```
import pandas as pd
from sklearn import preprocessing
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
import numpy as np


#Please insert correct path here
URL = '/content/crop.xlsx'
data = pd.read_excel(URL, header = 0)
print(data)
```

```
      NITROGEN  PHOSPHORUS  POTASSIUM  ...        PH    RAINFALL    CROP
0           90          42         43  ...  6.502985  202.935536    rice
1           85          58         41  ...  7.038096  226.655537    rice
2           60          55         44  ...  7.840207  263.964248    rice
3           74          35         40  ...  6.980401  242.864034    rice
4           78          42         42  ...  7.628473  262.717340    rice
...        ...         ...        ...  ...       ...         ...     ...
2195       107          34         32  ...  6.780064  177.774507  coffee
2196        99          15         27  ...  6.086922  127.924610  coffee
2197       118          33         30  ...  6.362608  173.322839  coffee
2198       117          32         34  ...  6.758793  127.175293  coffee
2199       104          18         30  ...  6.779833  140.937041  coffee

[2200 rows x 8 columns]
```

```
X = data[["NITROGEN","PHOSPHORUS","POTASSIUM","TEMPERATURE","HUMIDITY","PH","RAINFALL"]]
X.head()
```

	NITROGEN	PHOSPHORUS	POTASSIUM	TEMPERATURE	HUMIDITY	PH	RAINFALL
0	90	42	43	20.879744	82.002744	6.502985	202.935536

```
le = preprocessing.LabelEncoder()
crop = le.fit_transform(list(data["CROP"]))
Y = crop.copy()
Y
```

```
array([20, 20, 20, ...,  5,  5,  5])
```

```
print(X.shape, Y.shape)
```

```
(2200, 7) (2200,)
```

```
crop_summary = pd.pivot_table(data,index=['CROP'],aggfunc='mean')
crop_summary.head()
```

CROP	HUMIDITY	NITROGEN	PH	PHOSPHORUS	POTASSIUM	RAINFALL	TEMPERATURE
apple	92.333383	20.80	5.929663	134.22	199.89	112.654779	22.630942
banana	80.358123	100.23	5.983893	82.01	50.05	104.626980	27.376798
blackgram	65.118426	40.02	7.133952	67.47	19.24	67.884151	29.973340
chickpea	16.860439	40.09	7.336957	67.79	79.92	80.058977	18.872847
coconut	94.844272	21.98	5.976562	16.93	30.59	175.686646	27.409892

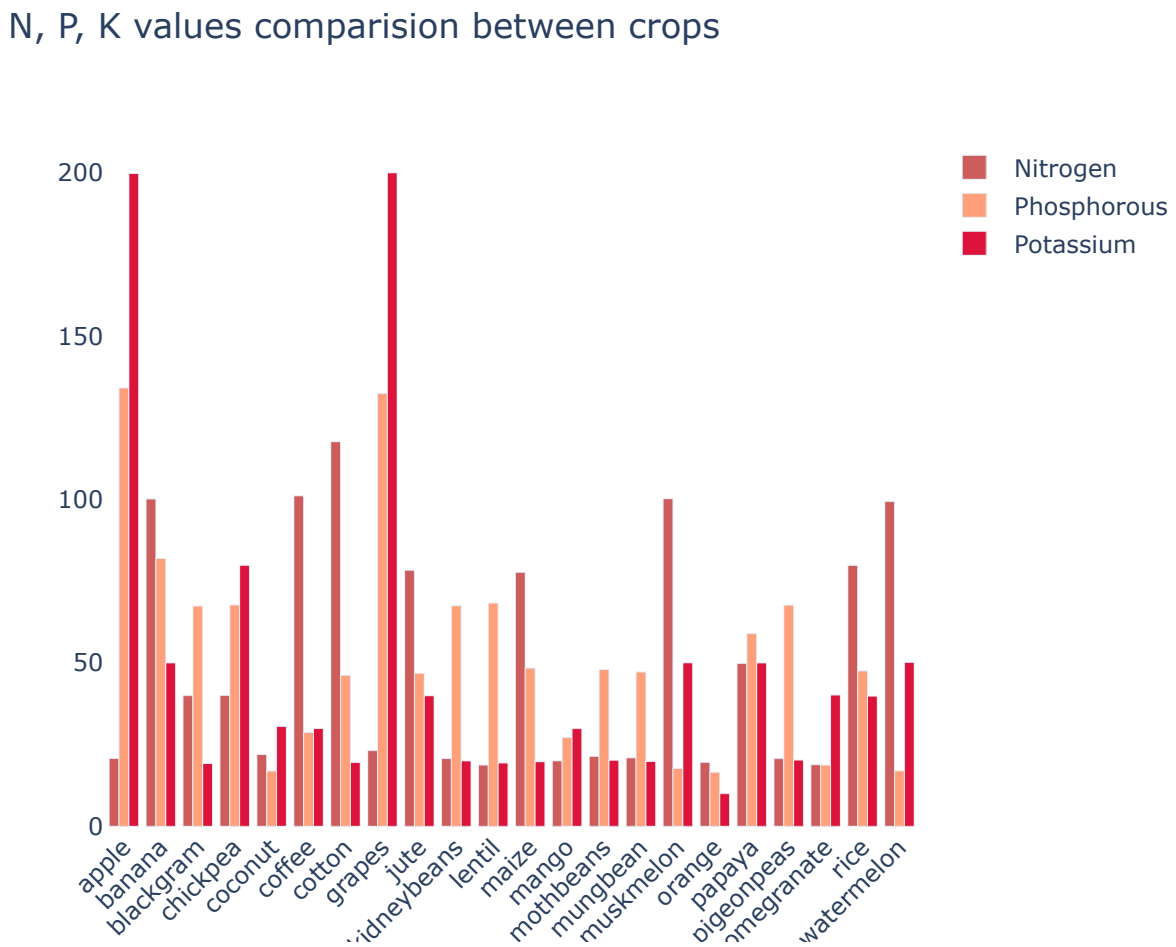
Data Visualisation

```
import matplotlib.pyplot as plt
```

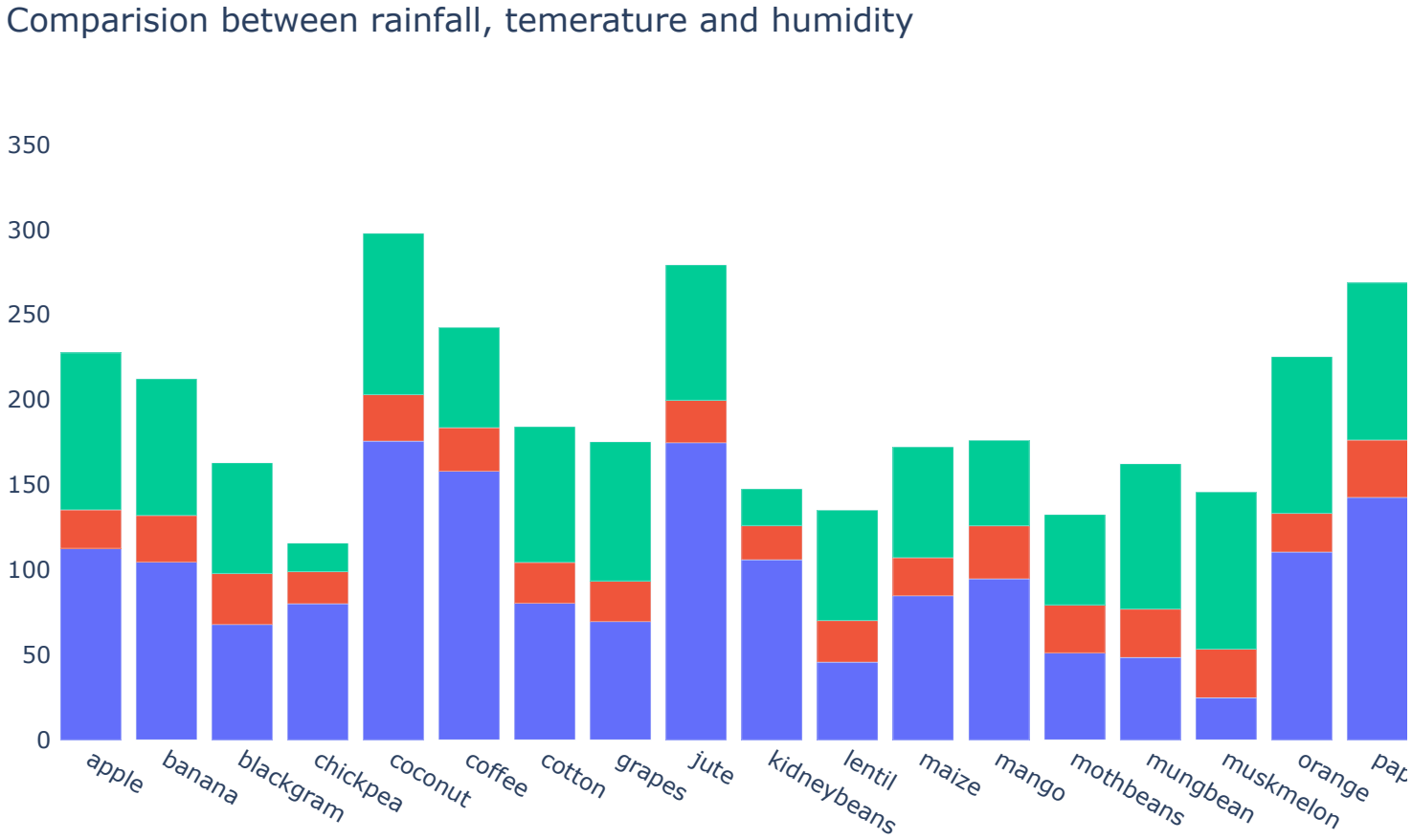
```
import seaborn as sns

import plotly.graph_objects as go
import plotly.express as px
from plotly.subplots import make_subplots
```

N, P, K values comparision between crops:

```
fig = go.Figure()
fig.add_trace(go.Bar(
    x=crop_summary.index,
    y=crop_summary['NITROGEN'],
    name='Nitrogen',
    marker_color='indianred'
))
fig.add_trace(go.Bar(
    x=crop_summary.index,
    y=crop_summary['PHOSPHORUS'],
    name='Phosphorous',
    marker_color='lightsalmon'
))
fig.add_trace(go.Bar(
    x=crop_summary.index,
    y=crop_summary['POTASSIUM'],
    name='Potassium',
    marker_color='crimson'
))

fig.update_layout(title="N, P, K values comparision between crops",
                  plot_bgcolor='white',
                  barmode='group',
                  xaxis_tickangle=-45)

fig.show()
```




```
import plotly.graph_objects as go
z=list(crop_summary.index)
fig = go.Figure(data=[
    go.Bar(name='RAINFALL', x=z, y=crop_summary["RAINFALL"]),
    go.Bar(name='TEMPERATURE', x=z, y=crop_summary["TEMPERATURE"]),
    go.Bar(name='HUMIDITY', x=z, y=crop_summary["HUMIDITY"])
])
# Change the bar mode
fig.update_layout(barmode='stack',title_text="Comparision between rainfall, temerature and humidity",plot_bgcolor='white',he
fig.show()
```



Training Model

```
X_train, X_test, y_train, y_test = train_test_split(X,Y,test_size=0.25)
```

```
print(X_train.shape, y_train.shape)
```

```
(1650, 7) (1650,)
```

```
print(X_test.shape, y_test.shape)
```

```
(550, 7) (550,)
```

KNN Clissifier

```
from sklearn.neighbors import KNeighborsClassifier


model = KNeighborsClassifier(n_neighbors=3)
model.fit(X_train, y_train)
```

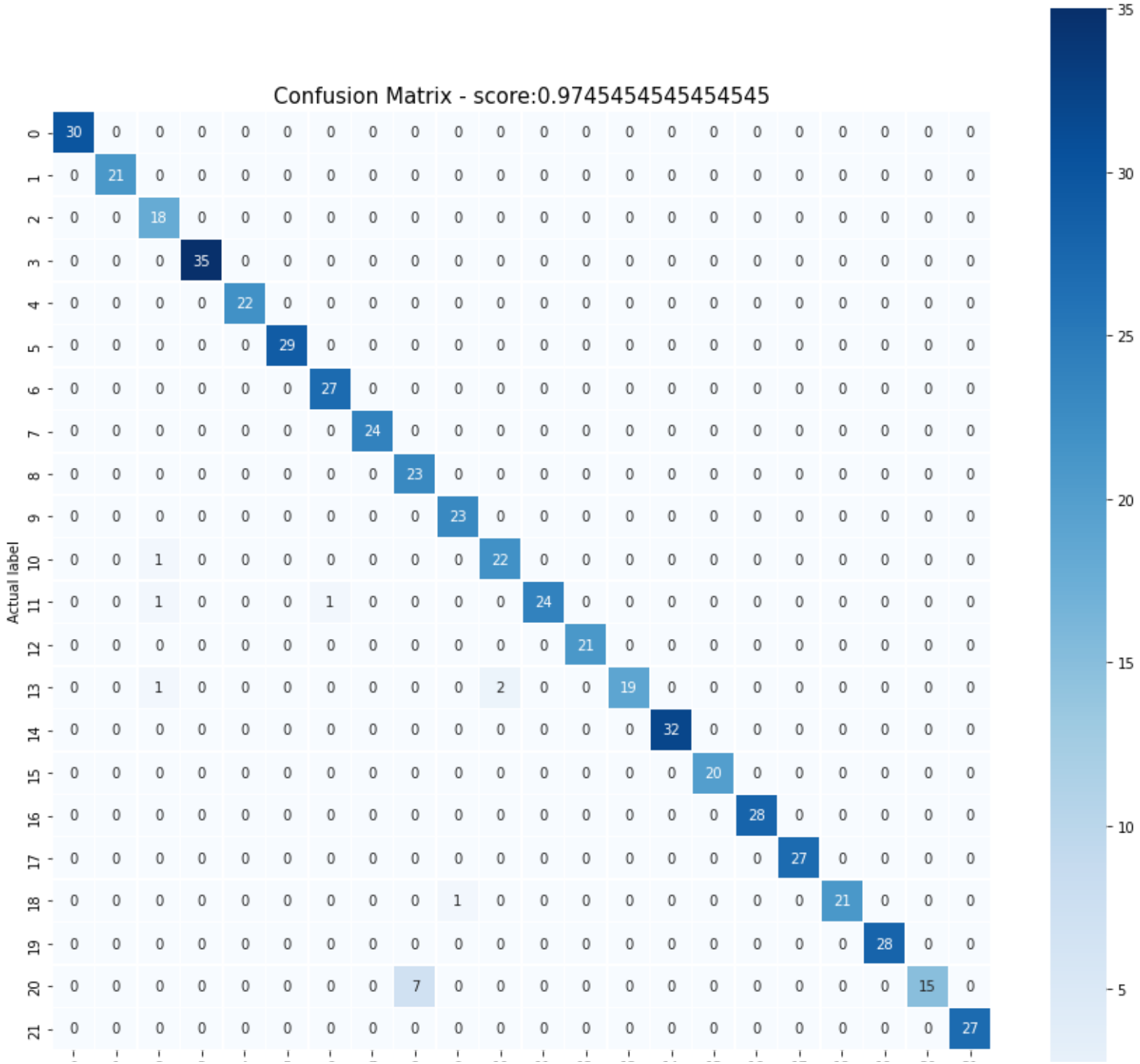
```
KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='minkowski',
                     metric_params=None, n_jobs=None, n_neighbors=3, p=2,
                     weights='uniform')
```

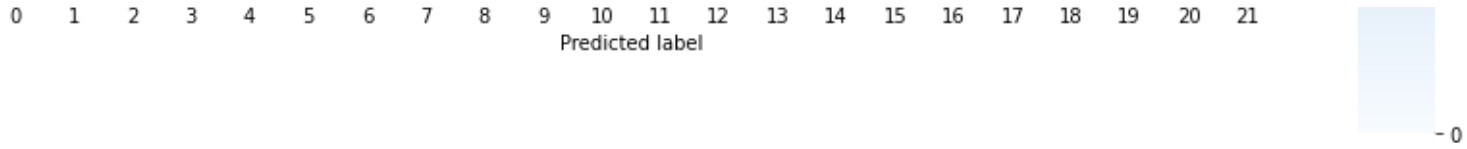
```
prediction_knn = model.predict(X_test)
```

```
print(accuracy_score(y_test,prediction_knn))
```

```
0.9745454545454545
```

```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, prediction_knn)

plt.figure(figsize=(15,15))
sns.heatmap(cm, annot=True, fmt=".0f", linewidths=.5, square = True, cmap = 'Blues');
plt.ylabel('Actual label');
plt.xlabel('Predicted label');
all_sample_title = 'Confusion Matrix - score:'+str(accuracy_score(y_test,prediction_knn))
plt.title(all_sample_title, size = 15);
plt.show()
```


Confusion Matrix - score:0.9745454545454545
Actual label
0 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 0 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2 0 0 18 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
3 0 0 0 35 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
4 0 0 0 0 22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
5 0 0 0 0 0 29 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
6 0 0 0 0 0 0 27 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
7 0 0 0 0 0 0 0 24 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
8 0 0 0 0 0 0 0 0 23 0 0 0 0 0 0 0 0 0 0 0 0 0 0
9 0 0 0 0 0 0 0 0 0 23 0 0 0 0 0 0 0 0 0 0 0 0 0
10 0 0 1 0 0 0 0 0 0 0 22 0 0 0 0 0 0 0 0 0 0 0 0
11 0 0 1 0 0 0 1 0 0 0 0 24 0 0 0 0 0 0 0 0 0 0 0
12 0 0 0 0 0 0 0 0 0 0 0 0 21 0 0 0 0 0 0 0 0 0 0
13 0 0 1 0 0 0 0 0 0 0 2 0 0 19 0 0 0 0 0 0 0 0 0
14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 32 0 0 0 0 0 0 0 0
15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 20 0 0 0 0 0 0 0
16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 28 0 0 0 0 0 0
17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 27 0 0 0 0 0
18 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 21 0 0 0 0
19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 28 0 0 0
20 0 0 0 0 0 0 0 0 7 0 0 0 0 0 0 0 0 0 0 0 15 0 0
21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 27 0
35
30
25
20
15
10
5



Saving Model File

```
import pickle
Pkl_Filename = "Crop_Model.pkl"

with open(Pkl_Filename, 'wb') as file:
    pickle.dump(model, file)
```

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