```
import warnings
warnings.simplefilter(action='ignore', category=FutureWarning)
warnings.simplefilter(action='ignore', category=UserWarning)
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

```
import numpy as np
import pandas as pd

import os
for dirname, _, filenames in os.walk('/content/Crop_recommendation.csv'):
    for filename in filenames:
        print(os.path.join(dirname, filename))
```

```
df=pd.read_csv('/content/Crop_recommendation.csv')
df.head()
```

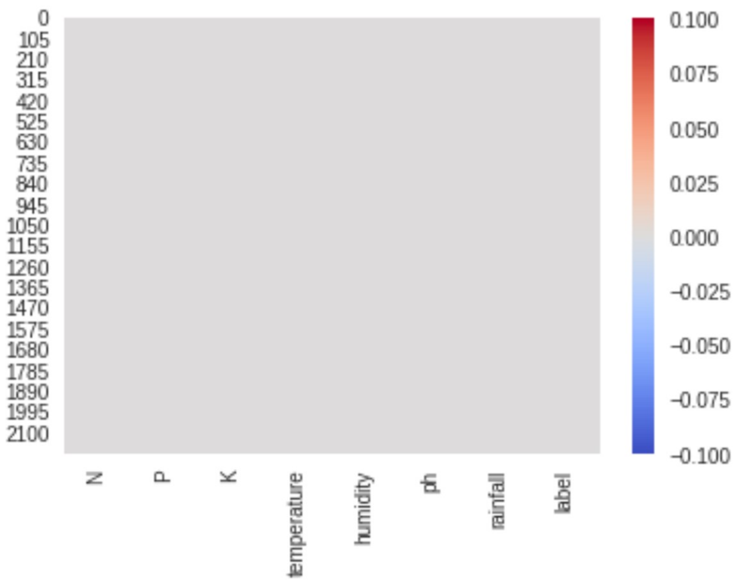
	N	P	K	temperature	humidity	ph	rainfall	label
0	90	42	43	20.879744	82.002744	6.502985	202.935536	rice
1	85	58	41	21.770462	80.319644	7.038096	226.655537	rice
2	60	55	44	23.004459	82.320763	7.840207	263.964248	rice
3	74	35	40	26.491096	80.158363	6.980401	242.864034	rice
4	78	42	42	20.130175	81.604873	7.628473	262.717340	rice

```
df.describe()
```

	N	P	K	temperature	humidity	ph
count	2200.000000	2200.000000	2200.000000	2200.000000	2200.000000	2200.000000
mean	50.551818	53.362727	48.149091	25.616244	71.481779	6.469480
std	36.917334	32.985883	50.647931	5.063749	22.263812	0.773938
min	0.000000	5.000000	5.000000	8.825675	14.258040	3.504752

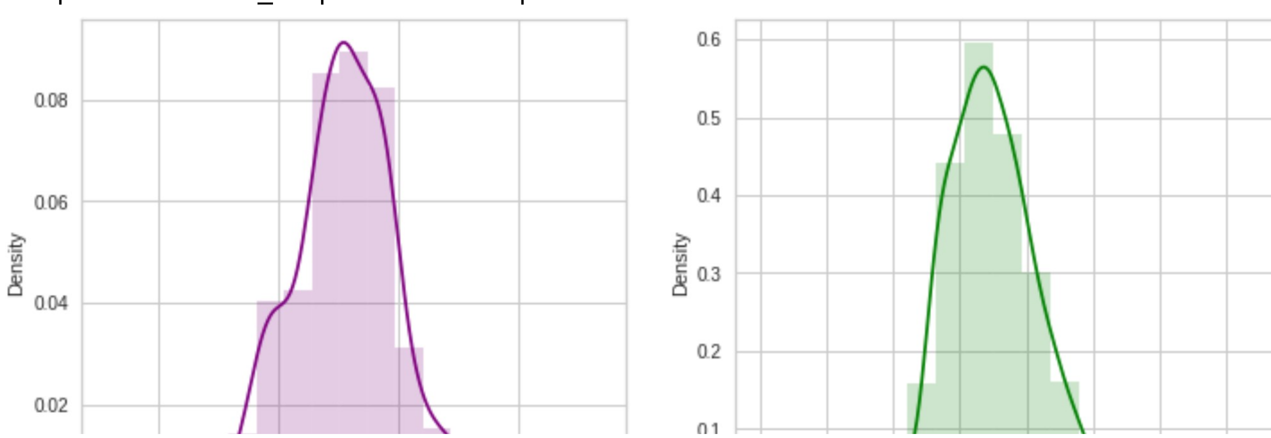
50%	37.000000	51.000000	32.000000	25.598693	80.473146	6.425045
75%	84.250000	68.000000	49.000000	28.561654	89.948771	6.923643
max	140.000000	145.000000	205.000000	43.675493	99.981876	9.935091

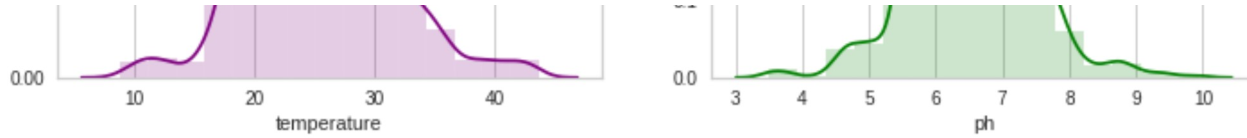
```
sns.heatmap(df.isnull(),cmap="coolwarm")
plt.show()
```




```
plt.figure(figsize=(12,5))
plt.subplot(1, 2, 1)
sns.distplot(df['temperature'],color="purple",bins=15,hist_kws={'alpha':0.2})
plt.subplot(1, 2, 2)
sns.distplot(df['ph'],color="green",bins=15,hist_kws={'alpha':0.2})
```

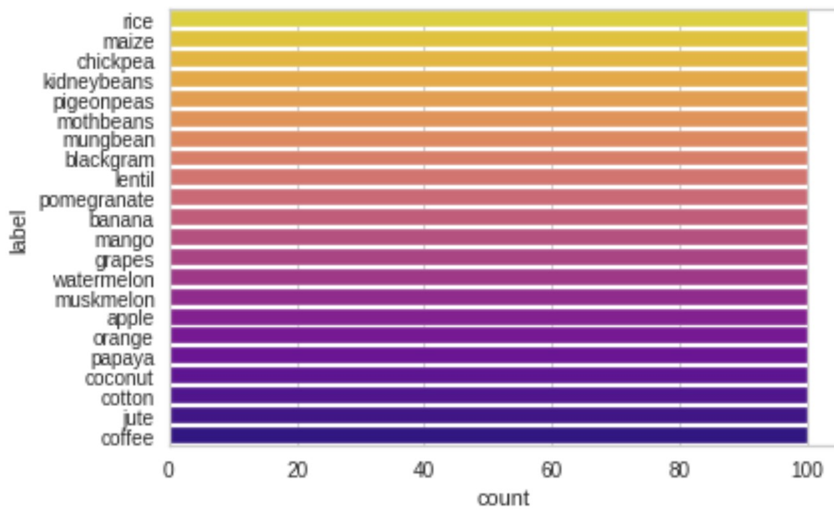
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fad2c1b12e0>
```






```
sns.countplot(y='label',data=df, palette="plasma_r")
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fad2c1b15b0>
```




```
sns.pairplot(df, hue = 'label')
```

```
sns.jointplot(x="rainfall",y="humidity",data=df[(df['temperature']<30) & (df['rainfall']>1
```

```
sns.jointplot(x="K",y="N",data=df[(df['N']>40)&(df['K']>40)],hue="label")
```

```
sns.jointplot(x="K",y="humidity",data=df,hue='label',size=8,s=30,alpha=0.7)
```

```
sns.boxplot(y='label',x='ph',data=df)
```

```
sns.boxplot(y='label',x='P',data=df[df['rainfall']>150])
```

```
sns.lineplot(data = df[(df['humidity']<65)], x = "K", y = "rainfall",hue="label")
```

```
c=df.label.astype('category')
targets = dict(enumerate(c.cat.categories))
```

```
df['target']=c.cat.codes

y=df.target
X=df[['N','P','K','temperature','humidity','ph','rainfall']]


sns.heatmap(X.corr())


from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler

X_train, X_test, y_train, y_test = train_test_split(X, y,random_state=1)

scaler = MinMaxScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)


from sklearn.neighbors import KNeighborsClassifier
knn = KNeighborsClassifier()
knn.fit(X_train_scaled, y_train)
knn.score(X_test_scaled, y_test)


from sklearn.metrics import confusion_matrix
mat=confusion_matrix(y_test,knn.predict(X_test_scaled))
df_cm = pd.DataFrame(mat, list(targets.values()), list(targets.values()))
sns.set(font_scale=1.0) # for label size
plt.figure(figsize = (12,8))
sns.heatmap(df_cm, annot=True, annot_kws={"size": 12},cmap="terrain")


k_range = range(1,11)
scores = []

for k in k_range:
    knn = KNeighborsClassifier(n_neighbors = k)
    knn.fit(X_train_scaled, y_train)
    scores.append(knn.score(X_test_scaled, y_test))

plt.xlabel('k')
plt.ylabel('accuracy')
plt.scatter(k_range, scores)
plt.vlines(k_range,0, scores, linestyle="dashed")
plt.ylim(0.96,0.99)
plt.xticks([i for i in range(1,11)]);
```

```
from sklearn.svm import SVC

svc_linear = SVC(kernel = 'linear').fit(X_train_scaled, y_train)
print("Linear Kernel Accuracy: ",svc_linear.score(X_test_scaled,y_test))

svc_poly = SVC(kernel = 'rbf').fit(X_train_scaled, y_train)
print("Rbf Kernel Accuracy: ", svc_poly.score(X_test_scaled,y_test))

svc_poly = SVC(kernel = 'poly').fit(X_train_scaled, y_train)
print("Poly Kernel Accuracy: ", svc_poly.score(X_test_scaled,y_test))
```

```
from sklearn.metrics import accuracy_score
from sklearn.model_selection import GridSearchCV

parameters = {'C': np.logspace(-3, 2, 6).tolist(), 'gamma': np.logspace(-3, 2, 6).tolist()
# 'degree': np.arange(0,5,1).tolist(), 'kernel':['linear','rbf','poly']

model = GridSearchCV(estimator = SVC(kernel="linear"), param_grid=parameters, n_jobs=-1, c
model.fit(X_train, y_train)
```

```
print(model.best_score_ )
print(model.best_params_ )
```

```
from sklearn.tree import DecisionTreeClassifier

clf = DecisionTreeClassifier(random_state=42).fit(X_train, y_train)
clf.score(X_test,y_test)
```

```
plt.figure(figsize=(10,4), dpi=80)
c_features = len(X_train.columns)
plt.barh(range(c_features), clf.feature_importances_)
plt.xlabel("Feature importance")
plt.ylabel("Feature name")
plt.yticks(np.arange(c_features), X_train.columns)
plt.show()
```

```
from sklearn.ensemble import RandomForestClassifier
clf = RandomForestClassifier(max_depth=4,n_estimators=100,random_state=42).fit(X_train, y_

print('RF Accuracy on training set: {:.2f}'.format(clf.score(X_train, y_train)))
print('RF Accuracy on test set: {:.2f}'.format(clf.score(X_test, y_test)))
```

```
from yellowbrick.classifier import ClassificationReport
classes=list(targets.values())
visualizer = ClassificationReport(clf, classes=classes, support=True,cmap="Blues")

visualizer.fit(X_train, y_train)  # Fit the visualizer and the model
visualizer.score(X_test, y_test)  # Evaluate the model on the test data
visualizer.show()
```

```
from sklearn.ensemble import GradientBoostingClassifier
grad = GradientBoostingClassifier().fit(X_train, y_train)
print('Gradient Boosting accuracy : {}'.format(grad.score(X_test,y_test)))
```