000	212.000000	212.000000	212.000000	212.000000
mean	1.518330	13.400283	2.673821	1.454104	72.659245	0.500708
std	0.003029	0.816704	1.444965	0.492482	0.773423	0.654181
min	1.511150	10.730000	0.000000	0.290000	69.810000	0.000000
25%	1.516517	12.897500	2.037500	1.190000	72.310000	0.130000
50%	1.517670	13.295000	3.480000	1.365000	72.800000	0.560000
75%	1.519120	13.802500	3.600000	1.630000	73.092500	0.610000
max	1.533930	17.380000	4.490000	3.500000	75.410000	6.210000

	Ca	Ba	Fe	Type
count	212.000000	212.000000	212.000000	212.000000
mean	8.951179	0.176698	0.057547	2.797170
std	1.428624	0.499277	0.097740	2.106499
min	5.430000	0.000000	0.000000	1.000000
25%	8.237500	0.000000	0.000000	1.000000

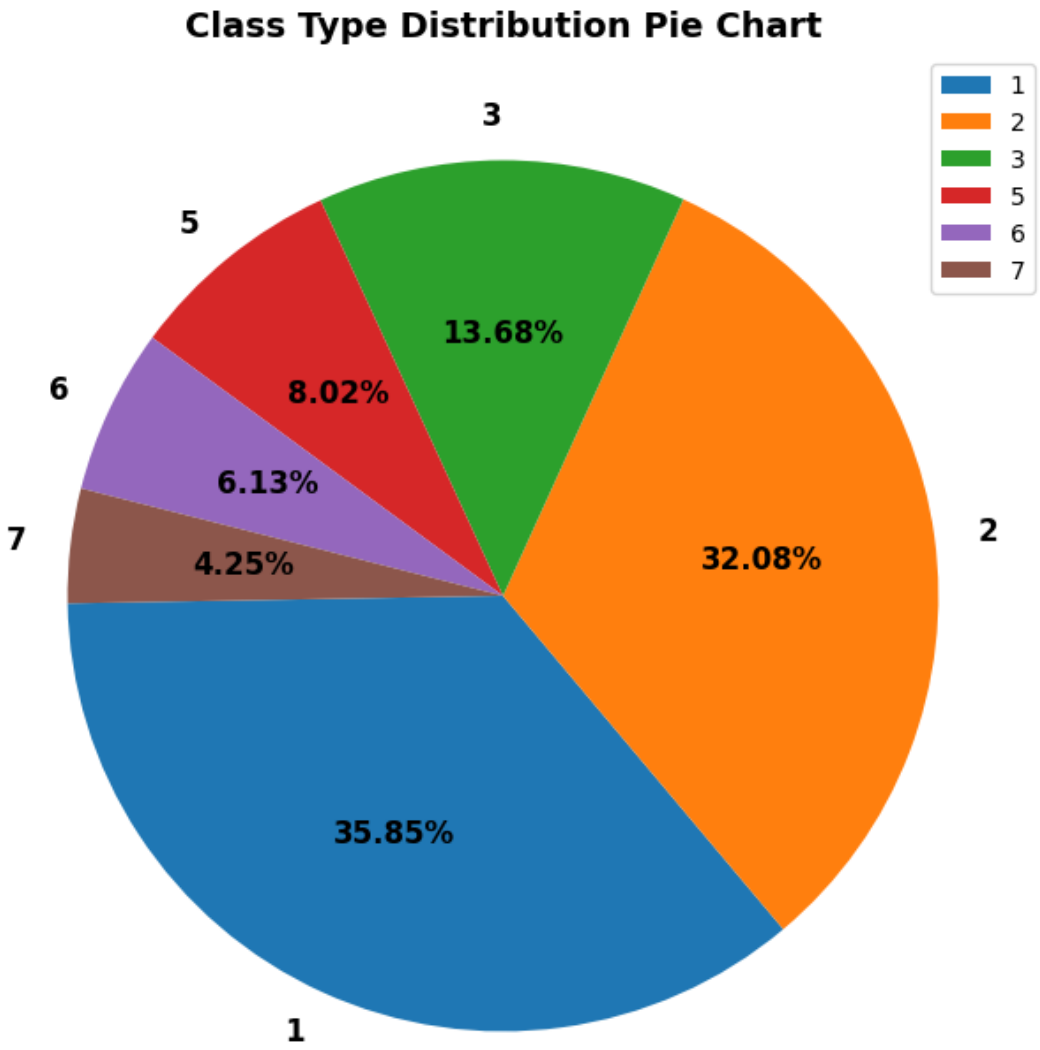
```
50%       8.600000     0.000000     0.000000     2.000000
75%       9.142500     0.000000     0.100000     3.000000
max      16.190000     3.150000     0.510000     7.000000
```

[9]:
```
data2= data1.copy()
```

[10]:
```
data2.hist()
plt.rcParams.update({'figure.figsize':(25,12), 'figure.dpi':100})
```

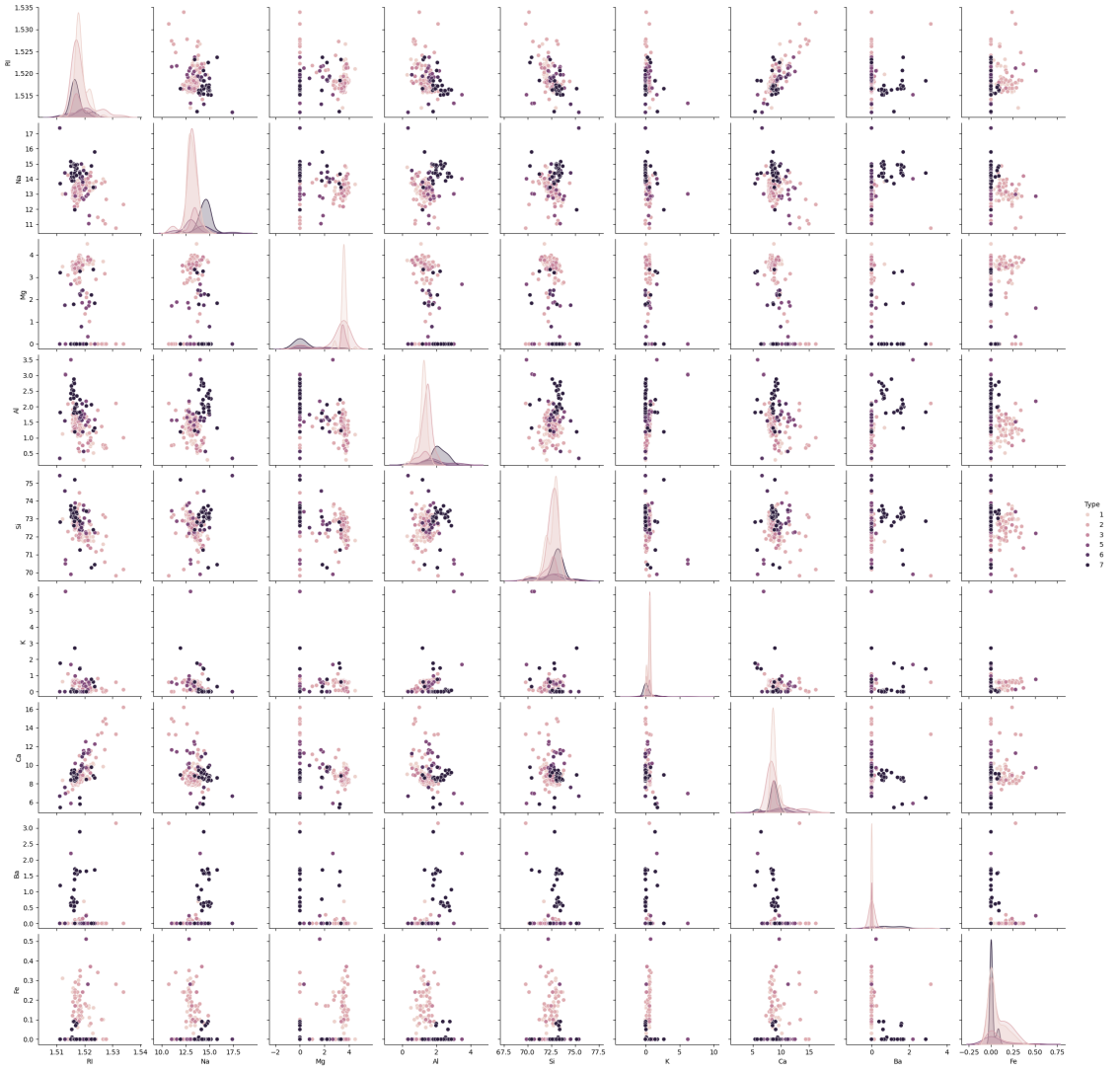


[11]:
```
plt.figure(figsize=(10, 8))
plt.pie(data2['Type'].value_counts(), labels=data2.Type.unique(),
        autopct='%.2f%%', startangle=181, textprops={'size': 'large',␣
 ↪'fontweight': 'bold', 'color': 'black'})
plt.legend(loc='upper right')
plt.title("Class Type Distribution Pie Chart", fontsize=14, fontweight='bold')
plt.show()
```



[12]:
```
sns.pairplot(data2, hue='Type')
```

[12]: <seaborn.axisgrid.PairGrid at 0x78f302b27790>



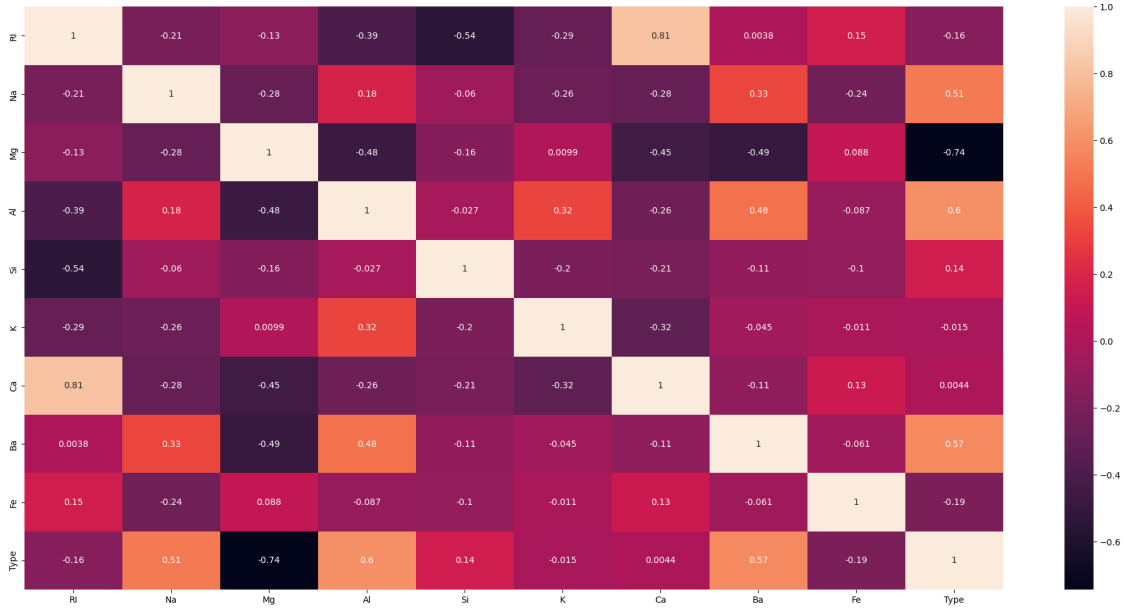
[13]:
```
correlation = data2.corr()
correlation. style. background_gradient (cmap = 'BrBG')
```

[13]: <pandas.io.formats.style.Styler at 0x78f2f942c0d0>

[14]:
```
data2 = np.random.randint(low=1,
                          high=100,
                          size=(10, 10))
# plotting the heatmap
hm = sns.heatmap(data=correlation,
                 annot=True)
plt.rcParams.update({'figure.figsize':(10,8), 'figure.dpi':100})

# displaying the plotted heatmap
```

```
plt.show()
```



[15]:
```
def get_correlated_feature_pairs(data, threshold=0.5):

    corr_matrix = data.corr().abs()  # Compute the absolute correlation matrix
    n_features = corr_matrix.shape[0]  # Number of features

    correlated_pairs = []  # List to store correlated feature pairs

    # Iterate through upper triangle of correlation matrix
    for i in range(n_features):
        for j in range(i+1, n_features):
            if corr_matrix.iloc[i, j] >= threshold:
                correlated_pairs.append((corr_matrix.index[i], corr_matrix.
↪columns[j]))

    return correlated_pairs
```

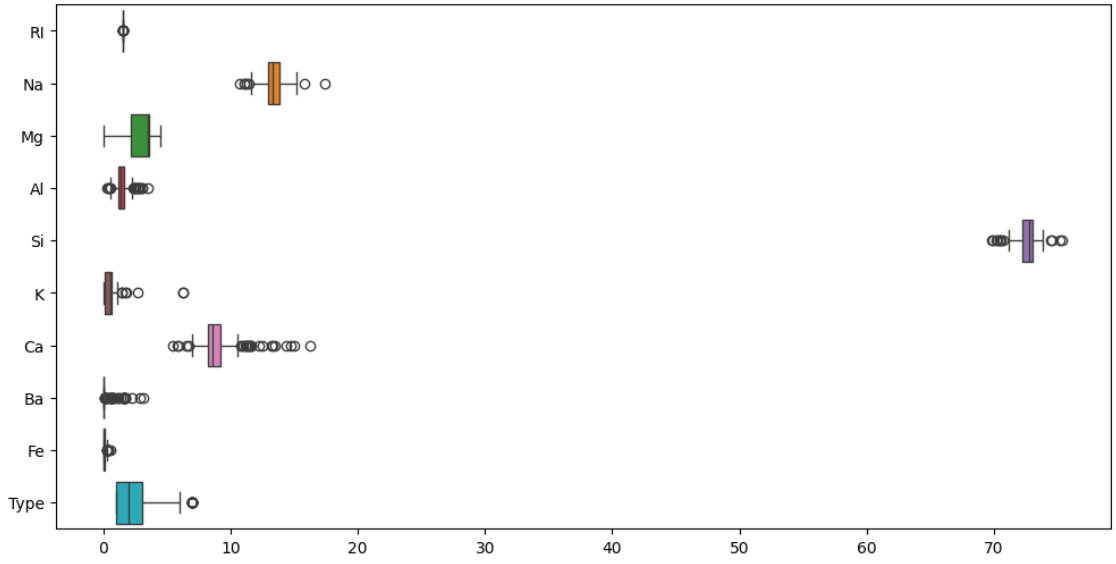
[16]:
```
correlated_pairs = get_correlated_feature_pairs(correlation, threshold=0.5)
print("Correlated Feature Pairs:")
for pair in correlated_pairs:
    print(pair)
```

```
Correlated Feature Pairs:
('RI', 'Al')
('RI', 'Si')
('RI', 'Ca')
```

```
('Na', 'Mg')
('Na', 'Al')
('Na', 'Ba')
('Na', 'Fe')
('Na', 'Type')
('Mg', 'Al')
('Mg', 'Ba')
('Mg', 'Type')
('Al', 'Ba')
('Al', 'Type')
('Ba', 'Type')
('Fe', 'Type')
```

[16]:

[17]:
```
plt.figure(figsize=(12,6))
sns.boxplot(data=data, orient="h")
plt.show()
```



[18]:
```
x = data1.drop('Type',
               axis = 1)
y = data1['Type']
```

[19]:
```
x
```

[19]:

	RI	Na	Mg	Al	Si	K	Ca	Ba	Fe
0	1.52101	13.64	4.49	1.10	71.78	0.06	8.75	0.00	0.0
1	1.51761	13.89	3.60	1.36	72.73	0.48	7.83	0.00	0.0

```
2    1.51618  13.53  3.55  1.54  72.99  0.39  7.78  0.00  0.0
3    1.51766  13.21  3.69  1.29  72.61  0.57  8.22  0.00  0.0
4    1.51742  13.27  3.62  1.24  73.08  0.55  8.07  0.00  0.0
..       …    …   …   …    …   …   …   …   …
209  1.51623  14.14  0.00  2.88  72.61  0.08  9.18  1.06  0.0
210  1.51685  14.92  0.00  1.99  73.06  0.00  8.40  1.59  0.0
211  1.52065  14.36  0.00  2.02  73.42  0.00  8.44  1.64  0.0
212  1.51651  14.38  0.00  1.94  73.61  0.00  8.48  1.57  0.0
213  1.51711  14.23  0.00  2.08  73.36  0.00  8.62  1.67  0.0

[212 rows x 9 columns]
```

[20]:
```
y
```

[20]:
```
0      1
1      1
2      1
3      1
4      1
      ..
209    7
210    7
211    7
212    7
213    7
Name: Type, Length: 212, dtype: int64
```

[21]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size=0.3,␣
 ↪random_state=25)
```

[22]:
```
rfc=RandomForestClassifier(n_estimators=200)
rfc.fit(X_train,y_train)
```

[22]:
```
RandomForestClassifier(n_estimators=200)
```

[23]:
```
ypred=rfc.predict(X_test)
ypred
```

[23]:
```
array([2, 2, 2, 1, 7, 5, 2, 1, 2, 5, 2, 1, 1, 1, 2, 2, 3, 2, 5, 3, 2, 1,
       7, 7, 2, 1, 5, 1, 1, 2, 1, 6, 1, 2, 1, 2, 7, 1, 6, 2, 5, 3, 2, 1,
       6, 2, 2, 3, 2, 1, 7, 1, 1, 3, 1, 2, 2, 3, 2, 1, 1, 1, 7, 2])
```

[24]:
```
pd.crosstab(y_test,ypred)
```

[24]:
```
col_0   1   2  3  5  6  7
Type
```

```
1      16   2  2  0  0  0
2       4  21  2  2  1  0
3       0   0  2  0  0  0
5       0   0  0  3  0  0
6       0   0  0  0  2  0
7       1   0  0  0  0  6
```

[25]:
```
#Accuracy
from sklearn.metrics import accuracy_score
accuracy_score(y_test,ypred)
```

[25]: 0.78125

[26]:
```
# Create the base classifier
base_classifier = RandomForestClassifier()

# Number of base models (iterations)
n_estimators = 10

# Create the Bagging classifier
bagging_classifier = BaggingClassifier(estimator=base_classifier,␣
 ↪n_estimators=n_estimators)

# Train the Bagging classifier
bagging_classifier.fit(X_train, y_train)

# Make predictions on the test set
y_pred = bagging_classifier.predict(X_test)

# Calculate accuracy
accuracy = accuracy_score(y_test, y_pred)
print("Accuracy:", accuracy)
```

```
Accuracy: 0.75
```

[27]:
```
# Instantiate Gradient Boosting Regressor
gbc = GradientBoostingClassifier(n_estimators=300,
                                 learning_rate=0.05,
                                 random_state=100,
                                 max_features=5 )
# Fit to training set
gbc.fit(X_train, y_train)

# Predict on test set
pred_y = gbc.predict(X_test)

# accuracy
```

```
acc = accuracy_score(y_test, pred_y)
print("Gradient Boosting Classifier accuracy is : {:.2f}".format(acc))
```

```
Gradient Boosting Classifier accuracy is : 0.77
```

[ ]: