In [1]:

```
# Importing
libraries import
numpy as np
import pandas
as pd
from scipy.stats
import mode import
matplotlib.pyplot as
plt import seaborn as
sns
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import
train_test_split, cross_val_score from
sklearn.svm import SVC
from sklearn.naive_bayes import GaussianNB
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, confusion_matrix

%matplotlib inline
```

In [3]:

```
# Reading the train.csv by
removing the # last column
since it's an empty column
DATA_PATH =
"C:/Users/ambee/OneDrive/Desktop/Trai
ning.csv" data =
pd.read_csv(DATA_PATH).dropna(axis
= 1)
```

```
# Checking whether the dataset is

balanced or not disease_counts =

data["prognosis"].value_counts()

temp_df = pd.DataFrame({

    "Disease":

    disease_counts.index,

    "Counts":

    disease_counts.values

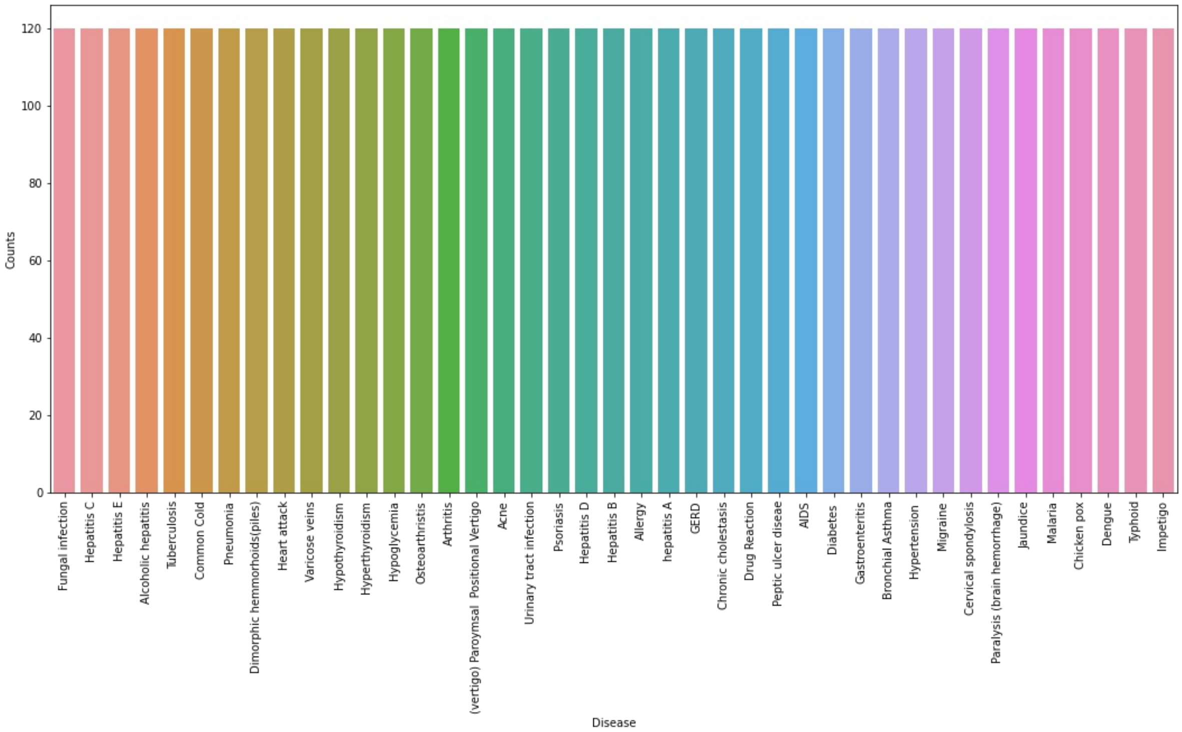
})


plt.figure(figsize = (18,8))

sns.barplot(x = "Disease", y = "Counts", data =

temp_df) plt.xticks(rotation=90)

plt.show()
```



In [4]:

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```
# Encoding the target value

into numerical # value using

LabelEncoder

encoder = LabelEncoder()

data["prognosis"] = encoder.fit_transform(data["prognosis"])
```

In [5]:

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```
X = data.iloc[:,:-1]

y = data.iloc[:, -1]

X_train, X_test, y_train, y_test

=train_test_split( X, y, test_size = 0.2,

random_state = 24)


print(f"Train: {X_train.shape},

{y_train.shape}") print(f"Test:

{X_test.shape}, {y_test.shape}")
```

```
Train: (3936, 132), (3936,)
Test: (984, 132), (984,)
```

In [6]:

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# Defining scoring metric for k-fold
cross validation def
cv_scoring(estimator, X, y):
    return accuracy_score(y, estimator.predict(X))

# Initializing
Models models =
{
    "SVC":SVC(),
    "Gaussian NB":GaussianNB(),
    "Random Forest":RandomForestClassifier(random_state=18)
}

# Producing cross validation score
for the models for model_name in
models:
    model = models[model_name]
    scores = cross_val_score(model, X, y, cv = 10,
                            n_jobs = -1,
                            scoring = cv_scoring)
    print("=="*30)
    print(model_name)
    print(f"Scores:
    {scores}")
    print(f"Mean Score: {np.mean(scores)}")
```

```
=================================
============================ SVC
Scores: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]
Mean Score: 1.0
================================================================
Gaussian NB
Scores: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]
Mean Score: 1.0
================================================================
Random Forest
Scores: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]
Mean Score: 1.0
```

In [7]:

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```
# Training and testing

SVM Classifier svm_model

= SVC()

svm_model.fit(X_train,

y_train) preds =

svm_model.predict(X_test)



print(f"Accuracy on train data by SVM Classifier\

: {accuracy_score(y_train, svm_model.predict(X_train))*100}")


print(f"Accuracy on test data by SVM Classifier\

: {accuracy_score(y_test,

preds)*100}") cf_matrix =

confusion_matrix(y_test, preds)

plt.figure(figsize=(12,8))

sns.heatmap(cf_matrix,

annot=True)

plt.title("Confusion Matrix for SVM Classifier on

Test Data") plt.show()



# Training and testing Naive

Bayes Classifier nb_model =
GaussianNB()
nb_model.fit(X_train, y_train)
preds = nb_model.predict(X_test)
print(f"Accuracy on train data by Naive Bayes Classifier\
: {accuracy_score(y_train, nb_model.predict(X_train))*100}")

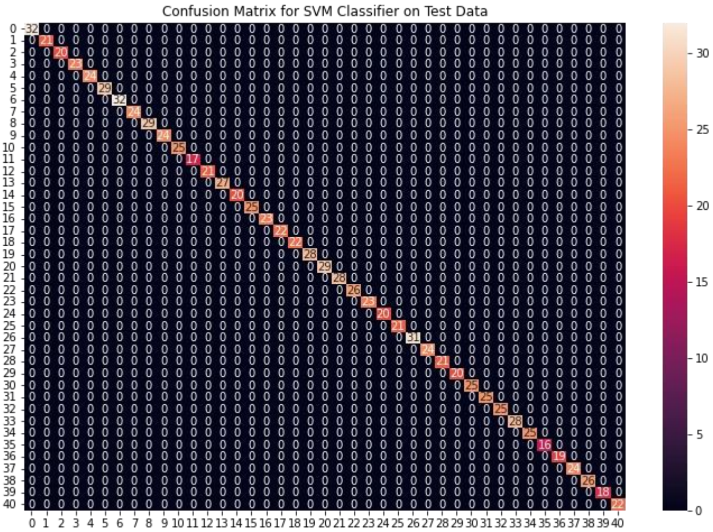
print(f"Accuracy on test data by Naive Bayes Classifier\
: {accuracy_score(y_test,
preds)*100}") cf_matrix =
confusion_matrix(y_test, preds)
plt.figure(figsize=(12,8))
sns.heatmap(cf_matrix,
annot=True)
plt.title("Confusion Matrix for Naive Bayes
Classifier on Test Data") plt.show()


# Training and testing Random Forest
Classifier rf_model =
RandomForestClassifier(random_state
=18) rf_model.fit(X_train, y_train)
preds = rf_model.predict(X_test)
print(f"Accuracy on train data by Random Forest Classifier\
: {accuracy_score(y_train, rf_model.predict(X_train))*100}")

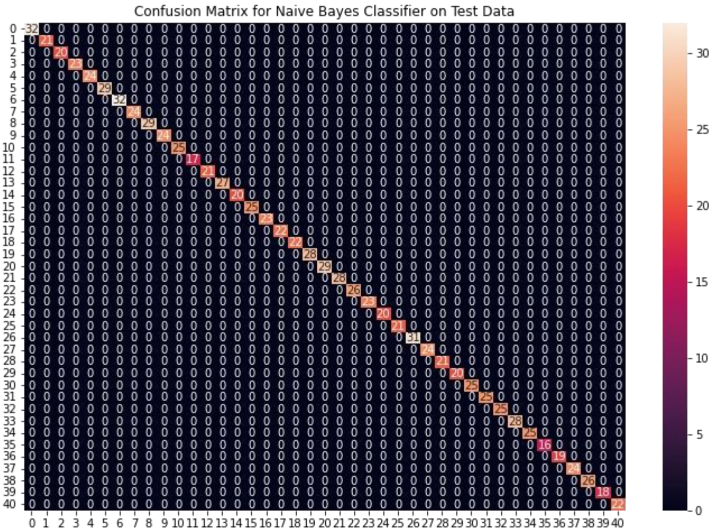
print(f"Accuracy on test data by Random Forest Classifier\
: {accuracy_score(y_test, preds)*100}")

cf_matrix =
confusion_matrix(y_test, preds)
plt.figure(figsize=(12,8))
sns.heatmap(cf_matrix,
annot=True)
plt.title("Confusion Matrix for Random Forest Classifier on
Test Data") plt.show()
```

```
Accuracy on train data by SVM
Classifier: 100.0 Accuracy on test
data by SVM Classifier: 100.0
```

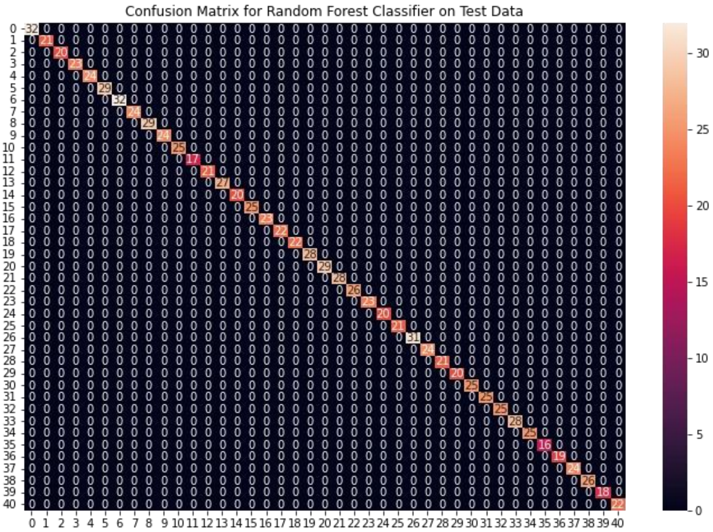


Accuracy on train data by Naive Bayes



Classifier: 100.0 Accuracy on test data by Naive Bayes Classifier: 100.0

Accuracy on train data by Random Forest



Classifier: 100.0 Accuracy on test data by Random Forest Classifier: 100.0

In [9]:

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# Training the models on

```
whole data
final_svm_model = SVC()
final_nb_model =
GaussianNB()
final_rf_model =
RandomForestClassifier(random_state=18)
final_svm_model.fit(X, y)
final_nb_model.fit(X, y)
final_rf_model.fit(X, y)

# Reading the test data
```

```
test_data = pd.read_csv("C:/Users/ambee/OneDrive/Desktop/Testing.csv").dropna(axis=1)


test_X = test_data.iloc[:, :-1]

test_Y = encoder.transform(test_data.iloc[:, -1])


# Making prediction by take mode

of predictions # made by all the

classifiers

svm_preds =

final_svm_model.predict(test_X)

nb_preds =

final_nb_model.predict(test_X)

rf_preds =

final_rf_model.predict(test_X)


final_preds = [mode([i,j,k])[0][0] for i,j,

            k in zip(svm_preds, nb_preds, rf_preds)]


print(f"Accuracy on Test dataset by the combined model\

: {accuracy_score(test_Y, final_preds)*100}")

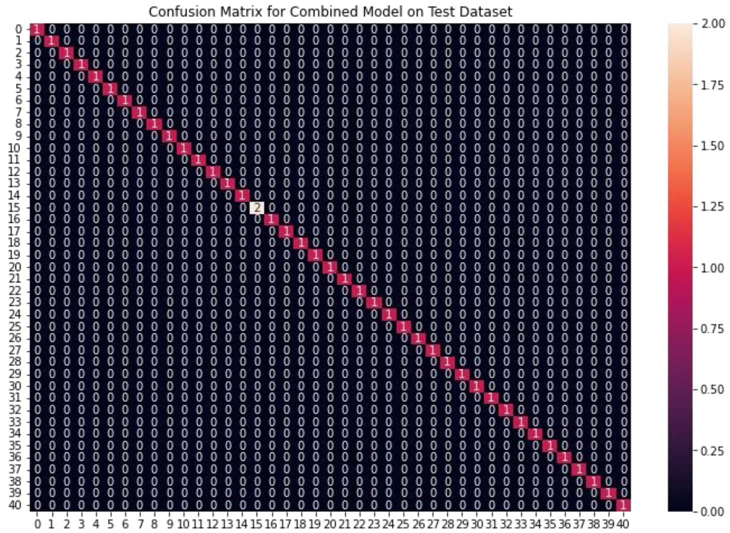

cf_matrix = confusion_matrix(test_Y,

final_preds) plt.figure(figsize=(12,8))


sns.heatmap(cf_matrix, annot = True)

plt.title("Confusion Matrix for Combined Model on

Test Dataset") plt.show()
```



```
Accuracy on Test dataset by the combined model: 100.0
In [10]:

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symptoms = X.columns.values


# Creating a symptom index

dictionary to encode the # input

symptoms into numerical form

symptom_index = {}

for index, value in enumerate(symptoms):

    symptom = " ".join([i.capitalize() for i in

    value.split("_")]) symptom_index[symptom] =

    index



data_dict = {

    "symptom_index":symptom_index,

    "predictions_classes":encoder.classes_
}


# Defining the Function

# Input: string containing symptoms

separated by commas # Output:

Generated predictions by models

def

    predictDisease(sympto
ms): symptoms =

symptoms.split(",")


# creating input data for the models
```

```
    input_data = [0] *
    len(data_dict["symptom_index"]) for
    symptom in symptoms:
        index =
        data_dict["symptom_index"][sympt
        om] input_data[index] = 1

    # reshaping the input data and
    converting it # into suitable
    format for model predictions
    input_data = np.array(input_data).reshape(1,-1)

    # generating individual outputs
    rf_prediction =
    data_dict["predictions_classes"][final_rf_model.predict(input_data)[0]]
    nb_prediction =
    data_dict["predictions_classes"][final_nb_model.predict(input_data)[0]]
    svm_prediction =
    data_dict["predictions_classes"][final_svm_model.predict(input_data)[0]]

    # making final prediction by taking mode of all predictions
    final_prediction = mode([rf_prediction, nb_prediction,
    svm_prediction])[0][0] predictions = {
        "rf_model_prediction":
        rf_prediction,
        "naive_bayes_prediction":
        nb_prediction,
        "svm_model_prediction":
        svm_prediction,
        "final_prediction":final_prediction
    }
return predictions
```

```
    # Testing the
           function

print(predictDisease("Itching,Skin Rash,Nodal Skin Eruptions"))
```

```
{'rf_model_prediction': 'Fungal infection', 'naive_bayes_prediction': 'Fungal infection', 'svm_model_prediction': 'Fungal infection',
'final_prediction': 'Fungal infection'}
```

In [ ]:

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