```
'Importing all the necessary libraries'
```

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```

```
import pandas as pd
import numpy as np
from sklearn.metrics import classification_report
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import classification_report
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import confusion_matrix
from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay
from sklearn.neighbors import KNeighborsClassifier
from sklearn.linear_model import LogisticRegression
from sklearn import svm
from sklearn.metrics import accuracy_score
```

```
'Reading the data file'
```

```
'Reading the data file'
```

```
df=pd.read_csv('voice.csv')
```

```
df.head()
```

```
   meanfreq        sd    median       Q25       Q75       IQR
skew  \
0  0.059781  0.064241  0.032027  0.015071  0.090193  0.075122
12.863462
1  0.066009  0.067310  0.040229  0.019414  0.092666  0.073252
22.423285
2  0.077316  0.083829  0.036718  0.008701  0.131908  0.123207
30.757155
3  0.151228  0.072111  0.158011  0.096582  0.207955  0.111374
1.232831
4  0.135120  0.079146  0.124656  0.078720  0.206045  0.127325
1.101174

          kurt    sp.ent       sfm  ...  centroid   meanfun    minfun
\
0   274.402906  0.893369  0.491918  ...  0.059781  0.084279  0.015702

1   634.613855  0.892193  0.513724  ...  0.066009  0.107937  0.015826

2  1024.927705  0.846389  0.478905  ...  0.077316  0.098706  0.015656

3     4.177296  0.963322  0.727232  ...  0.151228  0.088965  0.017798

4     4.333713  0.971955  0.783568  ...  0.135120  0.106398  0.016931
```

```
     maxfun   meandom    mindom    maxdom   dfrange   modindx  label
0  0.275862  0.007812  0.007812  0.007812  0.000000  0.000000   male
1  0.250000  0.009014  0.007812  0.054688  0.046875  0.052632   male
2  0.271186  0.007990  0.007812  0.015625  0.007812  0.046512   male
3  0.250000  0.201497  0.007812  0.562500  0.554688  0.247119   male
4  0.266667  0.712812  0.007812  5.484375  5.476562  0.208274   male

[5 rows x 21 columns]
```

```
'Removing all the blank cells and their respective rows'
```

```
'Removing all the blank cells and their respective rows'
```

```
df.dropna(inplace=True)
```

```
y=df['label']
X=df[['meanfreq','sd','median','Q25','Q75','IQR','skew','kurt','sp.ent
','sfm','mode','centroid','meanfun','minfun','maxfun','meandom','mindo
m','maxdom','dfrange','modindx']]
```

```
y=y.to_numpy()
Y_lst=list(y)
```

```
no_of_males=Y_lst.count("male")
no_of_females=Y_lst.count('female')
```

```
X
```

```
      meanfreq        sd    median       Q25       Q75       IQR
skew  \
0     0.059781  0.064241  0.032027  0.015071  0.090193  0.075122
12.863462
1     0.066009  0.067310  0.040229  0.019414  0.092666  0.073252
22.423285
2     0.077316  0.083829  0.036718  0.008701  0.131908  0.123207
30.757155
3     0.151228  0.072111  0.158011  0.096582  0.207955  0.111374
1.232831
4     0.135120  0.079146  0.124656  0.078720  0.206045  0.127325
1.101174
...        ...       ...       ...       ...       ...       ...
...
3163  0.131884  0.084734  0.153707  0.049285  0.201144  0.151859
1.762129
3164  0.116221  0.089221  0.076758  0.042718  0.204911  0.162193
0.693730
3165  0.142056  0.095798  0.183731  0.033424  0.224360  0.190936
```

```
1.876502
3166  0.143659  0.090628  0.184976  0.043508  0.219943  0.176435
1.591065
3167  0.165509  0.092884  0.183044  0.070072  0.250827  0.180756
1.705029

             kurt    sp.ent       sfm      mode  centroid   meanfun
minfun  \
0      274.402906  0.893369  0.491918  0.000000  0.059781  0.084279
0.015702
1      634.613855  0.892193  0.513724  0.000000  0.066009  0.107937
0.015826
2     1024.927705  0.846389  0.478905  0.000000  0.077316  0.098706
0.015656
3        4.177296  0.963322  0.727232  0.083878  0.151228  0.088965
0.017798
4        4.333713  0.971955  0.783568  0.104261  0.135120  0.106398
0.016931
...           ...       ...       ...       ...       ...       ...
...
3163     6.630383  0.962934  0.763182  0.200836  0.131884  0.182790
0.083770
3164     2.503954  0.960716  0.709570  0.013683  0.116221  0.188980
0.034409
3165     6.604509  0.946854  0.654196  0.008006  0.142056  0.209918
0.039506
3166     5.388298  0.950436  0.675470  0.212202  0.143659  0.172375
0.034483
3167     5.769115  0.938829  0.601529  0.267702  0.165509  0.185607
0.062257

        maxfun   meandom    mindom    maxdom   dfrange   modindx
0     0.275862  0.007812  0.007812  0.007812  0.000000  0.000000
1     0.250000  0.009014  0.007812  0.054688  0.046875  0.052632
2     0.271186  0.007990  0.007812  0.015625  0.007812  0.046512
3     0.250000  0.201497  0.007812  0.562500  0.554688  0.247119
4     0.266667  0.712812  0.007812  5.484375  5.476562  0.208274
...        ...       ...       ...       ...       ...       ...
3163  0.262295  0.832899  0.007812  4.210938  4.203125  0.161929
3164  0.275862  0.909856  0.039062  3.679688  3.640625  0.277897
3165  0.275862  0.494271  0.007812  2.937500  2.929688  0.194759
3166  0.250000  0.791360  0.007812  3.593750  3.585938  0.311002
3167  0.271186  0.227022  0.007812  0.554688  0.546875  0.350000

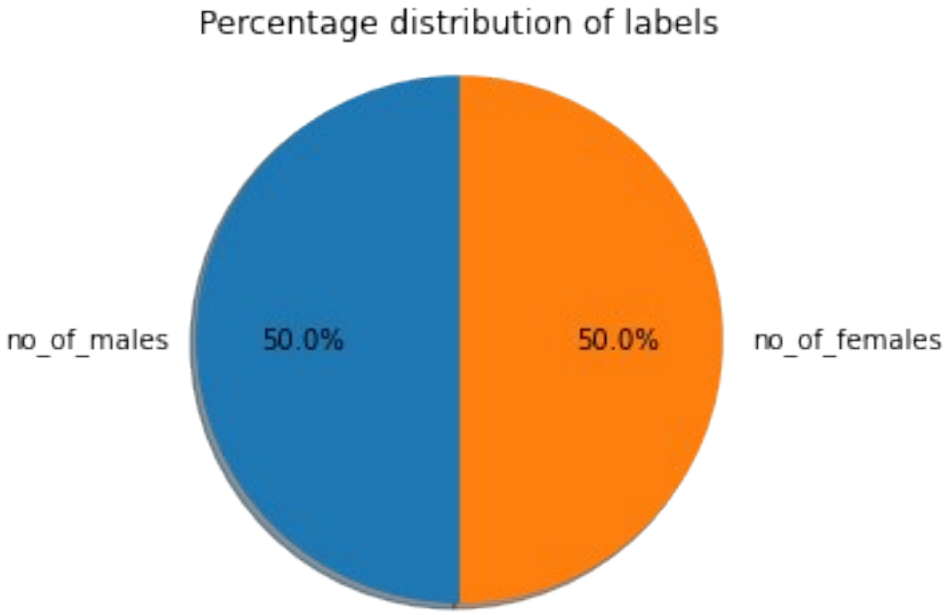
[3168 rows x 20 columns]

y

array(['male', 'male', 'male', ..., 'female', 'female', 'female'],
      dtype=object)
```

```
print('------------------2)Depict percentage distribution of label on
a pie chart----------------------------------')
data = [no_of_males,no_of_females]
label = ['no_of_males','no_of_females']
plt.pie(data, labels=label, autopct='%1.1f%%', shadow=True,
startangle=90)
plt.title('Percentage distribution of labels')
plt.axis('equal')
plt.show()
```

```
------------------2)Depict percentage distribution of label on a pie
chart----------------------------------
```




```
'3)Considering all the features as independent feature and label as
dependent feature,split the dataset training and testing data with
test size=20%'
```

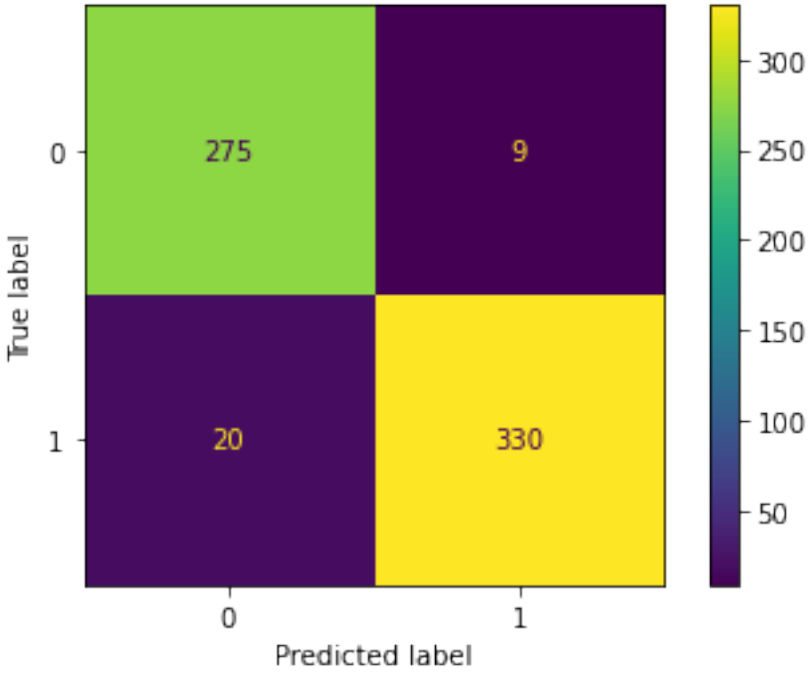
```
'3)Considering all the features as independent feature and label as
dependent feature,split the dataset training and testing data with
test size=20%'
```

```
X=X.to_numpy()
x_train, x_test, y_train, y_test = train_test_split(X, y ,test_size =
0.2)
```

```
print('------------------------------------
Decision_Tree_Classifier-----------------------------------------')
decision_tree = DecisionTreeClassifier()
decision_tree = decision_tree.fit(x_train,y_train)
y_pred_DecisionTreeClassifier=decision_tree.predict(x_test)
cm = confusion_matrix(y_test,y_pred_DecisionTreeClassifier)
```

```
disp = ConfusionMatrixDisplay(confusion_matrix=cm)
disp.plot()
plt.show()
print(classification_report(y_test,y_pred_DecisionTreeClassifier,
target_names=['male','female']))

-------------------------------------
Decision_Tree_Classifier----------------------------------------
```




```
              precision    recall  f1-score   support

        male       0.93      0.97      0.95       284
      female       0.97      0.94      0.96       350

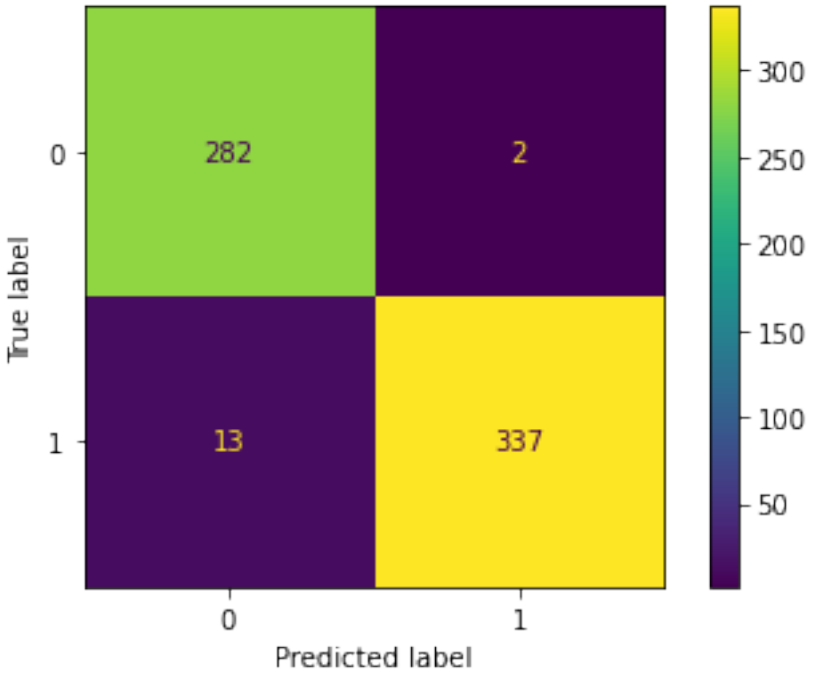
    accuracy                           0.95       634
   macro avg       0.95      0.96      0.95       634
weighted avg       0.95      0.95      0.95       634


print('----------------------------------------
Random_Forest_Classifier-------------------------------------------------')
clf_random_forest = RandomForestClassifier()
clf_random_forest.fit(x_train, y_train)
y_pred_randomforest=clf_random_forest.predict(x_test)
cm_random_forest = confusion_matrix(y_test,y_pred_randomforest)
disp = ConfusionMatrixDisplay(confusion_matrix=cm_random_forest)
disp.plot()

plt.show()
```

```
print(classification_report(y_test,y_pred_randomforest,
target_names=['male','female']))

----------------------------------------
Random_Forest_Classifier-----------------------------------------
```




```
              precision    recall  f1-score   support

        male       0.96      0.99      0.97       284
      female       0.99      0.96      0.98       350

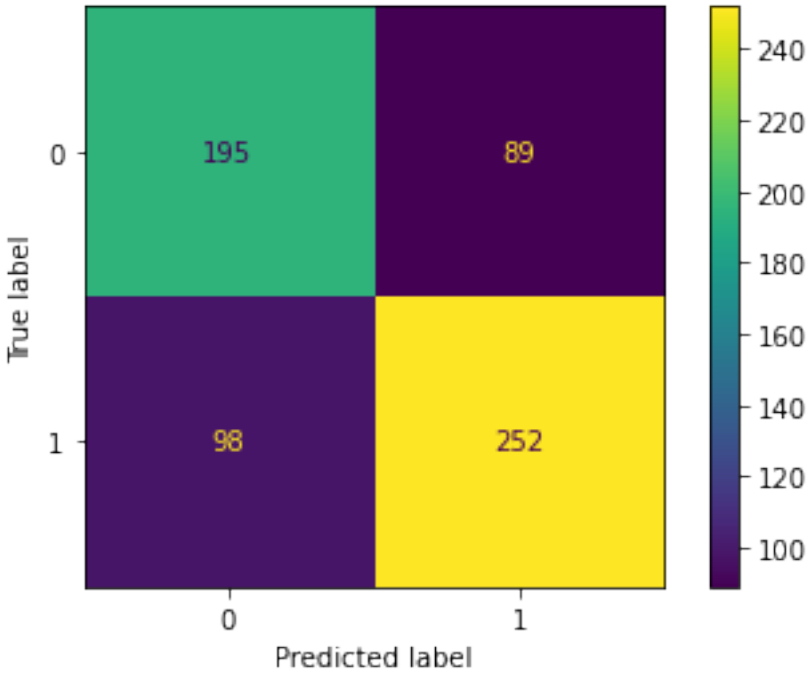
    accuracy                           0.98       634
   macro avg       0.98      0.98      0.98       634
weighted avg       0.98      0.98      0.98       634


print('---------------------------------------KNN-
Classifier-------------------------------------------------------')
neigh = KNeighborsClassifier()
neigh.fit(x_train, y_train)

y_pred_KNN=neigh.predict(x_test)
cm_KNN = confusion_matrix(y_test,y_pred_KNN)
disp = ConfusionMatrixDisplay(confusion_matrix=cm_KNN)
disp.plot()

plt.show()
print(classification_report(y_test,y_pred_KNN,
target_names=['male','female']))
```

```
--------------------------------------KNN-
Classifier-----------------------------------------------------
```

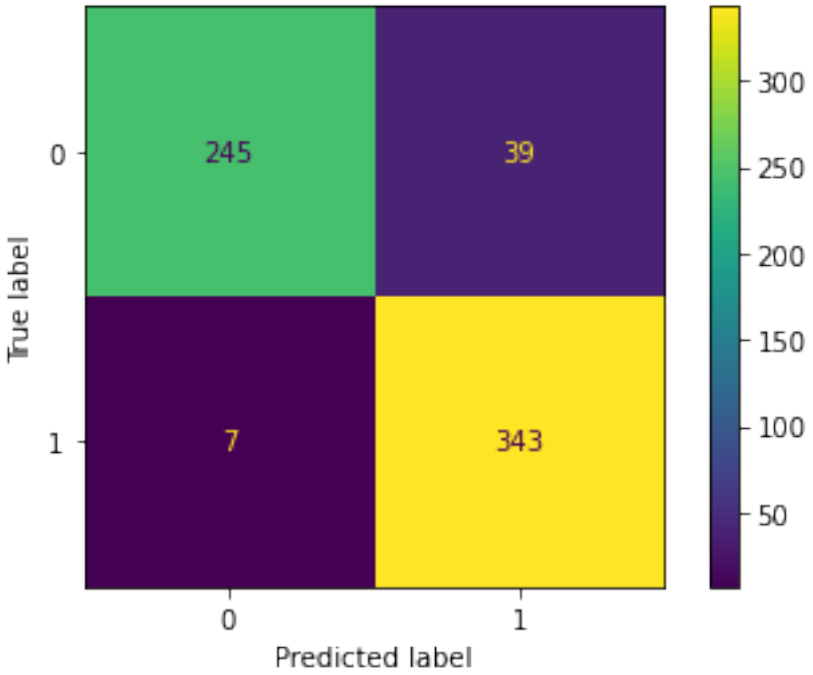


	precision	recall	f1-score	support
male	0.67	0.69	0.68	284
female	0.74	0.72	0.73	350
accuracy			0.71	634
macro avg	0.70	0.70	0.70	634
weighted avg	0.71	0.71	0.71	634

```
print('-----------------------------------------------Logistic-
Regression-----------------------------------------------------')
clf_logistic_regression = LogisticRegression( max_iter=1000)
clf_logistic_regression.fit(x_train, y_train)
y_pred_logistic_regression=clf_logistic_regression.predict(x_test)
cm_logistic_regression =
confusion_matrix(y_test,y_pred_logistic_regression)
disp =
ConfusionMatrixDisplay(confusion_matrix=cm_logistic_regression )
disp.plot()

plt.show()
print(classification_report(y_test,y_pred_logistic_regression,
target_names=['male','female']))
```

```
----------------------------------------------Logistic-
Regression----------------------------------------------
```

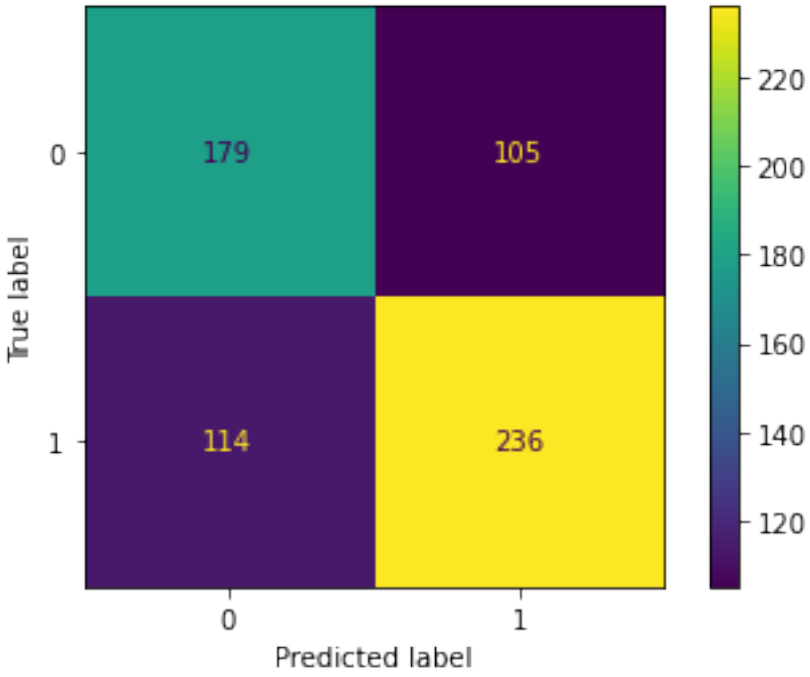


	precision	recall	f1-score	support
male	0.97	0.86	0.91	284
female	0.90	0.98	0.94	350
accuracy			0.93	634
macro avg	0.94	0.92	0.93	634
weighted avg	0.93	0.93	0.93	634

```
print('----------------------------------------------------SVM-
Classifier-----------------------------------------------------')
clf_svm = svm.SVC()
clf_svm.fit(x_train, y_train)
y_pred_svm=clf_svm .predict(x_test)
cm_svm = confusion_matrix(y_test,y_pred_svm)
disp = ConfusionMatrixDisplay(confusion_matrix=cm_svm )
disp.plot()

plt.show()
print(classification_report(y_test,y_pred_svm,
target_names=['male','female']))

----------------------------------------------SVM-
Classifier----------------------------------------------
```



	precision	recall	f1-score	support
male	0.61	0.63	0.62	284
female	0.69	0.67	0.68	350
accuracy			0.65	634
macro avg	0.65	0.65	0.65	634
weighted avg	0.66	0.65	0.66	634

```
print('Accuracy of DecisionTreeClassifier : ',accuracy_score(y_test,
y_pred_DecisionTreeClassifier))
print('Accuracy of RandomForestClassifier : ',accuracy_score(y_test,
y_pred_randomforest))
print('Accuracy of KNeighborsClassifier : ',accuracy_score(y_test,
y_pred_KNN))
print('Accuracy of LogisticRegression :
',accuracy_score(y_test,y_pred_logistic_regression))
print('Accuracy of SVM-Classifier :
',accuracy_score(y_test,y_pred_svm))
```

```
Accuracy of DecisionTreeClassifier :  0.9542586750788643
Accuracy of RandomForestClassifier :  0.9763406940063092
Accuracy of KNeighborsClassifier :  0.7050473186119873
Accuracy of LogisticRegression :  0.9274447949526814
Accuracy of SVM-Classifier :  0.6545741324921136
```

```
dit={accuracy_score(y_test,
y_pred_DecisionTreeClassifier):'DecisionTreeClassifier',accuracy_score
```

```
(y_test,
y_pred_randomforest):'RandomForestClassifier',accuracy_score(y_test,
y_pred_KNN):'KNeighborsClassifier',accuracy_score(y_test,y_pred_logist
ic_regression):'LogisticRegression',accuracy_score(y_test,y_pred_svm):
'Accuracy of SVM-Classifier'}

print(f'The model with best accuracy is {dit[max(dit.keys())]} which
has the accuracy of {max(dit.keys())}')
```

```
The model with best accuracy is RandomForestClassifier which has the
accuracy of 0.9763406940063092
```