# Capstone Project - Loan Application Status Prediction

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#### Batch: DS2312

## Problem Statement:

Develop a machine learning model to predict the approval status of loan applications based on various applicant and loan attributes. This will assist banks and financial institutions in efficiently and accurately determining the eligibility of applicants for loan approval.

Dataset Link:

* <https://github.com/FlipRoboTechnologies/ML_-Datasets/blob/main/Loan%20Application%20Status/loan_prediction.csv>

### Outline of the project:

1. Importing necessary libraries.
2. Importing dataset from GitHub.
3. Exploratory Data Analysis (EDA).
4. Data Preprocessing & Feature Engineering.
5. Model building and Saving
6. Concluding Remarks

# 1. Importing necessory libraries

import pandas as pd # for data wrangling purpose  
import numpy as np # Basic computation library  
import seaborn as sns # For Visualization   
import matplotlib.pyplot as plt # ploting package  
%matplotlib inline  
import warnings # Filtering warnings  
warnings.filterwarnings('ignore')

## Importing dataset from GitHub.

# Importing Loan Predication CSV dataset file using pandas  
df=pd.read\_csv('https://raw.githubusercontent.com/dsrscientist/DSData/master/loan\_prediction.csv')

# 2. Data Analysis

print('No of Rows:',df.shape[0])  
print('No. of Columns:',df.shape[1])  
df.head()

No of Rows: 614  
No. of Columns: 13

Loan\_ID Gender Married Dependents Education Self\_Employed \  
0 LP001002 Male No 0 Graduate No   
1 LP001003 Male Yes 1 Graduate No   
2 LP001005 Male Yes 0 Graduate Yes   
3 LP001006 Male Yes 0 Not Graduate No   
4 LP001008 Male No 0 Graduate No   
  
 ApplicantIncome CoapplicantIncome LoanAmount Loan\_Amount\_Term \  
0 5849 0.0 NaN 360.0   
1 4583 1508.0 128.0 360.0   
2 3000 0.0 66.0 360.0   
3 2583 2358.0 120.0 360.0   
4 6000 0.0 141.0 360.0   
  
 Credit\_History Property\_Area Loan\_Status   
0 1.0 Urban Y   
1 1.0 Rural N   
2 1.0 Urban Y   
3 1.0 Urban Y   
4 1.0 Urban Y

df

Loan\_ID Gender Married Dependents Education Self\_Employed \  
0 LP001002 Male No 0 Graduate No   
1 LP001003 Male Yes 1 Graduate No   
2 LP001005 Male Yes 0 Graduate Yes   
3 LP001006 Male Yes 0 Not Graduate No   
4 LP001008 Male No 0 Graduate No   
.. ... ... ... ... ... ...   
609 LP002978 Female No 0 Graduate No   
610 LP002979 Male Yes 3+ Graduate No   
611 LP002983 Male Yes 1 Graduate No   
612 LP002984 Male Yes 2 Graduate No   
613 LP002990 Female No 0 Graduate Yes   
  
 ApplicantIncome CoapplicantIncome LoanAmount Loan\_Amount\_Term \  
0 5849 0.0 NaN 360.0   
1 4583 1508.0 128.0 360.0   
2 3000 0.0 66.0 360.0   
3 2583 2358.0 120.0 360.0   
4 6000 0.0 141.0 360.0   
.. ... ... ... ...   
609 2900 0.0 71.0 360.0   
610 4106 0.0 40.0 180.0   
611 8072 240.0 253.0 360.0   
612 7583 0.0 187.0 360.0   
613 4583 0.0 133.0 360.0   
  
 Credit\_History Property\_Area Loan\_Status   
0 1.0 Urban Y   
1 1.0 Rural N   
2 1.0 Urban Y   
3 1.0 Urban Y   
4 1.0 Urban Y   
.. ... ... ...   
609 1.0 Rural Y   
610 1.0 Rural Y   
611 1.0 Urban Y   
612 1.0 Urban Y   
613 0.0 Semiurban N   
  
[614 rows x 13 columns]

df.tail()

Loan\_ID Gender Married Dependents Education Self\_Employed \  
609 LP002978 Female No 0 Graduate No   
610 LP002979 Male Yes 3+ Graduate No   
611 LP002983 Male Yes 1 Graduate No   
612 LP002984 Male Yes 2 Graduate No   
613 LP002990 Female No 0 Graduate Yes   
  
 ApplicantIncome CoapplicantIncome LoanAmount Loan\_Amount\_Term \  
609 2900 0.0 71.0 360.0   
610 4106 0.0 40.0 180.0   
611 8072 240.0 253.0 360.0   
612 7583 0.0 187.0 360.0   
613 4583 0.0 133.0 360.0   
  
 Credit\_History Property\_Area Loan\_Status   
609 1.0 Rural Y   
610 1.0 Rural Y   
611 1.0 Urban Y   
612 1.0 Urban Y   
613 0.0 Semiurban N

df.columns

Index(['Loan\_ID', 'Gender', 'Married', 'Dependents', 'Education',  
 'Self\_Employed', 'ApplicantIncome', 'CoapplicantIncome', 'LoanAmount',  
 'Loan\_Amount\_Term', 'Credit\_History', 'Property\_Area', 'Loan\_Status'],  
 dtype='object')

# 3. Exploratory Data Analysis

Checking integrity of data & Missing value

### Data Integrity Check

df.duplicated().sum() # This check any if any duplicated entry exit in dataset

0

Since dataset is large, Let check for any entry which is repeated or duplicated in dataset at same date.

#### Comment:

Dataset doesnot contain Any duplicate entry.

df.info()

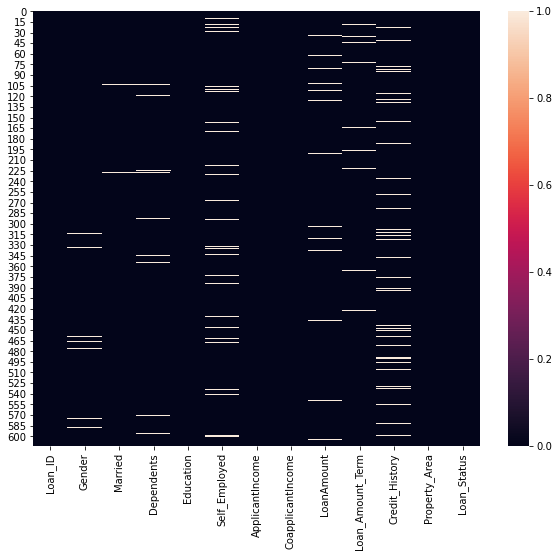
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 614 entries, 0 to 613  
Data columns (total 13 columns):  
 # Column Non-Null Count Dtype   
--- ------ -------------- -----   
 0 Loan\_ID 614 non-null object   
 1 Gender 601 non-null object   
 2 Married 611 non-null object   
 3 Dependents 599 non-null object   
 4 Education 614 non-null object   
 5 Self\_Employed 582 non-null object   
 6 ApplicantIncome 614 non-null int64   
 7 CoapplicantIncome 614 non-null float64  
 8 LoanAmount 592 non-null float64  
 9 Loan\_Amount\_Term 600 non-null float64  
 10 Credit\_History 564 non-null float64  
 11 Property\_Area 614 non-null object   
 12 Loan\_Status 614 non-null object   
dtypes: float64(4), int64(1), object(8)  
memory usage: 62.5+ KB

* Observation :
  + In loan application status dataset we have 614 rows with 13 columns including target variable.
  + A Target Variable is 'Loan\_Status' having object datatype and It is categorical variable.
  + Gender, Married, Education,Self Employed, Credit History, Loan Status are categorical features.
  + There are three types of datatype dtypes: float64(4), int64(1), object(8)

### Missing value check

plt.figure(figsize=(10,8))  
sns.heatmap(df.isnull())

<AxesSubplot:>



#Heat map showing values which are not available or null

missing\_values = df.isnull().sum().sort\_values(ascending = False)  
percentage\_missing\_values =(missing\_values/len(df))\*100  
print(pd.concat([missing\_values, percentage\_missing\_values], axis =1, keys =['Missing Values', '% Missing data']))

Missing Values % Missing data  
Credit\_History 50 8.143322  
Self\_Employed 32 5.211726  
LoanAmount 22 3.583062  
Dependents 15 2.442997  
Loan\_Amount\_Term 14 2.280130  
Gender 13 2.117264  
Married 3 0.488599  
Loan\_Status 0 0.000000  
Property\_Area 0 0.000000  
CoapplicantIncome 0 0.000000  
ApplicantIncome 0 0.000000  
Education 0 0.000000  
Loan\_ID 0 0.000000

* Observation :
  + 7 out 13 columns contains missing value.
  + As small amount of data is missing so we use mean amd mode to replace with NaN values.

Lets explore categorical features before missing value imputation.

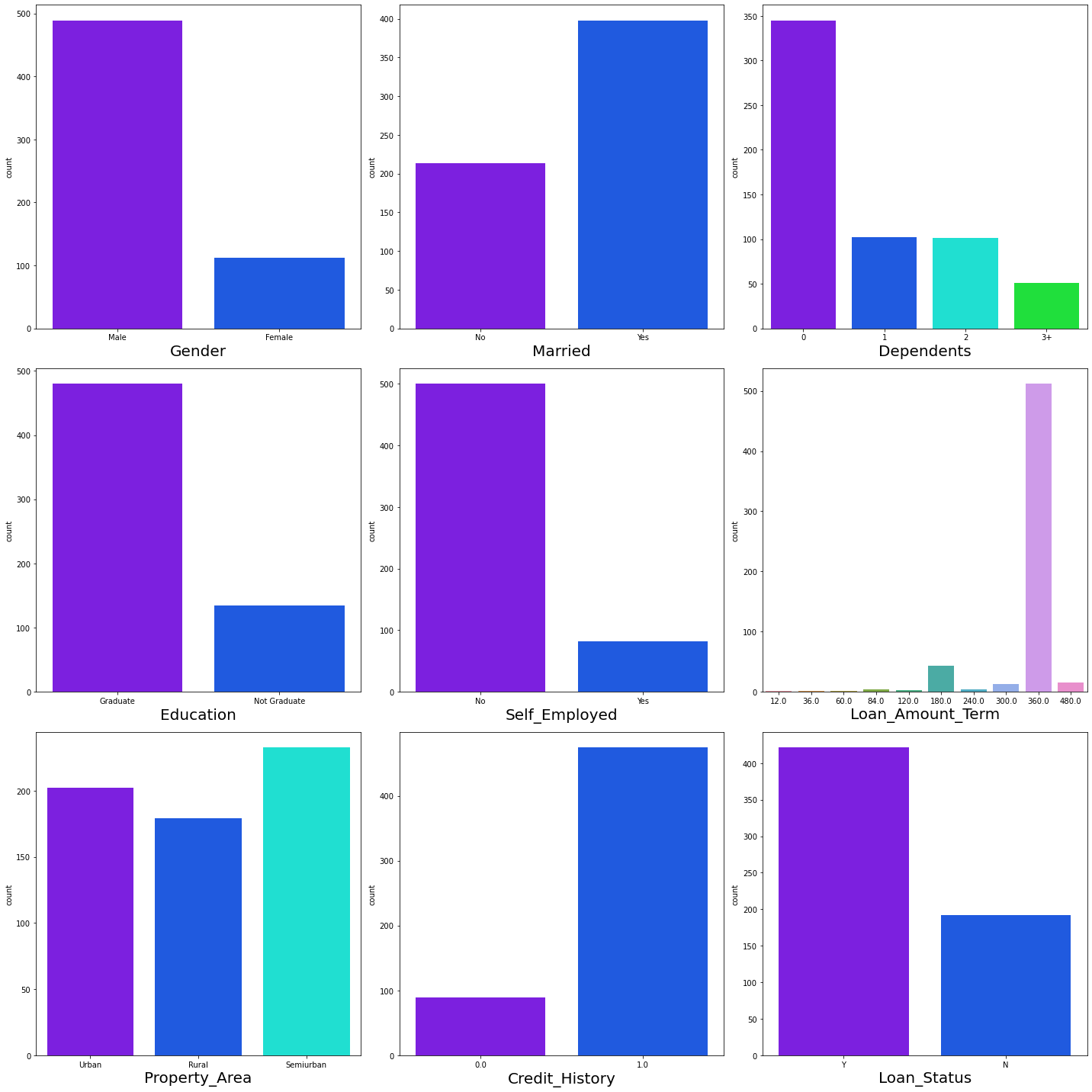
### Start with Enlisting Value counts & Sub-categories of different categorial features available

category=['Gender','Married','Dependents','Education','Self\_Employed',  
 'Loan\_Amount\_Term','Property\_Area','Credit\_History','Loan\_Status']  
for i in category:  
 print(i)  
 print(df[i].value\_counts())  
 print('='\*100)

Gender  
Male 489  
Female 112  
Name: Gender, dtype: int64  
====================================================================================================  
Married  
Yes 398  
No 213  
Name: Married, dtype: int64  
====================================================================================================  
Dependents  
0 345  
1 102  
2 101  
3+ 51  
Name: Dependents, dtype: int64  
====================================================================================================  
Education  
Graduate 480  
Not Graduate 134  
Name: Education, dtype: int64  
====================================================================================================  
Self\_Employed  
No 500  
Yes 82  
Name: Self\_Employed, dtype: int64  
====================================================================================================  
Loan\_Amount\_Term  
360.0 512  
180.0 44  
480.0 15  
300.0 13  
84.0 4  
240.0 4  
120.0 3  
36.0 2  
60.0 2  
12.0 1  
Name: Loan\_Amount\_Term, dtype: int64  
====================================================================================================  
Property\_Area  
Semiurban 233  
Urban 202  
Rural 179  
Name: Property\_Area, dtype: int64  
====================================================================================================  
Credit\_History  
1.0 475  
0.0 89  
Name: Credit\_History, dtype: int64  
====================================================================================================  
Loan\_Status  
Y 422  
N 192  
Name: Loan\_Status, dtype: int64  
====================================================================================================

# Visual Representation of Categorical variables

sns.set\_palette('gist\_rainbow\_r')  
plt.figure(figsize=(20,20),facecolor='white')  
plotnumber=1  
category=['Gender','Married','Dependents','Education','Self\_Employed',  
 'Loan\_Amount\_Term','Property\_Area','Credit\_History','Loan\_Status']  
for i in category:  
 if plotnumber<=9:  
 ax=plt.subplot(3,3,plotnumber)  
 sns.countplot(df[i])  
 plt.xlabel(i,fontsize=20)  
 plotnumber+=1  
plt.tight\_layout()  
plt.show()

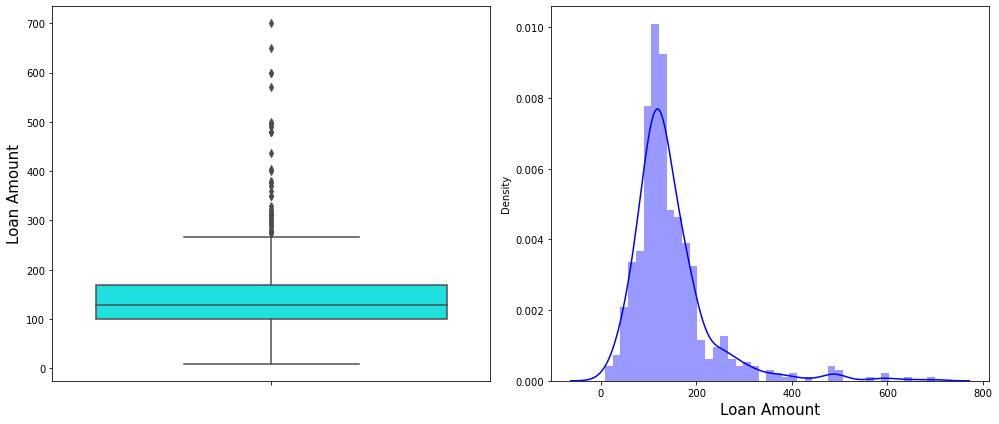


* Observation:
  + Out of Total loan application 80 % applicants are Male. We can Explore loan amount for each gender applied and evaluate whether on the same basis loan is approved for each gender or not?
  + Only 20% applicants are self employed. So it will interesting to gain insight on relation between Applicant income and loan approval for non self employed category. We will look to find any benchmark range of Income for loan approval.Another benchmark we will try to find is about loan requirement for these two categories.
  + Nearly 70% are married and 75% of loan applicants are graduates
  + Almost 60% of the applicants have no dependents.
  + Most of applicants come from Semi Urban areas, followed by Urban and Rural areas.
  + 80% people previously have credit history. Normally people having credit history are seen more prone to get loan approval.
  + Nearly 70 % applicant gets loan approved.

We can impute categoical variable with mode in that category. For numerical variable we have option of mean and median. If Outliers are to strech then we will impute with median.

### Let check outliers for missing values Numerical variable having missing values by plotting boxplot.

plt.figure(figsize=(14,6))  
plt.subplot(1,2,1)  
sns.boxplot( y='LoanAmount', data=df,color='cyan')  
plt.ylabel('Loan Amount',fontsize=15)  
plt.subplot(1,2,2)  
sns.distplot(df['LoanAmount'], color='b')  
plt.xlabel('Loan Amount',fontsize=15)  
plt.tight\_layout()  
plt.show()



print("Mean of Loan Amount:",df['LoanAmount'].mean())  
print("Median of Loan Amount:",df['LoanAmount'].median())

Mean of Loan Amount: 146.41216216216216  
Median of Loan Amount: 128.0

#### Observation-

* The mean is greater than median loan amount.
* Clearly we can see outliers in boxplot and feature is strecth to far in distribution plot.

As extreme outliers are present in feature and for that reason as data is more sensitive to mean we are going to impute missing values in loan amount with median.

### Imputation of Missing values

#### Imputation details :

Skewed or non-normal data: If the data is heavily skewed or has outliers, the median is a better choice as it is robust to extreme values.

1. Missing values in Loan amount is impute with median value.
2. Maximum Loan term is 360 Months so Missing value in Loan amount term is replace with 360 Months.
3. categorical data such as Credit History, Self Employed, dependents, Gender and Married are replace with mode of repective features.

# Imputating Missing value with mode for categorical features  
df['Credit\_History'].fillna(df['Credit\_History'].mode()[0],inplace=True)  
df['Self\_Employed'].fillna(df['Self\_Employed'].mode()[0],inplace=True)  
df['Dependents'].fillna(df['Dependents'].mode()[0], inplace=True)  
df['Gender'].fillna(df['Gender'].mode()[0],inplace=True)  
df['Married'].fillna(df['Married'].mode()[0],inplace=True)  
  
# Imputation of Numerical features  
df['Loan\_Amount\_Term'].fillna(df['Loan\_Amount\_Term'].mode()[0],inplace=True)  
df['LoanAmount'].fillna(df['LoanAmount'].median(), inplace=True)

### Missing Value Check After Imputation

missing\_values = df.isnull().sum().sort\_values(ascending = False)  
percentage\_missing\_values =(missing\_values/len(df))\*100  
print(pd.concat([missing\_values, percentage\_missing\_values], axis =1, keys =['Missing Values', '% Missing data']))

Missing Values % Missing data  
Loan\_Status 0 0.0  
Property\_Area 0 0.0  
Credit\_History 0 0.0  
Loan\_Amount\_Term 0 0.0  
LoanAmount 0 0.0  
CoapplicantIncome 0 0.0  
ApplicantIncome 0 0.0  
Self\_Employed 0 0.0  
Education 0 0.0  
Dependents 0 0.0  
Married 0 0.0  
Gender 0 0.0  
Loan\_ID 0 0.0

#### Comment :

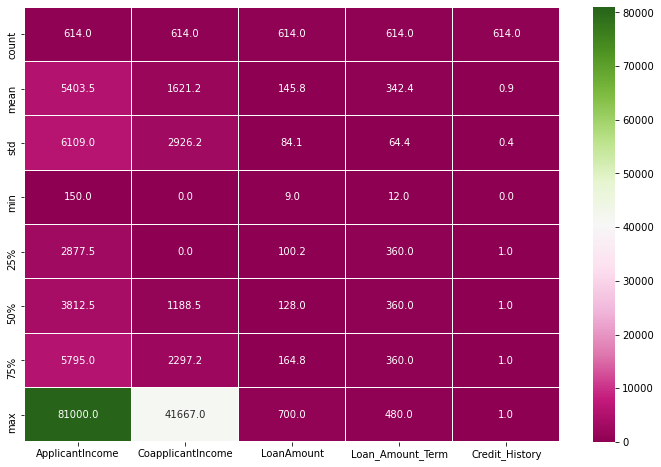
Finally, No Missing Value is Present.

We are Now Yes To Go Further !!!

### Statistical Matrix

# Visualizing the statistics of the columns using heatmap.  
plt.figure(figsize=(12,8))  
sns.heatmap(df.describe(),linewidths = 0.1,fmt='0.1f',annot = True,cmap='PiYG')

<AxesSubplot:>



df.describe()

ApplicantIncome CoapplicantIncome LoanAmount Loan\_Amount\_Term \  
count 614.000000 614.000000 614.000000 614.000000   
mean 5403.459283 1621.245798 145.752443 342.410423   
std 6109.041673 2926.248369 84.107233 64.428629   
min 150.000000 0.000000 9.000000 12.000000   
25% 2877.500000 0.000000 100.250000 360.000000   
50% 3812.500000 1188.500000 128.000000 360.000000   
75% 5795.000000 2297.250000 164.750000 360.000000   
max 81000.000000 41667.000000 700.000000 480.000000   
  
 Credit\_History   
count 614.000000   
mean 0.855049   
std 0.352339   
min 0.000000   
25% 1.000000   
50% 1.000000   
75% 1.000000   
max 1.000000

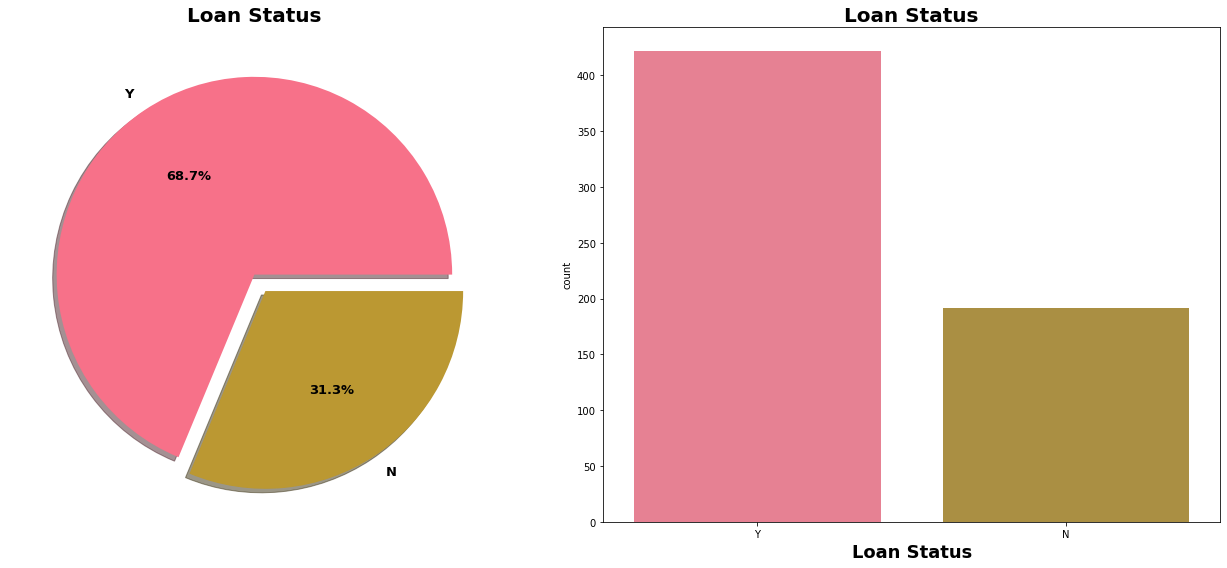
#### Observation:

* In Applicant Income & Coapplicant Income Std deviation value is greater than median. So data is spread and skewed.
* Taking 75% and Max rows into consideration we can surely say that Outliers exist in Applicant Income, Coapplicant Income,Loan Amount.
* Since Credit History is Categorical variable there is no significance in different statstical parameter of it.
* Minimum Tenure for Loan is 12 Months and Maximum Loan tenure is 480 Months.
* Minimum Applicant income is 150 and maximum is 81000.

Let dive into exploration of Target and independent feature.

### Target Variable

plt.rcParams["figure.autolayout"] = True  
sns.set\_palette('husl')  
f,ax=plt.subplots(1,2,figsize=(18,8))  
df['Loan\_Status'].value\_counts().plot.pie(explode=[0,0.1],autopct='%2.1f%%',  
 textprops ={ 'fontweight': 'bold','fontsize':13}, ax=ax[0],shadow=True)  
ax[0].set\_title('Loan Status', fontsize=20,fontweight ='bold')  
ax[0].set\_ylabel('')  
sns.countplot('Loan\_Status',data=df,ax=ax[1])  
ax[1].set\_title('Loan Status',fontsize=20,fontweight ='bold')  
ax[1].set\_xlabel("Loan Status",fontsize=18,fontweight ='bold')  
plt.show()



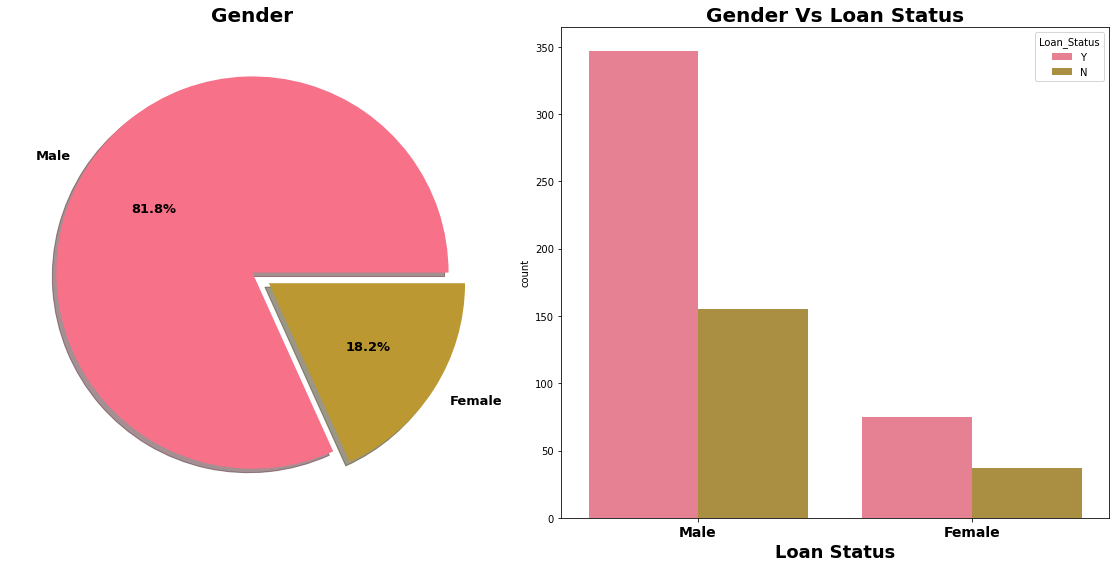
#### Comment :

* 68.7% Applicants gets loan Approval.
* We can see that dataset is imbalanced in nature.

Let check each feature against Target variable to gain insight into data.

### Gender Vs Loan Status

plt.rcParams["figure.autolayout"] = True  
sns.set\_palette('husl')  
f,ax=plt.subplots(1,2,figsize=(16,8))  
df['Gender'].value\_counts().plot.pie(explode=[0,0.1],autopct='%2.1f%%',  
 textprops ={ 'fontweight': 'bold','fontsize':13}, ax=ax[0],shadow=True)  
ax[0].set\_title('Gender', fontsize=20,fontweight ='bold')  
ax[0].set\_ylabel('')  
sns.countplot('Gender',hue="Loan\_Status",data=df,ax=ax[1])  
ax[1].set\_title('Gender Vs Loan Status',fontsize=20,fontweight ='bold')  
ax[1].set\_xlabel("Loan Status",fontsize=18,fontweight ='bold')  
plt.xticks(fontsize=14,fontweight ='bold')  
plt.tight\_layout()  
plt.show()



pd.crosstab(df['Gender'],df["Loan\_Status"], margins=True).style.background\_gradient(cmap='summer\_r')

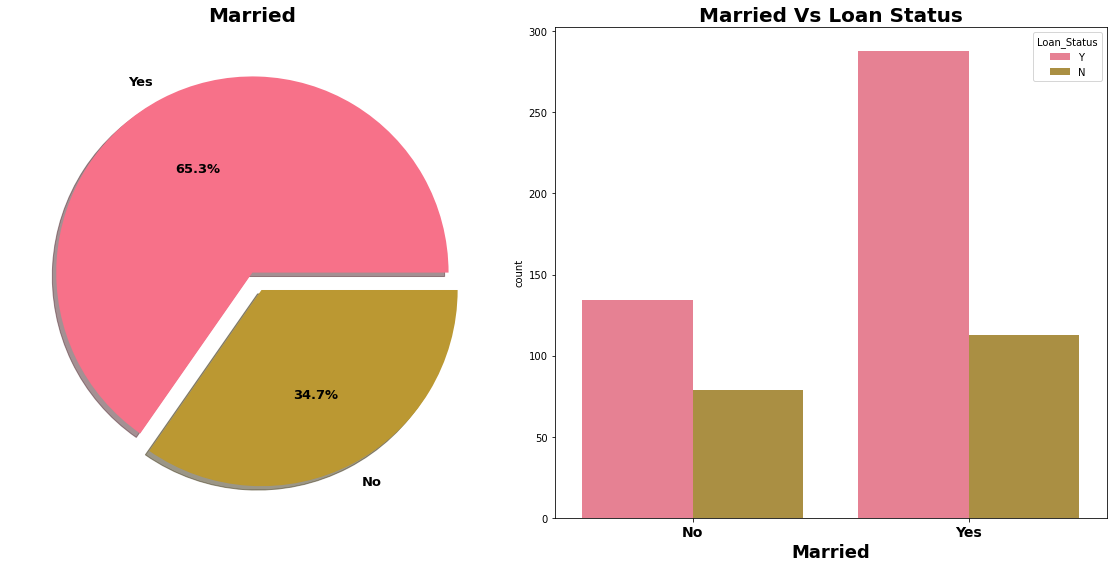
<pandas.io.formats.style.Styler at 0x29ea5022a60>

#### Comment :

* 81.8% Applicant are male.
* Irrespective Gender 65 % Applicant from each gender gets loan approval.It means that gender doesnot play any role loan approval. No Discrimation on name of Gender done.

### Married Vs Loan Status

plt.rcParams["figure.autolayout"] = True  
sns.set\_palette('husl')  
f,ax=plt.subplots(1,2,figsize=(16,8))  
df['Married'].value\_counts().plot.pie(explode=[0,0.1],autopct='%2.1f%%',  
 textprops ={ 'fontweight': 'bold','fontsize':13}, ax=ax[0],shadow=True)  
ax[0].set\_title('Married', fontsize=20,fontweight ='bold')  
ax[0].set\_ylabel('')  
sns.countplot('Married',hue="Loan\_Status",data=df,ax=ax[1])  
ax[1].set\_title('Married Vs Loan Status',fontsize=20,fontweight ='bold')  
ax[1].set\_xlabel("Married",fontsize=18,fontweight ='bold')  
plt.xticks(fontsize=14,fontweight ='bold')  
plt.tight\_layout()  
plt.show()



pd.crosstab([df['Gender'],df['Married']],[df.Loan\_Status],margins=True).style.background\_gradient(cmap='gist\_rainbow\_r')

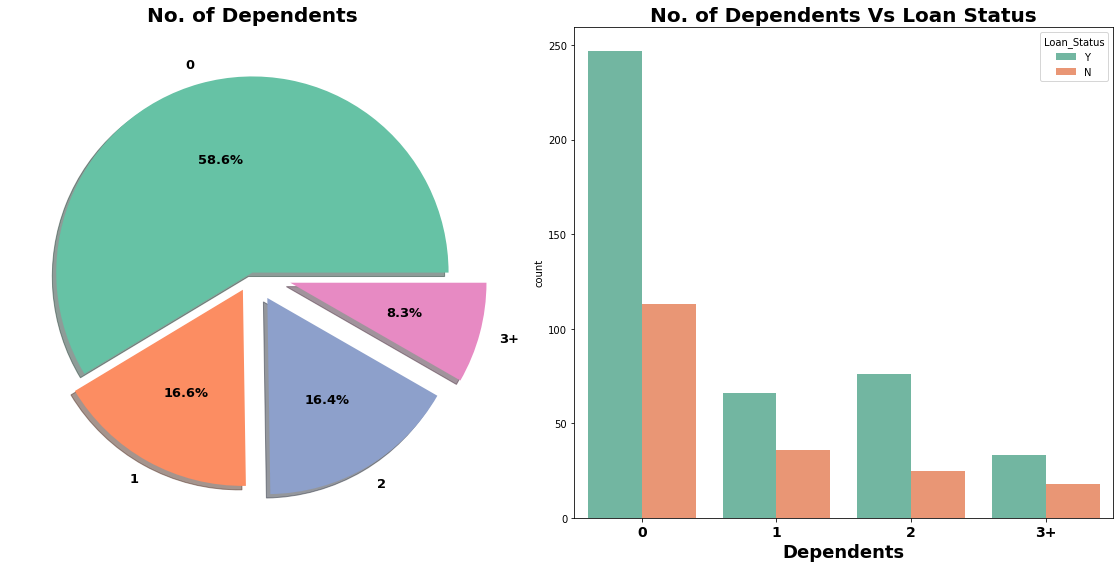
<pandas.io.formats.style.Styler at 0x29ea3d159a0>

#### Comment:

* 65.3 % loan applicants are married. We can see from Count plot that Married people have more possibility of getting loan approval.
* But Here comes Interesting observation from crosstab :
  + Unmarried Women are more chances of getting loan approval compare to married women.We will try to find which factor actually play deciding role here like education, employeement or Income.
  + Married Men are more chances of loan approval.

### Let check how number dependents play here.

plt.rcParams["figure.autolayout"] = True  
sns.set\_palette('Set2')  
f,ax=plt.subplots(1,2,figsize=(16,8))  
df['Dependents'].value\_counts().plot.pie(explode=[0,0.1,0.15,0.2],autopct='%2.1f%%',  
 textprops ={ 'fontweight': 'bold','fontsize':13}, ax=ax[0],shadow=True)  
ax[0].set\_title('No. of Dependents', fontsize=20,fontweight ='bold')  
ax[0].set\_ylabel('')  
sns.countplot('Dependents',hue="Loan\_Status",data=df,ax=ax[1])  
ax[1].set\_title('No. of Dependents Vs Loan Status',fontsize=20,fontweight ='bold')  
ax[1].set\_xlabel("Dependents",fontsize=18,fontweight ='bold')  
plt.xticks(fontsize=14,fontweight ='bold')  
plt.tight\_layout()  
plt.show()



pd.crosstab([df['Dependents']],[df.Loan\_Status,df['Gender']],margins=True).style.background\_gradient(cmap='summer\_r')

<pandas.io.formats.style.Styler at 0x29ea6d8fbb0>

pd.crosstab([df['Dependents'],df['Gender']],[df.Loan\_Status],margins=True).style.background\_gradient(cmap='Blues')

<pandas.io.formats.style.Styler at 0x29ea6e5bd60>

#### Comment:

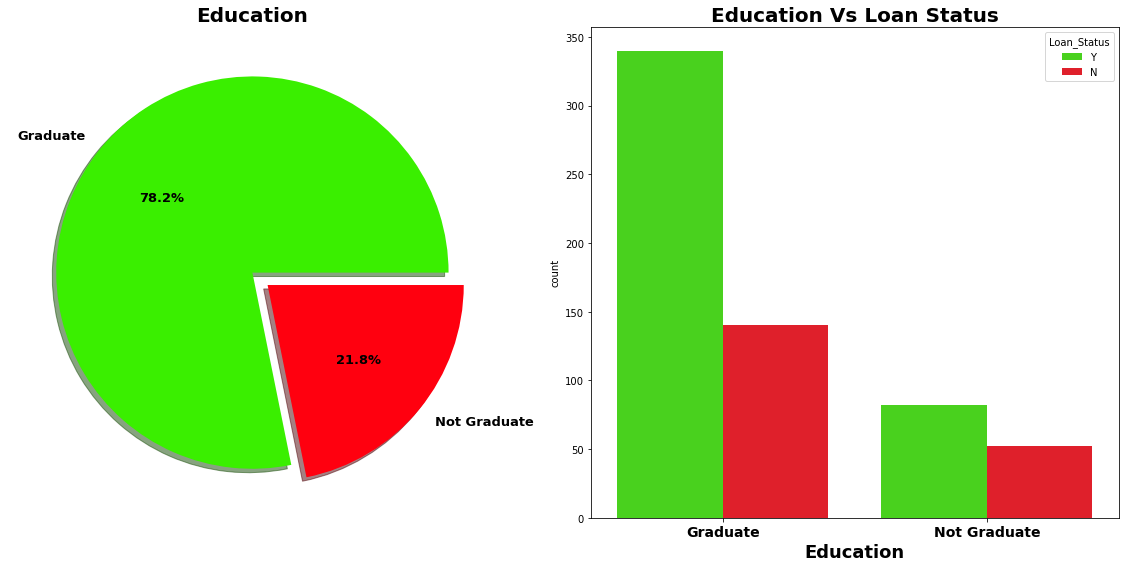
* 58.6% Applicants have no dependents on them.33% Applicants have either 1 or 2 dependents. It will interesting check whether with increase in number dependents their is increase in requirement loan amount.
* Female having zero dependents have more chances to get loan approval compare to Females with dependents.
* For male Maximum loan approval comes with 0 dependents followed by 2 dependents.

df.head()

Loan\_ID Gender Married Dependents Education Self\_Employed \  
0 LP001002 Male No 0 Graduate No   
1 LP001003 Male Yes 1 Graduate No   
2 LP001005 Male Yes 0 Graduate Yes   
3 LP001006 Male Yes 0 Not Graduate No   
4 LP001008 Male No 0 Graduate No   
  
 ApplicantIncome CoapplicantIncome LoanAmount Loan\_Amount\_Term \  
0 5849 0.0 128.0 360.0   
1 4583 1508.0 128.0 360.0   
2 3000 0.0 66.0 360.0   
3 2583 2358.0 120.0 360.0   
4 6000 0.0 141.0 360.0   
  
 Credit\_History Property\_Area Loan\_Status   
0 1.0 Urban Y   
1 1.0 Rural N   
2 1.0 Urban Y   
3 1.0 Urban Y   
4 1.0 Urban Y

### Education Vs Loan status

plt.rcParams["figure.autolayout"] = True  
sns.set\_palette('prism')  
f,ax=plt.subplots(1,2,figsize=(16,8))  
df['Education'].value\_counts().plot.pie(explode=[0,0.1],autopct='%2.1f%%',  
 textprops ={ 'fontweight': 'bold','fontsize':13}, ax=ax[0],shadow=True)  
ax[0].set\_title('Education', fontsize=20,fontweight ='bold')  
ax[0].set\_ylabel('')  
sns.countplot('Education',hue="Loan\_Status",data=df,ax=ax[1])  
ax[1].set\_title('Education Vs Loan Status',fontsize=20,fontweight ='bold')  
ax[1].set\_xlabel("Education",fontsize=18,fontweight ='bold')  
plt.xticks(fontsize=14,fontweight ='bold')  
plt.tight\_layout()  
plt.show()



pd.crosstab([df['Education'],df['Gender']],[df.Loan\_Status],margins=True).style.background\_gradient(cmap='Blues')

<pandas.io.formats.style.Styler at 0x29ea4dca820>

#### Comment:

* Graduate applicants are more likely to get loan approval irrespective gender.

df.head()

Loan\_ID Gender Married Dependents Education Self\_Employed \  
0 LP001002 Male No 0 Graduate No   
1 LP001003 Male Yes 1 Graduate No   
2 LP001005 Male Yes 0 Graduate Yes   
3 LP001006 Male Yes 0 Not Graduate No   
4 LP001008 Male No 0 Graduate No   
  
 ApplicantIncome CoapplicantIncome LoanAmount Loan\_Amount\_Term \  
0 5849 0.0 128.0 360.0   
1 4583 1508.0 128.0 360.0   
2 3000 0.0 66.0 360.0   
3 2583 2358.0 120.0 360.0   
4 6000 0.0 141.0 360.0   
  
 Credit\_History Property\_Area Loan\_Status   
0 1.0 Urban Y   
1 1.0 Rural N   
2 1.0 Urban Y   
3 1.0 Urban Y   
4 1.0 Urban Y

# EDA Concluding Remarks

In EDA, duplicate entries in the dataset has been figured out.

Missing values are figured out. Missing value imputation is performed.

# 4. Pre-processing Pipeline

### Encoding categorical data

Category=['Gender','Married','Education','Self\_Employed','Property\_Area','Loan\_Status']

# Using Label Encoder on categorical variable  
from sklearn.preprocessing import LabelEncoder  
le = LabelEncoder()  
for i in Category:  
 df[i] = le.fit\_transform(df[i])  
df.head()

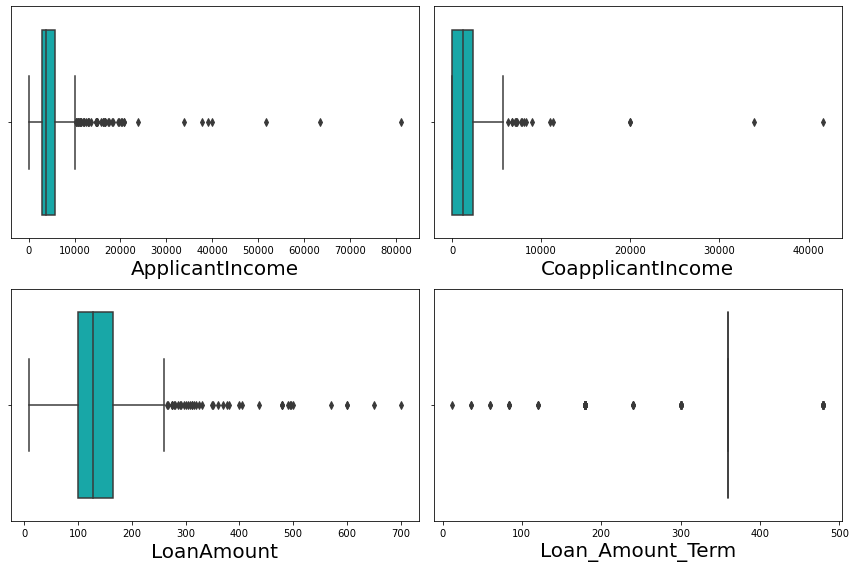
Loan\_ID Gender Married Dependents Education Self\_Employed \  
0 LP001002 1 0 0 0 0   
1 LP001003 1 1 1 0 0   
2 LP001005 1 1 0 0 1   
3 LP001006 1 1 0 1 0   
4 LP001008 1 0 0 0 0   
  
 ApplicantIncome CoapplicantIncome LoanAmount Loan\_Amount\_Term \  
0 5849 0.0 128.0 360.0   
1 4583 1508.0 128.0 360.0   
2 3000 0.0 66.0 360.0   
3 2583 2358.0 120.0 360.0   
4 6000 0.0 141.0 360.0   
  
 Credit\_History Property\_Area Loan\_Status   
0 1.0 2 1   
1 1.0 0 0   
2 1.0 2 1   
3 1.0 2 1   
4 1.0 2 1

# Feature selection and Engineering

## 1. Outliers Detection and Removal

Numerical =['ApplicantIncome','CoapplicantIncome','LoanAmount','Loan\_Amount\_Term']

plt.figure(figsize=(12,8),facecolor='white')  
plotnumber=1  
  
for column in Numerical:  
 if plotnumber<=4:  
 ax=plt.subplot(2,2,plotnumber)  
 sns.boxplot(df[column],color='c')  
 plt.xlabel(column,fontsize=20)  
 plotnumber+=1  
plt.tight\_layout()  
plt.show()



From Boxplot we can see outliers exist dataset.

# Droping unnecessary columns  
df.drop(["Loan\_ID"], axis=1, inplace=True)

df['Dependents'] = df.Dependents.map({'0':0,'1':1,'2':2,'3+':3})

df['Dependents'] =pd.to\_numeric(df['Dependents'])

from scipy.stats import zscore  
z = np.abs(zscore(df))  
threshold = 3  
df1 = df[(z<3).all(axis = 1)]  
  
print ("Shape of the dataframe before removing outliers: ", df.shape)  
print ("Shape of the dataframe after removing outliers: ", df1.shape)  
print ("Percentage of data loss post outlier removal: ", (df.shape[0]-df1.shape[0])/df.shape[0]\*100)  
  
df=df1.copy() # reassigning the changed dataframe name to our original dataframe name

Shape of the dataframe before removing outliers: (614, 12)  
Shape of the dataframe after removing outliers: (577, 12)  
Percentage of data loss post outlier removal: 6.026058631921824

##### Data Loss

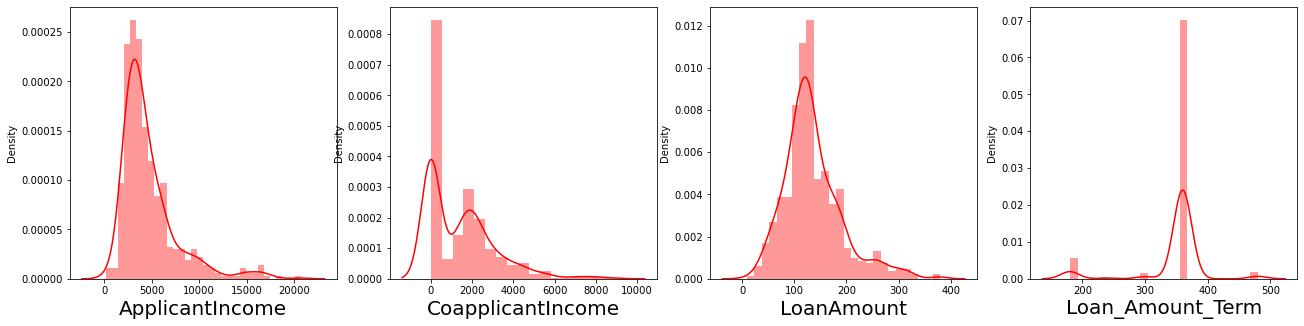
print("\033[1m"+'Percentage Data Loss :'+"\033[0m",((614-577)/614)\*100,'%')

Percentage Data Loss : 6.026058631921824 %

We are losing 6.02 % of data and which Acceptable.

## 2. Skewness of features

plt.figure(figsize=(22,5),facecolor='white')  
plotnum=1  
for col in Numerical:  
 if plotnum<=4:  
 plt.subplot(1,4,plotnum)  
 sns.distplot(df[col],color='r')  
 plt.xlabel(col,fontsize=20)  
 plotnum+=1  
plt.show()



df.skew()

Gender -1.622920  
Married -0.630211  
Dependents 1.052106  
Education 1.306588  
Self\_Employed 2.252848  
ApplicantIncome 2.148522  
CoapplicantIncome 1.350517  
LoanAmount 1.151525  
Loan\_Amount\_Term -2.098806  
Credit\_History -1.976043  
Property\_Area -0.055332  
Loan\_Status -0.822635  
dtype: float64

#### Comment :

* Out of all above feature 'ApplicantIncome', 'CoapplicantIncome', 'LoanAmount' are skewed which are numerical feature.
* Other features are categorical in nature so skewness is nothing to do with these remaining feature.We will ignore them.
* We will yeo-johnson transformation method.

# Removing skewness using yeo-johnson method to get better prediction  
skew = ['ApplicantIncome', 'CoapplicantIncome', 'LoanAmount']  
  
from sklearn.preprocessing import PowerTransformer  
scaler = PowerTransformer(method='yeo-johnson')

df[skew] = scaler.fit\_transform(df[skew].values)  
df[skew].head()

ApplicantIncome CoapplicantIncome LoanAmount  
0 0.681780 -1.122446 0.000771  
1 0.234783 0.744117 0.000771  
2 -0.527201 -1.122446 -1.437336  
3 -0.791972 0.895786 -0.153545  
4 0.728848 -1.122446 0.238260

#### Checking skewness after using yeo-johnson ethod

df.skew()

Gender -1.622920  
Married -0.630211  
Dependents 1.052106  
Education 1.306588  
Self\_Employed 2.252848  
ApplicantIncome 0.027981  
CoapplicantIncome -0.191876  
LoanAmount 0.048425  
Loan\_Amount\_Term -2.098806  
Credit\_History -1.976043  
Property\_Area -0.055332  
Loan\_Status -0.822635  
dtype: float64

For Numerical variable skewness is within permissible limit.

So Yes To Go Forward !!!

## 3. Corrleation

df.corr()

Gender Married Dependents Education Self\_Employed \  
Gender 1.000000 0.378997 0.188162 0.045696 -0.006207   
Married 0.378997 1.000000 0.329900 0.024817 -0.015779   
Dependents 0.188162 0.329900 1.000000 0.069814 0.044543   
Education 0.045696 0.024817 0.069814 1.000000 -0.007139   
Self\_Employed -0.006207 -0.015779 0.044543 -0.007139 1.000000   
ApplicantIncome 0.058590 -0.024783 0.105994 -0.176074 0.212260   
CoapplicantIncome 0.234551 0.335820 0.004109 0.049739 -0.087338   
LoanAmount 0.172146 0.181878 0.131772 -0.128715 0.117218   
Loan\_Amount\_Term -0.104983 -0.127348 -0.087389 -0.090523 -0.032914   
Credit\_History 0.013172 0.019308 -0.020288 -0.075217 -0.016390   
Property\_Area -0.026340 0.010595 0.002327 -0.068596 -0.028253   
Loan\_Status 0.017408 0.089026 0.017872 -0.092658 -0.026525   
  
 ApplicantIncome CoapplicantIncome LoanAmount \  
Gender 0.058590 0.234551 0.172146   
Married -0.024783 0.335820 0.181878   
Dependents 0.105994 0.004109 0.131772   
Education -0.176074 0.049739 -0.128715   
Self\_Employed 0.212260 -0.087338 0.117218   
ApplicantIncome 1.000000 -0.360946 0.432154   
CoapplicantIncome -0.360946 1.000000 0.200081   
LoanAmount 0.432154 0.200081 1.000000   
Loan\_Amount\_Term -0.069429 0.000951 0.049057   
Credit\_History 0.028825 0.006564 -0.003626   
Property\_Area -0.011364 -0.074476 -0.098090   
Loan\_Status -0.002484 0.079344 -0.023609   
  
 Loan\_Amount\_Term Credit\_History Property\_Area \  
Gender -0.104983 0.013172 -0.026340   
Married -0.127348 0.019308 0.010595   
Dependents -0.087389 -0.020288 0.002327   
Education -0.090523 -0.075217 -0.068596   
Self\_Employed -0.032914 -0.016390 -0.028253   
ApplicantIncome -0.069429 0.028825 -0.011364   
CoapplicantIncome 0.000951 0.006564 -0.074476   
LoanAmount 0.049057 -0.003626 -0.098090   
Loan\_Amount\_Term 1.000000 0.027392 -0.057004   
Credit\_History 0.027392 1.000000 -0.008121   
Property\_Area -0.057004 -0.008121 1.000000   
Loan\_Status -0.020291 0.560936 0.026507   
  
 Loan\_Status   
Gender 0.017408   
Married 0.089026   
Dependents 0.017872   
Education -0.092658   
Self\_Employed -0.026525   
ApplicantIncome -0.002484   
CoapplicantIncome 0.079344   
LoanAmount -0.023609   
Loan\_Amount\_Term -0.020291   
Credit\_History 0.560936   
Property\_Area 0.026507   
Loan\_Status 1.000000

plt.figure(figsize=(21,13))  
sns.heatmap(df.corr(), vmin=-1, vmax=1, annot=True, square=True, fmt='0.3f',   
 annot\_kws={'size':10}, cmap="gist\_stern")  
plt.xticks(fontsize=12)  
plt.yticks(fontsize=12)  
plt.show()



plt.figure(figsize = (18,6))  
df.corr()['Loan\_Status'].drop(['Loan\_Status']).sort\_values(ascending=False).plot(kind='bar',color = 'purple')  
plt.xlabel('Features',fontsize=15)  
plt.ylabel('Income',fontsize=15)  
plt.title('Correlation of features with Target Variable Loan\_Status',fontsize = 18)  
plt.show()



#### Observation:

Most of feature are poorly or moderately correlated with target variable expect Credit History.

* Maximum correlation of 0.561 exist between Credit History and Loan status.

###### 4. Checking Multicollinearity between features using variance\_inflation\_factor

from statsmodels.stats.outliers\_influence import variance\_inflation\_factor  
vif= pd.DataFrame()  
vif['VIF']= [variance\_inflation\_factor(df.values,i) for i in range(df.shape[1])]  
vif['Features']= df.columns  
vif

VIF Features  
0 6.119789 Gender  
1 3.963538 Married  
2 1.778377 Dependents  
3 1.355469 Education  
4 1.197219 Self\_Employed  
5 1.756726 ApplicantIncome  
6 1.596438 CoapplicantIncome  
7 1.548450 LoanAmount  
8 10.415255 Loan\_Amount\_Term  
9 9.483180 Credit\_History  
10 2.654799 Property\_Area  
11 4.818436 Loan\_Status

All features VIF is within permissible limit of 10.

So No Need to Worry About Multicollinearity.

##### 5. Balanceing Imbalanced target feature

df.Loan\_Status.value\_counts()

1 398  
0 179  
Name: Loan\_Status, dtype: int64

As Target variable data is Imbalanced in nature we will need to balance target variable.

##### Balancing using SMOTE

from imblearn.over\_sampling import SMOTE

# Splitting data in target and dependent feature  
X = df.drop(['Loan\_Status'], axis =1)  
Y = df['Loan\_Status']

# Oversampleing using SMOTE Techniques  
oversample = SMOTE()  
X, Y = oversample.fit\_resample(X, Y)

Y.value\_counts()

1 398  
0 398  
Name: Loan\_Status, dtype: int64

We have successfully resolved the class imbalanced problem and now all the categories have same data ensuring that the ML model does not get biased towards one category.

## Standard Scaling

from sklearn.preprocessing import StandardScaler  
scaler= StandardScaler()  
X\_scale = scaler.fit\_transform(X)

# 5. Building Machine Learning Models

##### As Prediction is categorical variable Supervised machine learning models implemented are LogisticRegression, GaussianNB, DecisionTreeClassifier, KNeighborsClassifier, RandomForestClassifier, ExtraTreesClassifier.

from sklearn.model\_selection import train\_test\_split  
from sklearn.linear\_model import LogisticRegression  
from sklearn.naive\_bayes import GaussianNB  
from sklearn.svm import SVC  
from sklearn.tree import DecisionTreeClassifier  
from sklearn.neighbors import KNeighborsClassifier  
from sklearn.ensemble import RandomForestClassifier  
from sklearn.ensemble import ExtraTreesClassifier  
from sklearn.neighbors import KNeighborsClassifier  
from sklearn.metrics import accuracy\_score, confusion\_matrix,classification\_report,f1\_score

X\_train, X\_test, Y\_train, Y\_test = train\_test\_split(X\_scale, Y, random\_state=99, test\_size=.3)  
print('Training feature matrix size:',X\_train.shape)  
print('Training target vector size:',Y\_train.shape)  
print('Test feature matrix size:',X\_test.shape)  
print('Test target vector size:',Y\_test.shape)

Training feature matrix size: (557, 11)  
Training target vector size: (557,)  
Test feature matrix size: (239, 11)  
Test target vector size: (239,)

### Finding best Random state

from sklearn.linear\_model import LogisticRegression  
from sklearn.metrics import accuracy\_score, confusion\_matrix,classification\_report,f1\_score  
maxAccu=0  
maxRS=0  
for i in range(1,250):  
 X\_train,X\_test,Y\_train,Y\_test = train\_test\_split(X\_scale,Y,test\_size = 0.3, random\_state=i)  
 log\_reg=LogisticRegression()  
 log\_reg.fit(X\_train,Y\_train)  
 y\_pred=log\_reg.predict(X\_test)  
 acc=accuracy\_score(Y\_test,y\_pred)  
 if acc>maxAccu:  
 maxAccu=acc  
 maxRS=i  
print('Best accuracy is', maxAccu ,'on Random\_state', maxRS)

Best accuracy is 0.8158995815899581 on Random\_state 78

## Logistics Regression Model

X\_train, X\_test, Y\_train, Y\_test = train\_test\_split(X\_scale, Y, random\_state=78, test\_size=.3)  
log\_reg=LogisticRegression()  
log\_reg.fit(X\_train,Y\_train)  
y\_pred=log\_reg.predict(X\_test)  
print('\033[1m'+'Logistics Regression Evaluation'+'\033[0m')  
print('\n')  
print('\033[1m'+'Accuracy Score of Logistics Regression :'+'\033[0m', accuracy\_score(Y\_test, y\_pred))  
print('\n')  
print('\033[1m'+'Confusion matrix of Logistics Regression :'+'\033[0m \n',confusion\_matrix(Y\_test, y\_pred))  
print('\n')  
print('\033[1m'+'classification Report of Logistics Regression'+'\033[0m \n',classification\_report(Y\_test, y\_pred))

Logistics Regression Evaluation  
  
  
Accuracy Score of Logistics Regression : 0.8158995815899581  
  
  
Confusion matrix of Logistics Regression :   
 [[ 76 34]  
 [ 10 119]]  
  
  
classification Report of Logistics Regression   
 precision recall f1-score support  
  
 0 0.88 0.69 0.78 110  
 1 0.78 0.92 0.84 129  
  
 accuracy 0.82 239  
 macro avg 0.83 0.81 0.81 239  
weighted avg 0.83 0.82 0.81 239

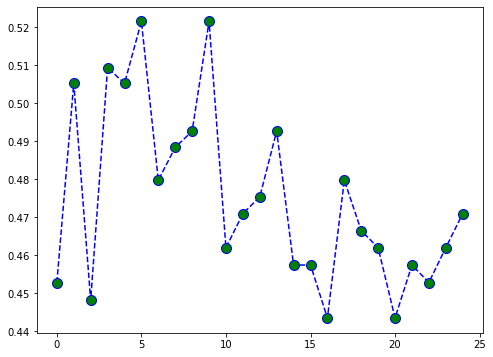
### Finding Optimal value of n\_neighbors for KNN

from sklearn import neighbors  
from math import sqrt  
from sklearn.metrics import mean\_squared\_error  
rmse\_val = [] #to store rmse values for different k  
for K in range(25):  
 K = K+1  
 model = neighbors.KNeighborsClassifier(n\_neighbors = K)  
  
 model.fit(X\_train,Y\_train) #fit the model  
 y\_pred=model.predict(X\_test) #make prediction on test set  
 error = sqrt(mean\_squared\_error(Y\_test,y\_pred)) #calculate rmse  
 rmse\_val.append(error) #store rmse values  
 print('RMSE value for k= ' , K , 'is:', error)

RMSE value for k= 1 is: 0.4527923591472056  
RMSE value for k= 2 is: 0.5052030537546389  
RMSE value for k= 3 is: 0.44814821218396267  
RMSE value for k= 4 is: 0.5093272287453544  
RMSE value for k= 5 is: 0.5052030537546389  
RMSE value for k= 6 is: 0.5215041008435626  
RMSE value for k= 7 is: 0.47971400126799746  
RMSE value for k= 8 is: 0.4883581921595791  
RMSE value for k= 9 is: 0.49262341019056577  
RMSE value for k= 10 is: 0.5215041008435626  
RMSE value for k= 11 is: 0.4619406036915484  
RMSE value for k= 12 is: 0.47091116165974684  
RMSE value for k= 13 is: 0.4753329597178616  
RMSE value for k= 14 is: 0.49262341019056577  
RMSE value for k= 15 is: 0.45738935374634826  
RMSE value for k= 16 is: 0.45738935374634826  
RMSE value for k= 17 is: 0.44345543143056887  
RMSE value for k= 18 is: 0.47971400126799746  
RMSE value for k= 19 is: 0.4664474480124446  
RMSE value for k= 20 is: 0.4619406036915484  
RMSE value for k= 21 is: 0.44345543143056887  
RMSE value for k= 22 is: 0.45738935374634826  
RMSE value for k= 23 is: 0.4527923591472056  
RMSE value for k= 24 is: 0.4619406036915484  
RMSE value for k= 25 is: 0.47091116165974684

#plotting the rmse values against k values -  
plt.figure(figsize = (8,6))  
plt.plot(range(25), rmse\_val, color='blue', linestyle='dashed', marker='o', markerfacecolor='green', markersize=10)

[<matplotlib.lines.Line2D at 0x23fa6adea00>]



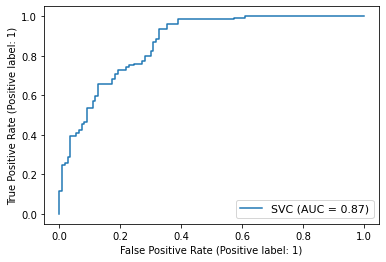
#### Comment-

At k=3, we get the minimum RMSE value which approximately 0.44814821218396267, and shoots up on further increasing the k value. We can safely say that k=3 will give us the best result in this case

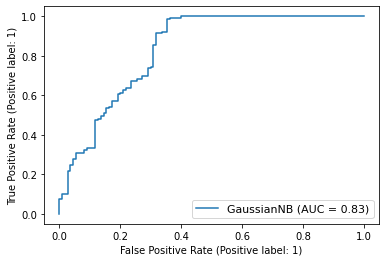
## Applying other classification algorithm

from sklearn.metrics import plot\_roc\_curve  
model=[   
 SVC(),  
 GaussianNB(),  
 DecisionTreeClassifier(),  
 KNeighborsClassifier(n\_neighbors = 3),  
 RandomForestClassifier(),  
 ExtraTreesClassifier()]  
   
for m in model:  
 m.fit(X\_train,Y\_train)  
 y\_pred=m.predict(X\_test)  
 print('\033[1m'+'Classification ML Algorithm Evaluation Matrix',m,'is' +'\033[0m')  
 print('\n')  
 print('\033[1m'+'Accuracy Score :'+'\033[0m\n', accuracy\_score(Y\_test, y\_pred))  
 print('\n')  
 print('\033[1m'+'Confusion matrix :'+'\033[0m \n',confusion\_matrix(Y\_test, y\_pred))  
 print('\n')  
 print('\033[1m'+'Classification Report :'+'\033[0m \n',classification\_report(Y\_test, y\_pred))  
 print('\n')  
 disp = plot\_roc\_curve(m,X\_test,Y\_test)   
 plt.legend(prop={'size':11}, loc='lower right')  
 plt.show()  
 print('============================================================================================================')

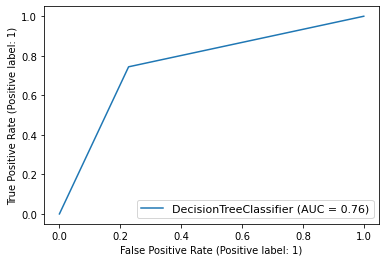
Classification ML Algorithm Evaluation Matrix SVC() is  
  
  
Accuracy Score :  
 0.7824267782426778  
  
  
Confusion matrix :   
 [[ 75 35]  
 [ 17 112]]  
  
  
Classification Report :   
 precision recall f1-score support  
  
 0 0.82 0.68 0.74 110  
 1 0.76 0.87 0.81 129  
  
 accuracy 0.78 239  
 macro avg 0.79 0.78 0.78 239  
weighted avg 0.79 0.78 0.78 239



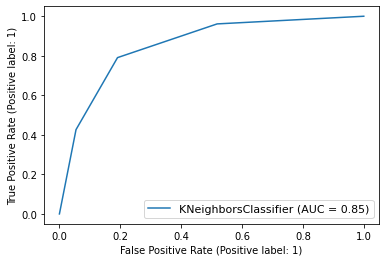
============================================================================================================  
Classification ML Algorithm Evaluation Matrix GaussianNB() is  
  
  
Accuracy Score :  
 0.7698744769874477  
  
  
Confusion matrix :   
 [[ 76 34]  
 [ 21 108]]  
  
  
Classification Report :   
 precision recall f1-score support  
  
 0 0.78 0.69 0.73 110  
 1 0.76 0.84 0.80 129  
  
 accuracy 0.77 239  
 macro avg 0.77 0.76 0.77 239  
weighted avg 0.77 0.77 0.77 239



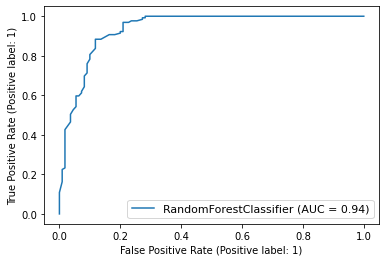
============================================================================================================  
Classification ML Algorithm Evaluation Matrix DecisionTreeClassifier() is  
  
  
Accuracy Score :  
 0.7573221757322176  
  
  
Confusion matrix :   
 [[85 25]  
 [33 96]]  
  
  
Classification Report :   
 precision recall f1-score support  
  
 0 0.72 0.77 0.75 110  
 1 0.79 0.74 0.77 129  
  
 accuracy 0.76 239  
 macro avg 0.76 0.76 0.76 239  
weighted avg 0.76 0.76 0.76 239



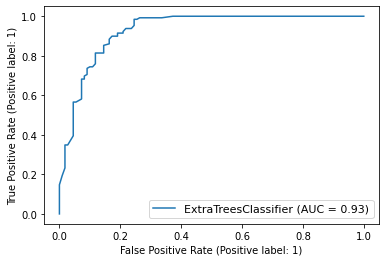
============================================================================================================  
Classification ML Algorithm Evaluation Matrix KNeighborsClassifier(n\_neighbors=3) is  
  
  
Accuracy Score :  
 0.799163179916318  
  
  
Confusion matrix :   
 [[ 89 21]  
 [ 27 102]]  
  
  
Classification Report :   
 precision recall f1-score support  
  
 0 0.77 0.81 0.79 110  
 1 0.83 0.79 0.81 129  
  
 accuracy 0.80 239  
 macro avg 0.80 0.80 0.80 239  
weighted avg 0.80 0.80 0.80 239



============================================================================================================  
Classification ML Algorithm Evaluation Matrix RandomForestClassifier() is  
  
  
Accuracy Score :  
 0.8744769874476988  
  
  
Confusion matrix :   
 [[ 95 15]  
 [ 15 114]]  
  
  
Classification Report :   
 precision recall f1-score support  
  
 0 0.86 0.86 0.86 110  
 1 0.88 0.88 0.88 129  
  
 accuracy 0.87 239  
 macro avg 0.87 0.87 0.87 239  
weighted avg 0.87 0.87 0.87 239



============================================================================================================  
Classification ML Algorithm Evaluation Matrix ExtraTreesClassifier() is  
  
  
Accuracy Score :  
 0.8451882845188284  
  
  
Confusion matrix :   
 [[ 94 16]  
 [ 21 108]]  
  
  
Classification Report :   
 precision recall f1-score support  
  
 0 0.82 0.85 0.84 110  
 1 0.87 0.84 0.85 129  
  
 accuracy 0.85 239  
 macro avg 0.84 0.85 0.84 239  
weighted avg 0.85 0.85 0.85 239



============================================================================================================

# CrossValidation :

k-fold cross validation is a procedure used to estimate the skill of the model on new data.Cross-validation is primarily used in applied machine learning to estimate the skill of a machine learning model on unseen data.k-fold cross-validation is to evaluate the model design, not a particular training. As k gets larger, the difference in size between the training set and the resampling subsets gets smaller. As this difference decreases, the bias of the technique becomes smaller

from sklearn.model\_selection import cross\_val\_score  
model=[LogisticRegression(),  
 SVC(),  
 GaussianNB(),  
 DecisionTreeClassifier(),  
 KNeighborsClassifier(n\_neighbors = 3),  
 RandomForestClassifier(),  
 ExtraTreesClassifier()]  
  
for m in model:  
 score = cross\_val\_score(m, X\_scale, Y, cv =5)  
 print('\n')  
 print('\033[1m'+'Cross Validation Score', m, ':'+'\033[0m\n')  
 print("Score :" ,score)  
 print("Mean Score :",score.mean())  
 print("Std deviation :",score.std())  
 print('\n')  
 print('============================================================================================================')

Cross Validation Score LogisticRegression() :  
  
Score : [0.7125 0.72327044 0.77987421 0.77987421 0.75471698]  
Mean Score : 0.7500471698113207  
Std deviation : 0.02802818386940136  
  
  
============================================================================================================  
  
  
Cross Validation Score SVC() :  
  
Score : [0.69375 0.73584906 0.81132075 0.77987421 0.7672956 ]  
Mean Score : 0.7576179245283019  
Std deviation : 0.04006492014756698  
  
  
============================================================================================================  
  
  
Cross Validation Score GaussianNB() :  
  
Score : [0.68125 0.72327044 0.76100629 0.74842767 0.80503145]  
Mean Score : 0.7437971698113207  
Std deviation : 0.04098957691327699  
  
  
============================================================================================================  
  
  
Cross Validation Score DecisionTreeClassifier() :  
  
Score : [0.75 0.71698113 0.79874214 0.77358491 0.81761006]  
Mean Score : 0.7713836477987421  
Std deviation : 0.03551649787042896  
  
  
============================================================================================================  
  
  
Cross Validation Score KNeighborsClassifier(n\_neighbors=3) :  
  
Score : [0.73125 0.70440252 0.73584906 0.79245283 0.81132075]  
Mean Score : 0.7550550314465408  
Std deviation : 0.040163797895197195  
  
  
============================================================================================================  
  
  
Cross Validation Score RandomForestClassifier() :  
  
Score : [0.76875 0.78616352 0.83018868 0.88050314 0.90566038]  
Mean Score : 0.834253144654088  
Std deviation : 0.05264570073032976  
  
  
============================================================================================================  
  
  
Cross Validation Score ExtraTreesClassifier() :  
  
Score : [0.78125 0.79245283 0.8427673 0.87421384 0.86163522]  
Mean Score : 0.8304638364779875  
Std deviation : 0.037158931806044425  
  
  
============================================================================================================

#### We can see that RandomForestClassifier() gives us good Accuracy and maximum f1 score along with best Cross-validation score. we will apply Hyperparameter tuning on Random Forest model and Used it as final model.

# Hyper Parameter Tuning : GridSearchCV

from sklearn.model\_selection import GridSearchCV

parameter = { 'bootstrap': [True], 'max\_depth': [5, 10,20,40,50,60],   
 'max\_features': ['auto', 'log2'],   
 'criterion':['gini','entropy'],  
 'n\_estimators': [5, 10, 15 ,25,50,60,70]}

GCV = GridSearchCV(RandomForestClassifier(),parameter,verbose=10)  
GCV.fit(X\_train,Y\_train)

Fitting 5 folds for each of 168 candidates, totalling 840 fits  
[CV 1/5; 1/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5  
[CV 1/5; 1/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5;, score=0.750 total time= 0.0s  
[CV 2/5; 1/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5  
[CV 2/5; 1/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5;, score=0.723 total time= 0.0s  
[CV 3/5; 1/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5  
[CV 3/5; 1/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 4/5; 1/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5  
[CV 4/5; 1/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5;, score=0.712 total time= 0.0s  
[CV 5/5; 1/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=5  
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[CV 1/5; 2/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10;, score=0.795 total time= 0.0s  
[CV 2/5; 2/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10  
[CV 2/5; 2/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10;, score=0.723 total time= 0.0s  
[CV 3/5; 2/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10  
[CV 3/5; 2/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10;, score=0.802 total time= 0.0s  
[CV 4/5; 2/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10  
[CV 4/5; 2/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 5/5; 2/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10  
[CV 5/5; 2/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=10;, score=0.748 total time= 0.0s  
[CV 1/5; 3/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=15  
[CV 1/5; 3/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=15;, score=0.759 total time= 0.0s  
[CV 2/5; 3/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=15  
[CV 2/5; 3/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=15;, score=0.750 total time= 0.0s  
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[CV 5/5; 3/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=15;, score=0.748 total time= 0.0s  
[CV 1/5; 4/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=25  
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[CV 2/5; 4/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=25;, score=0.759 total time= 0.0s  
[CV 3/5; 4/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=25  
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[CV 2/5; 5/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=50  
[CV 2/5; 5/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=50;, score=0.750 total time= 0.1s  
[CV 3/5; 5/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=50  
[CV 3/5; 5/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=50;, score=0.802 total time= 0.1s  
[CV 4/5; 5/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=50  
[CV 4/5; 5/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=50;, score=0.730 total time= 0.1s  
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[CV 5/5; 5/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=auto, n\_estimators=50;, score=0.721 total time= 0.1s  
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[CV 3/5; 7/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=5;, score=0.748 total time= 0.0s  
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[CV 4/5; 7/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=5;, score=0.721 total time= 0.0s  
[CV 5/5; 7/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=5  
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[CV 3/5; 8/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=10  
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[CV 5/5; 8/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=10;, score=0.712 total time= 0.0s  
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[CV 3/5; 9/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=15  
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[CV 5/5; 9/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=15  
[CV 5/5; 9/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=15;, score=0.730 total time= 0.0s  
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[CV 2/5; 10/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=25;, score=0.777 total time= 0.0s  
[CV 3/5; 10/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=25  
[CV 3/5; 10/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=25;, score=0.811 total time= 0.0s  
[CV 4/5; 10/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=25  
[CV 4/5; 10/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=25;, score=0.739 total time= 0.0s  
[CV 5/5; 10/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=25  
[CV 5/5; 10/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=25;, score=0.766 total time= 0.0s  
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[CV 2/5; 11/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=50;, score=0.750 total time= 0.1s  
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[CV 3/5; 11/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=50;, score=0.811 total time= 0.1s  
[CV 4/5; 11/168] START bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=50  
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[CV 4/5; 12/168] END bootstrap=True, criterion=gini, max\_depth=5, max\_features=log2, n\_estimators=100;, score=0.757 total time= 0.2s  
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[CV 2/5; 14/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=10;, score=0.759 total time= 0.0s  
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[CV 3/5; 14/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=10;, score=0.820 total time= 0.0s  
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[CV 5/5; 14/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=10;, score=0.766 total time= 0.0s  
[CV 1/5; 15/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15

[CV 1/5; 15/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.759 total time= 0.0s  
[CV 2/5; 15/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15  
[CV 2/5; 15/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.795 total time= 0.0s  
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[CV 3/5; 15/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.811 total time= 0.0s  
[CV 4/5; 15/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15  
[CV 4/5; 15/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.748 total time= 0.0s  
[CV 5/5; 15/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15  
[CV 5/5; 15/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.757 total time= 0.0s  
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[CV 3/5; 16/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=25;, score=0.802 total time= 0.0s  
[CV 4/5; 16/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=25  
[CV 4/5; 16/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=25;, score=0.757 total time= 0.0s  
[CV 5/5; 16/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=25  
[CV 5/5; 16/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=25;, score=0.748 total time= 0.0s  
[CV 1/5; 17/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=50  
[CV 1/5; 17/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=50;, score=0.777 total time= 0.1s  
[CV 2/5; 17/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=50  
[CV 2/5; 17/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=50;, score=0.759 total time= 0.1s  
[CV 3/5; 17/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=50  
[CV 3/5; 17/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=50;, score=0.811 total time= 0.2s  
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[CV 4/5; 17/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=50;, score=0.775 total time= 0.1s  
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[CV 5/5; 17/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=50;, score=0.766 total time= 0.0s  
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[CV 1/5; 18/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=100;, score=0.768 total time= 0.3s  
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[CV 2/5; 18/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=100;, score=0.768 total time= 0.2s  
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[CV 4/5; 18/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=100;, score=0.793 total time= 0.3s  
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[CV 5/5; 18/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=auto, n\_estimators=100;, score=0.748 total time= 0.3s  
[CV 1/5; 19/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=5  
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[CV 5/5; 19/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=5  
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[CV 5/5; 20/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=10;, score=0.739 total time= 0.0s  
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[CV 3/5; 21/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=15  
[CV 3/5; 21/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=15;, score=0.793 total time= 0.0s  
[CV 4/5; 21/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=15  
[CV 4/5; 21/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=15;, score=0.748 total time= 0.0s  
[CV 5/5; 21/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=15  
[CV 5/5; 21/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=15;, score=0.793 total time= 0.0s  
[CV 1/5; 22/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=25  
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[CV 5/5; 22/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=25;, score=0.757 total time= 0.0s  
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[CV 2/5; 23/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=50;, score=0.759 total time= 0.1s  
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[CV 3/5; 24/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=100  
[CV 3/5; 24/168] END bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=100;, score=0.829 total time= 0.2s  
[CV 4/5; 24/168] START bootstrap=True, criterion=gini, max\_depth=10, max\_features=log2, n\_estimators=100  
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[CV 2/5; 25/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=5  
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[CV 3/5; 25/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=5;, score=0.739 total time= 0.0s  
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[CV 3/5; 26/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=10;, score=0.793 total time= 0.0s  
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[CV 4/5; 26/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=10;, score=0.739 total time= 0.0s  
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[CV 1/5; 27/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=15;, score=0.759 total time= 0.0s  
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[CV 2/5; 29/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=50

[CV 2/5; 29/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=50;, score=0.750 total time= 0.0s  
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[CV 4/5; 29/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=50;, score=0.811 total time= 0.1s  
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[CV 3/5; 30/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=100;, score=0.802 total time= 0.3s  
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[CV 4/5; 30/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=100;, score=0.793 total time= 0.3s  
[CV 5/5; 30/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=100  
[CV 5/5; 30/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=auto, n\_estimators=100;, score=0.775 total time= 0.3s  
[CV 1/5; 31/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=5  
[CV 1/5; 31/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=5;, score=0.732 total time= 0.0s  
[CV 2/5; 31/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=5  
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[CV 3/5; 31/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=5;, score=0.712 total time= 0.0s  
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[CV 5/5; 31/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=5;, score=0.748 total time= 0.0s  
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[CV 2/5; 32/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=10;, score=0.750 total time= 0.0s  
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[CV 3/5; 32/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=10;, score=0.757 total time= 0.0s  
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[CV 1/5; 33/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 1/5; 33/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.759 total time= 0.0s  
[CV 2/5; 33/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 2/5; 33/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.741 total time= 0.0s  
[CV 3/5; 33/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 3/5; 33/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.775 total time= 0.0s  
[CV 4/5; 33/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 4/5; 33/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.802 total time= 0.0s  
[CV 5/5; 33/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 5/5; 33/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.802 total time= 0.0s  
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[CV 1/5; 34/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25;, score=0.804 total time= 0.0s  
[CV 2/5; 34/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25  
[CV 2/5; 34/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25;, score=0.741 total time= 0.0s  
[CV 3/5; 34/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25  
[CV 3/5; 34/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25;, score=0.802 total time= 0.0s  
[CV 4/5; 34/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25  
[CV 4/5; 34/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25;, score=0.820 total time= 0.0s  
[CV 5/5; 34/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25  
[CV 5/5; 34/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=25;, score=0.757 total time= 0.0s  
[CV 1/5; 35/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=50  
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[CV 2/5; 35/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=50;, score=0.741 total time= 0.0s  
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[CV 3/5; 35/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=50;, score=0.802 total time= 0.1s  
[CV 4/5; 35/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=50  
[CV 4/5; 35/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=50;, score=0.829 total time= 0.0s  
[CV 5/5; 35/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=50  
[CV 5/5; 35/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=50;, score=0.766 total time= 0.0s  
[CV 1/5; 36/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100  
[CV 1/5; 36/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.759 total time= 0.2s  
[CV 2/5; 36/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100

[CV 2/5; 36/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.768 total time= 0.2s  
[CV 3/5; 36/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100  
[CV 3/5; 36/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.811 total time= 0.3s  
[CV 4/5; 36/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100  
[CV 4/5; 36/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.802 total time= 0.3s  
[CV 5/5; 36/168] START bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100  
[CV 5/5; 36/168] END bootstrap=True, criterion=gini, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.766 total time= 0.3s  
[CV 1/5; 37/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=5  
[CV 1/5; 37/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=5;, score=0.741 total time= 0.0s  
[CV 2/5; 37/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=5  
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[CV 3/5; 37/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=5;, score=0.757 total time= 0.0s  
[CV 4/5; 37/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=5  
[CV 4/5; 37/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=5;, score=0.748 total time= 0.0s  
[CV 5/5; 37/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=5  
[CV 5/5; 37/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=5;, score=0.739 total time= 0.0s  
[CV 1/5; 38/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10  
[CV 1/5; 38/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.759 total time= 0.0s  
[CV 2/5; 38/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10  
[CV 2/5; 38/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.723 total time= 0.0s  
[CV 3/5; 38/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10  
[CV 3/5; 38/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.766 total time= 0.0s  
[CV 4/5; 38/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10  
[CV 4/5; 38/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.721 total time= 0.0s  
[CV 5/5; 38/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10  
[CV 5/5; 38/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.739 total time= 0.0s  
[CV 1/5; 39/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15  
[CV 1/5; 39/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.768 total time= 0.0s  
[CV 2/5; 39/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15  
[CV 2/5; 39/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.750 total time= 0.0s  
[CV 3/5; 39/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15  
[CV 3/5; 39/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.775 total time= 0.0s  
[CV 4/5; 39/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15  
[CV 4/5; 39/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.757 total time= 0.0s  
[CV 5/5; 39/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15  
[CV 5/5; 39/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.730 total time= 0.0s  
[CV 1/5; 40/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25  
[CV 1/5; 40/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25;, score=0.821 total time= 0.0s  
[CV 2/5; 40/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25  
[CV 2/5; 40/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25;, score=0.777 total time= 0.0s  
[CV 3/5; 40/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25  
[CV 3/5; 40/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 4/5; 40/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25  
[CV 4/5; 40/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25;, score=0.811 total time= 0.0s  
[CV 5/5; 40/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25  
[CV 5/5; 40/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=25;, score=0.757 total time= 0.0s  
[CV 1/5; 41/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50  
[CV 1/5; 41/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50;, score=0.777 total time= 0.1s  
[CV 2/5; 41/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50  
[CV 2/5; 41/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50;, score=0.795 total time= 0.1s  
[CV 3/5; 41/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50  
[CV 3/5; 41/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50;, score=0.811 total time= 0.1s  
[CV 4/5; 41/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50  
[CV 4/5; 41/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50;, score=0.784 total time= 0.1s  
[CV 5/5; 41/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50  
[CV 5/5; 41/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=50;, score=0.748 total time= 0.1s  
[CV 1/5; 42/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100  
[CV 1/5; 42/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100;, score=0.777 total time= 0.2s  
[CV 2/5; 42/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100  
[CV 2/5; 42/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100;, score=0.795 total time= 0.2s  
[CV 3/5; 42/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100  
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[CV 4/5; 42/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100  
[CV 4/5; 42/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100;, score=0.802 total time= 0.3s  
[CV 5/5; 42/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100  
[CV 5/5; 42/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=auto, n\_estimators=100;, score=0.757 total time= 0.3s  
[CV 1/5; 43/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5  
[CV 1/5; 43/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5;, score=0.750 total time= 0.0s  
[CV 2/5; 43/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5  
[CV 2/5; 43/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5;, score=0.688 total time= 0.0s  
[CV 3/5; 43/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5  
[CV 3/5; 43/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5;, score=0.739 total time= 0.0s  
[CV 4/5; 43/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5  
[CV 4/5; 43/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5;, score=0.784 total time= 0.0s  
[CV 5/5; 43/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5  
[CV 5/5; 43/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=5;, score=0.793 total time= 0.0s  
[CV 1/5; 44/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10  
[CV 1/5; 44/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.714 total time= 0.0s  
[CV 2/5; 44/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10  
[CV 2/5; 44/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.696 total time= 0.0s  
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[CV 3/5; 44/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.739 total time= 0.0s  
[CV 4/5; 44/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10

[CV 4/5; 44/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 5/5; 44/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10  
[CV 5/5; 44/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.730 total time= 0.0s  
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[CV 1/5; 45/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.795 total time= 0.0s  
[CV 2/5; 45/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15  
[CV 2/5; 45/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.750 total time= 0.0s  
[CV 3/5; 45/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15  
[CV 3/5; 45/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.820 total time= 0.0s  
[CV 4/5; 45/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15  
[CV 4/5; 45/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.811 total time= 0.0s  
[CV 5/5; 45/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15  
[CV 5/5; 45/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.775 total time= 0.0s  
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[CV 1/5; 46/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.768 total time= 0.0s  
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[CV 2/5; 46/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.759 total time= 0.0s  
[CV 3/5; 46/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=25  
[CV 3/5; 46/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.802 total time= 0.0s  
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[CV 4/5; 46/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.793 total time= 0.0s  
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[CV 5/5; 46/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.775 total time= 0.0s  
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[CV 2/5; 47/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=50;, score=0.759 total time= 0.1s  
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[CV 3/5; 47/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=50;, score=0.820 total time= 0.1s  
[CV 4/5; 47/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=50  
[CV 4/5; 47/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=50;, score=0.793 total time= 0.1s  
[CV 5/5; 47/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=50  
[CV 5/5; 47/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=50;, score=0.748 total time= 0.1s  
[CV 1/5; 48/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 1/5; 48/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.786 total time= 0.3s  
[CV 2/5; 48/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 2/5; 48/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.741 total time= 0.3s  
[CV 3/5; 48/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 3/5; 48/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.847 total time= 0.3s  
[CV 4/5; 48/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 4/5; 48/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.811 total time= 0.4s  
[CV 5/5; 48/168] START bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 5/5; 48/168] END bootstrap=True, criterion=gini, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.775 total time= 0.2s  
[CV 1/5; 49/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 1/5; 49/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.750 total time= 0.0s  
[CV 2/5; 49/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 2/5; 49/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.696 total time= 0.0s  
[CV 3/5; 49/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 3/5; 49/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.748 total time= 0.0s  
[CV 4/5; 49/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 4/5; 49/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.685 total time= 0.0s  
[CV 5/5; 49/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 5/5; 49/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.694 total time= 0.0s  
[CV 1/5; 50/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 1/5; 50/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.714 total time= 0.0s  
[CV 2/5; 50/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 2/5; 50/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.750 total time= 0.0s  
[CV 3/5; 50/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 3/5; 50/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.766 total time= 0.0s  
[CV 4/5; 50/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 4/5; 50/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.793 total time= 0.0s  
[CV 5/5; 50/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 5/5; 50/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.748 total time= 0.0s  
[CV 1/5; 51/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 1/5; 51/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.795 total time= 0.0s  
[CV 2/5; 51/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 2/5; 51/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.750 total time= 0.0s  
[CV 3/5; 51/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 3/5; 51/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.820 total time= 0.0s  
[CV 4/5; 51/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 4/5; 51/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.793 total time= 0.0s  
[CV 5/5; 51/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 5/5; 51/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.793 total time= 0.0s  
[CV 1/5; 52/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 1/5; 52/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.786 total time= 0.0s  
[CV 2/5; 52/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 2/5; 52/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.741 total time= 0.0s  
[CV 3/5; 52/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 3/5; 52/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.838 total time= 0.0s  
[CV 4/5; 52/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 4/5; 52/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.784 total time= 0.0s  
[CV 5/5; 52/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 5/5; 52/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.775 total time= 0.0s  
[CV 1/5; 53/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 1/5; 53/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.786 total time= 0.2s  
[CV 2/5; 53/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 2/5; 53/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.750 total time= 0.1s  
[CV 3/5; 53/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 3/5; 53/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.784 total time= 0.1s  
[CV 4/5; 53/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 4/5; 53/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.793 total time= 0.1s  
[CV 5/5; 53/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 5/5; 53/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.739 total time= 0.1s  
[CV 1/5; 54/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 1/5; 54/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.795 total time= 0.2s  
[CV 2/5; 54/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 2/5; 54/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.759 total time= 0.2s  
[CV 3/5; 54/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 3/5; 54/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.820 total time= 0.2s  
[CV 4/5; 54/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 4/5; 54/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.802 total time= 0.2s  
[CV 5/5; 54/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 5/5; 54/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.748 total time= 0.3s  
[CV 1/5; 55/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 1/5; 55/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.741 total time= 0.0s  
[CV 2/5; 55/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 2/5; 55/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.759 total time= 0.0s  
[CV 3/5; 55/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 3/5; 55/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.730 total time= 0.0s  
[CV 4/5; 55/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 4/5; 55/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.739 total time= 0.0s  
[CV 5/5; 55/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 5/5; 55/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 1/5; 56/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 1/5; 56/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.768 total time= 0.0s  
[CV 2/5; 56/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 2/5; 56/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.723 total time= 0.0s  
[CV 3/5; 56/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 3/5; 56/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.847 total time= 0.0s  
[CV 4/5; 56/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 4/5; 56/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.730 total time= 0.0s  
[CV 5/5; 56/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 5/5; 56/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.748 total time= 0.0s  
[CV 1/5; 57/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 1/5; 57/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.786 total time= 0.0s  
[CV 2/5; 57/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 2/5; 57/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.759 total time= 0.0s  
[CV 3/5; 57/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 3/5; 57/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.802 total time= 0.0s  
[CV 4/5; 57/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 4/5; 57/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.793 total time= 0.0s  
[CV 5/5; 57/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 5/5; 57/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.766 total time= 0.1s  
[CV 1/5; 58/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25  
[CV 1/5; 58/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.804 total time= 0.0s  
[CV 2/5; 58/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25  
[CV 2/5; 58/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.759 total time= 0.0s  
[CV 3/5; 58/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25  
[CV 3/5; 58/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 4/5; 58/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25

[CV 4/5; 58/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 5/5; 58/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25  
[CV 5/5; 58/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.757 total time= 0.0s  
[CV 1/5; 59/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 1/5; 59/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.812 total time= 0.1s  
[CV 2/5; 59/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 2/5; 59/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.768 total time= 0.2s  
[CV 3/5; 59/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 3/5; 59/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.811 total time= 0.2s  
[CV 4/5; 59/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 4/5; 59/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.757 total time= 0.1s  
[CV 5/5; 59/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 5/5; 59/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.712 total time= 0.1s  
[CV 1/5; 60/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 1/5; 60/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.777 total time= 0.6s  
[CV 2/5; 60/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 2/5; 60/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.777 total time= 0.4s  
[CV 3/5; 60/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 3/5; 60/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.811 total time= 0.2s  
[CV 4/5; 60/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 4/5; 60/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.829 total time= 0.2s  
[CV 5/5; 60/168] START bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 5/5; 60/168] END bootstrap=True, criterion=gini, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.757 total time= 0.2s  
[CV 1/5; 61/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5  
[CV 1/5; 61/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.732 total time= 0.0s  
[CV 2/5; 61/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5  
[CV 2/5; 61/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.714 total time= 0.0s  
[CV 3/5; 61/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5  
[CV 3/5; 61/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.793 total time= 0.0s  
[CV 4/5; 61/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5  
[CV 4/5; 61/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.784 total time= 0.0s  
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[CV 5/5; 61/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.757 total time= 0.0s  
[CV 1/5; 62/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 1/5; 62/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.768 total time= 0.0s  
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[CV 2/5; 62/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.741 total time= 0.0s  
[CV 3/5; 62/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 3/5; 62/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 4/5; 62/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 4/5; 62/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.793 total time= 0.0s  
[CV 5/5; 62/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 5/5; 62/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 1/5; 63/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 1/5; 63/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.768 total time= 0.0s  
[CV 2/5; 63/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 2/5; 63/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.786 total time= 0.0s  
[CV 3/5; 63/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 3/5; 63/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.811 total time= 0.0s  
[CV 4/5; 63/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 4/5; 63/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.766 total time= 0.0s  
[CV 5/5; 63/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=15  
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[CV 1/5; 64/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 1/5; 64/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.732 total time= 0.0s  
[CV 2/5; 64/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 2/5; 64/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.795 total time= 0.0s  
[CV 3/5; 64/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 3/5; 64/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.802 total time= 0.0s  
[CV 4/5; 64/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 4/5; 64/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 5/5; 64/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 5/5; 64/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.766 total time= 0.0s  
[CV 1/5; 65/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50  
[CV 1/5; 65/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.759 total time= 0.0s  
[CV 2/5; 65/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50  
[CV 2/5; 65/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.750 total time= 0.0s  
[CV 3/5; 65/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50  
[CV 3/5; 65/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.784 total time= 0.0s  
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[CV 4/5; 65/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.775 total time= 0.0s  
[CV 5/5; 65/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50

[CV 5/5; 65/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.739 total time= 0.0s  
[CV 1/5; 66/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100  
[CV 1/5; 66/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.759 total time= 0.2s  
[CV 2/5; 66/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100  
[CV 2/5; 66/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.759 total time= 0.2s  
[CV 3/5; 66/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100  
[CV 3/5; 66/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.820 total time= 0.2s  
[CV 4/5; 66/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100  
[CV 4/5; 66/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.811 total time= 0.6s  
[CV 5/5; 66/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100  
[CV 5/5; 66/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.757 total time= 0.2s  
[CV 1/5; 67/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5  
[CV 1/5; 67/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5;, score=0.723 total time= 0.0s  
[CV 2/5; 67/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5  
[CV 2/5; 67/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5;, score=0.795 total time= 0.0s  
[CV 3/5; 67/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5  
[CV 3/5; 67/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 4/5; 67/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5  
[CV 4/5; 67/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5;, score=0.730 total time= 0.0s  
[CV 5/5; 67/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5  
[CV 5/5; 67/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=5;, score=0.703 total time= 0.0s  
[CV 1/5; 68/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 1/5; 68/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.750 total time= 0.0s  
[CV 2/5; 68/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 2/5; 68/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.759 total time= 0.0s  
[CV 3/5; 68/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 3/5; 68/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 4/5; 68/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 4/5; 68/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 5/5; 68/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 5/5; 68/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.793 total time= 0.0s  
[CV 1/5; 69/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15  
[CV 1/5; 69/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.759 total time= 0.0s  
[CV 2/5; 69/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15  
[CV 2/5; 69/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.768 total time= 0.0s  
[CV 3/5; 69/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15  
[CV 3/5; 69/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.784 total time= 0.0s  
[CV 4/5; 69/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15  
[CV 4/5; 69/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.802 total time= 0.0s  
[CV 5/5; 69/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15  
[CV 5/5; 69/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.748 total time= 0.0s  
[CV 1/5; 70/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25  
[CV 1/5; 70/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.795 total time= 0.0s  
[CV 2/5; 70/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25  
[CV 2/5; 70/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.750 total time= 0.0s  
[CV 3/5; 70/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25  
[CV 3/5; 70/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 4/5; 70/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25  
[CV 4/5; 70/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 5/5; 70/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25  
[CV 5/5; 70/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.766 total time= 0.0s  
[CV 1/5; 71/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50  
[CV 1/5; 71/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.750 total time= 0.1s  
[CV 2/5; 71/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50  
[CV 2/5; 71/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.768 total time= 0.2s  
[CV 3/5; 71/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50  
[CV 3/5; 71/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.811 total time= 0.2s  
[CV 4/5; 71/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50  
[CV 4/5; 71/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.802 total time= 0.4s  
[CV 5/5; 71/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50  
[CV 5/5; 71/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.766 total time= 0.2s  
[CV 1/5; 72/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100  
[CV 1/5; 72/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100;, score=0.768 total time= 0.2s  
[CV 2/5; 72/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100  
[CV 2/5; 72/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100;, score=0.741 total time= 0.2s  
[CV 3/5; 72/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100  
[CV 3/5; 72/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100;, score=0.811 total time= 0.3s  
[CV 4/5; 72/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100  
[CV 4/5; 72/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100;, score=0.802 total time= 0.2s  
[CV 5/5; 72/168] START bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100

[CV 5/5; 72/168] END bootstrap=True, criterion=gini, max\_depth=60, max\_features=log2, n\_estimators=100;, score=0.739 total time= 0.2s  
[CV 1/5; 73/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5  
[CV 1/5; 73/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5;, score=0.786 total time= 0.0s  
[CV 2/5; 73/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5  
[CV 2/5; 73/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5;, score=0.714 total time= 0.0s  
[CV 3/5; 73/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5  
[CV 3/5; 73/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5;, score=0.784 total time= 0.0s  
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[CV 4/5; 73/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 5/5; 73/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5  
[CV 5/5; 73/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=5;, score=0.739 total time= 0.0s  
[CV 1/5; 74/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=10  
[CV 1/5; 74/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=10;, score=0.714 total time= 0.0s  
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[CV 2/5; 74/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=10;, score=0.696 total time= 0.0s  
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[CV 3/5; 74/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=10;, score=0.784 total time= 0.0s  
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[CV 4/5; 74/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=10;, score=0.775 total time= 0.0s  
[CV 5/5; 74/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=10  
[CV 5/5; 74/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=10;, score=0.829 total time= 0.0s  
[CV 1/5; 75/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=15  
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[CV 2/5; 75/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=15  
[CV 2/5; 75/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=15;, score=0.741 total time= 0.0s  
[CV 3/5; 75/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=15  
[CV 3/5; 75/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=15;, score=0.775 total time= 0.0s  
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[CV 4/5; 75/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=15;, score=0.820 total time= 0.0s  
[CV 5/5; 75/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=15  
[CV 5/5; 75/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=15;, score=0.793 total time= 0.0s  
[CV 1/5; 76/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=25  
[CV 1/5; 76/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=25;, score=0.741 total time= 0.0s  
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[CV 2/5; 76/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=25;, score=0.741 total time= 0.0s  
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[CV 3/5; 76/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=25;, score=0.802 total time= 0.0s  
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[CV 4/5; 76/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 5/5; 76/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=25  
[CV 5/5; 76/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=25;, score=0.739 total time= 0.0s  
[CV 1/5; 77/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50  
[CV 1/5; 77/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50;, score=0.777 total time= 0.1s  
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[CV 2/5; 77/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50;, score=0.741 total time= 0.1s  
[CV 3/5; 77/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50  
[CV 3/5; 77/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50;, score=0.820 total time= 0.1s  
[CV 4/5; 77/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50  
[CV 4/5; 77/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50;, score=0.802 total time= 0.2s  
[CV 5/5; 77/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50  
[CV 5/5; 77/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=50;, score=0.766 total time= 0.1s  
[CV 1/5; 78/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100  
[CV 1/5; 78/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100;, score=0.759 total time= 0.2s  
[CV 2/5; 78/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100  
[CV 2/5; 78/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100;, score=0.777 total time= 0.2s  
[CV 3/5; 78/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100  
[CV 3/5; 78/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100;, score=0.820 total time= 0.2s  
[CV 4/5; 78/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100  
[CV 4/5; 78/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100;, score=0.793 total time= 0.2s  
[CV 5/5; 78/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100  
[CV 5/5; 78/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=auto, n\_estimators=100;, score=0.757 total time= 0.2s  
[CV 1/5; 79/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5  
[CV 1/5; 79/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.750 total time= 0.0s  
[CV 2/5; 79/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5  
[CV 2/5; 79/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.652 total time= 0.0s  
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[CV 3/5; 79/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 4/5; 79/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5  
[CV 4/5; 79/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.721 total time= 0.0s  
[CV 5/5; 79/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5  
[CV 5/5; 79/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 1/5; 80/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 1/5; 80/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.750 total time= 0.0s  
[CV 2/5; 80/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 2/5; 80/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.723 total time= 0.0s  
[CV 3/5; 80/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 3/5; 80/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.802 total time= 0.0s  
[CV 4/5; 80/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 4/5; 80/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.784 total time= 0.0s

[CV 5/5; 80/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 5/5; 80/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.730 total time= 0.0s  
[CV 1/5; 81/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 1/5; 81/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.768 total time= 0.0s  
[CV 2/5; 81/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 2/5; 81/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.777 total time= 0.0s  
[CV 3/5; 81/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 3/5; 81/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.802 total time= 0.0s  
[CV 4/5; 81/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 4/5; 81/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.775 total time= 0.0s  
[CV 5/5; 81/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 5/5; 81/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.757 total time= 0.0s  
[CV 1/5; 82/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 1/5; 82/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.768 total time= 0.0s  
[CV 2/5; 82/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 2/5; 82/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.759 total time= 0.0s  
[CV 3/5; 82/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 3/5; 82/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.811 total time= 0.0s  
[CV 4/5; 82/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 4/5; 82/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.802 total time= 0.0s  
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[CV 3/5; 83/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=50;, score=0.820 total time= 0.1s  
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[CV 4/5; 83/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=50;, score=0.811 total time= 0.1s  
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[CV 1/5; 84/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=100;, score=0.768 total time= 0.2s  
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[CV 4/5; 84/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=100  
[CV 4/5; 84/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=100;, score=0.793 total time= 0.2s  
[CV 5/5; 84/168] START bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=100  
[CV 5/5; 84/168] END bootstrap=True, criterion=gini, max\_depth=80, max\_features=log2, n\_estimators=100;, score=0.757 total time= 0.2s  
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[CV 1/5; 85/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=5;, score=0.777 total time= 0.0s  
[CV 2/5; 85/168] START bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=5  
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[CV 5/5; 86/168] START bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=10  
[CV 5/5; 86/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=10;, score=0.730 total time= 0.0s  
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[CV 4/5; 87/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=15;, score=0.712 total time= 0.0s  
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[CV 1/5; 88/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=25;, score=0.759 total time= 0.0s  
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[CV 2/5; 88/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=25;, score=0.759 total time= 0.0s  
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[CV 5/5; 88/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=25;, score=0.730 total time= 0.0s  
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[CV 2/5; 89/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=auto, n\_estimators=50;, score=0.750 total time= 0.0s  
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[CV 2/5; 92/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=log2, n\_estimators=10;, score=0.759 total time= 0.0s  
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[CV 2/5; 95/168] END bootstrap=True, criterion=entropy, max\_depth=5, max\_features=log2, n\_estimators=50;, score=0.750 total time= 0.0s  
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[CV 5/5; 97/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=5;, score=0.757 total time= 0.0s  
[CV 1/5; 98/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=10  
[CV 1/5; 98/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=10;, score=0.777 total time= 0.0s  
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[CV 4/5; 98/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=10;, score=0.748 total time= 0.0s  
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[CV 5/5; 98/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=10;, score=0.766 total time= 0.0s  
[CV 1/5; 99/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15  
[CV 1/5; 99/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.786 total time= 0.0s  
[CV 2/5; 99/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15  
[CV 2/5; 99/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.777 total time= 0.0s  
[CV 3/5; 99/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15  
[CV 3/5; 99/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.757 total time= 0.0s  
[CV 4/5; 99/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15  
[CV 4/5; 99/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.784 total time= 0.0s  
[CV 5/5; 99/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15  
[CV 5/5; 99/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=15;, score=0.757 total time= 0.0s  
[CV 1/5; 100/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=25  
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[CV 2/5; 100/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=25;, score=0.768 total time= 0.1s  
[CV 3/5; 100/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=25  
[CV 3/5; 100/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=25;, score=0.793 total time= 0.1s  
[CV 4/5; 100/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=25  
[CV 4/5; 100/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=25;, score=0.775 total time= 0.1s  
[CV 5/5; 100/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=25  
[CV 5/5; 100/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=25;, score=0.757 total time= 0.1s  
[CV 1/5; 101/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=50  
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[CV 3/5; 101/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=50;, score=0.829 total time= 0.2s  
[CV 4/5; 101/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=50

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[CV 5/5; 101/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=50;, score=0.775 total time= 0.1s  
[CV 1/5; 102/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=100  
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[CV 2/5; 102/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=100;, score=0.777 total time= 0.4s  
[CV 3/5; 102/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=100  
[CV 3/5; 102/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=100;, score=0.820 total time= 0.4s  
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[CV 4/5; 102/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=100;, score=0.766 total time= 0.4s  
[CV 5/5; 102/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=100  
[CV 5/5; 102/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=auto, n\_estimators=100;, score=0.757 total time= 0.5s  
[CV 1/5; 103/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5  
[CV 1/5; 103/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5;, score=0.723 total time= 0.0s  
[CV 2/5; 103/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5  
[CV 2/5; 103/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5;, score=0.714 total time= 0.0s  
[CV 3/5; 103/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5  
[CV 3/5; 103/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5;, score=0.730 total time= 0.0s  
[CV 4/5; 103/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5  
[CV 4/5; 103/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5;, score=0.667 total time= 0.0s  
[CV 5/5; 103/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5  
[CV 5/5; 103/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=5;, score=0.712 total time= 0.0s  
[CV 1/5; 104/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10  
[CV 1/5; 104/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10;, score=0.768 total time= 0.0s  
[CV 2/5; 104/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10  
[CV 2/5; 104/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10;, score=0.759 total time= 0.0s  
[CV 3/5; 104/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10  
[CV 3/5; 104/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10;, score=0.802 total time= 0.0s  
[CV 4/5; 104/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10  
[CV 4/5; 104/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10;, score=0.793 total time= 0.0s  
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[CV 5/5; 104/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=10;, score=0.757 total time= 0.0s  
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[CV 2/5; 105/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=15;, score=0.750 total time= 0.0s  
[CV 3/5; 105/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=15  
[CV 3/5; 105/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=15;, score=0.811 total time= 0.0s  
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[CV 4/5; 105/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=15;, score=0.811 total time= 0.0s  
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[CV 1/5; 106/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=25;, score=0.777 total time= 0.1s  
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[CV 2/5; 106/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=25;, score=0.777 total time= 0.1s  
[CV 3/5; 106/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=25  
[CV 3/5; 106/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=25;, score=0.856 total time= 0.1s  
[CV 4/5; 106/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=25  
[CV 4/5; 106/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=25;, score=0.766 total time= 0.1s  
[CV 5/5; 106/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=25  
[CV 5/5; 106/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=25;, score=0.730 total time= 0.1s  
[CV 1/5; 107/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=50  
[CV 1/5; 107/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=50;, score=0.759 total time= 0.2s  
[CV 2/5; 107/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=50  
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[CV 4/5; 107/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=50;, score=0.811 total time= 0.2s  
[CV 5/5; 107/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=50  
[CV 5/5; 107/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=50;, score=0.739 total time= 0.2s  
[CV 1/5; 108/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=100  
[CV 1/5; 108/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=100;, score=0.786 total time= 0.4s  
[CV 2/5; 108/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=100  
[CV 2/5; 108/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=100;, score=0.768 total time= 0.3s  
[CV 3/5; 108/168] START bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=100

[CV 3/5; 108/168] END bootstrap=True, criterion=entropy, max\_depth=10, max\_features=log2, n\_estimators=100;, score=0.829 total time= 0.2s  
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[CV 3/5; 109/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=5;, score=0.802 total time= 0.0s  
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[CV 1/5; 110/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=10;, score=0.786 total time= 0.0s  
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[CV 2/5; 110/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=10;, score=0.696 total time= 0.0s  
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[CV 4/5; 110/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=10;, score=0.757 total time= 0.0s  
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[CV 2/5; 111/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=15;, score=0.750 total time= 0.0s  
[CV 3/5; 111/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=15  
[CV 3/5; 111/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=15;, score=0.766 total time= 0.0s  
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[CV 2/5; 112/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=25  
[CV 2/5; 112/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=25;, score=0.750 total time= 0.0s  
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[CV 3/5; 112/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=25;, score=0.802 total time= 0.0s  
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[CV 5/5; 112/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=25;, score=0.766 total time= 0.0s  
[CV 1/5; 113/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=50  
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[CV 2/5; 113/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=50;, score=0.786 total time= 0.1s  
[CV 3/5; 113/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=50  
[CV 3/5; 113/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=50;, score=0.829 total time= 0.1s  
[CV 4/5; 113/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=50  
[CV 4/5; 113/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=50;, score=0.793 total time= 0.1s  
[CV 5/5; 113/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=50  
[CV 5/5; 113/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=50;, score=0.775 total time= 0.1s  
[CV 1/5; 114/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100  
[CV 1/5; 114/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100;, score=0.750 total time= 0.2s  
[CV 2/5; 114/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100  
[CV 2/5; 114/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100;, score=0.759 total time= 0.2s  
[CV 3/5; 114/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100  
[CV 3/5; 114/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100;, score=0.811 total time= 0.2s  
[CV 4/5; 114/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100  
[CV 4/5; 114/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100;, score=0.811 total time= 0.3s  
[CV 5/5; 114/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100  
[CV 5/5; 114/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=auto, n\_estimators=100;, score=0.739 total time= 0.2s  
[CV 1/5; 115/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5  
[CV 1/5; 115/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5;, score=0.696 total time= 0.0s  
[CV 2/5; 115/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5  
[CV 2/5; 115/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5;, score=0.741 total time= 0.0s  
[CV 3/5; 115/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5  
[CV 3/5; 115/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5;, score=0.739 total time= 0.0s  
[CV 4/5; 115/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5  
[CV 4/5; 115/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5;, score=0.784 total time= 0.0s  
[CV 5/5; 115/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5  
[CV 5/5; 115/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 1/5; 116/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10  
[CV 1/5; 116/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10;, score=0.723 total time= 0.0s  
[CV 2/5; 116/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10

[CV 2/5; 116/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10;, score=0.732 total time= 0.0s  
[CV 3/5; 116/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10  
[CV 3/5; 116/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10;, score=0.775 total time= 0.0s  
[CV 4/5; 116/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10  
[CV 4/5; 116/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10;, score=0.739 total time= 0.0s  
[CV 5/5; 116/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10  
[CV 5/5; 116/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=10;, score=0.775 total time= 0.0s  
[CV 1/5; 117/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 1/5; 117/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.750 total time= 0.0s  
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[CV 2/5; 117/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.732 total time= 0.0s  
[CV 3/5; 117/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 3/5; 117/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.784 total time= 0.0s  
[CV 4/5; 117/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 4/5; 117/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.739 total time= 0.0s  
[CV 5/5; 117/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15  
[CV 5/5; 117/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=15;, score=0.748 total time= 0.0s  
[CV 1/5; 118/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=25  
[CV 1/5; 118/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=25;, score=0.786 total time= 0.0s  
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[CV 3/5; 118/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=25  
[CV 3/5; 118/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=25;, score=0.820 total time= 0.0s  
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[CV 2/5; 119/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=50  
[CV 2/5; 119/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=50;, score=0.732 total time= 0.1s  
[CV 3/5; 119/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=50  
[CV 3/5; 119/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=50;, score=0.829 total time= 0.1s  
[CV 4/5; 119/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=50  
[CV 4/5; 119/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=50;, score=0.811 total time= 0.2s  
[CV 5/5; 119/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=50  
[CV 5/5; 119/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=50;, score=0.775 total time= 0.1s  
[CV 1/5; 120/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=100  
[CV 1/5; 120/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.768 total time= 0.4s  
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[CV 2/5; 120/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.759 total time= 0.4s  
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[CV 3/5; 120/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.829 total time= 0.3s  
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[CV 4/5; 120/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.793 total time= 0.3s  
[CV 5/5; 120/168] START bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=100  
[CV 5/5; 120/168] END bootstrap=True, criterion=entropy, max\_depth=20, max\_features=log2, n\_estimators=100;, score=0.757 total time= 0.3s  
[CV 1/5; 121/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=5  
[CV 1/5; 121/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=5;, score=0.714 total time= 0.0s  
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[CV 2/5; 121/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=5;, score=0.705 total time= 0.0s  
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[CV 3/5; 121/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=5;, score=0.685 total time= 0.0s  
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[CV 5/5; 121/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=5  
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[CV 1/5; 122/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.723 total time= 0.0s  
[CV 2/5; 122/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=10  
[CV 2/5; 122/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.732 total time= 0.0s  
[CV 3/5; 122/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=10  
[CV 3/5; 122/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.784 total time= 0.1s  
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[CV 4/5; 122/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.766 total time= 0.0s  
[CV 5/5; 122/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=10  
[CV 5/5; 122/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=10;, score=0.694 total time= 0.0s  
[CV 1/5; 123/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=15  
[CV 1/5; 123/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.777 total time= 0.0s  
[CV 2/5; 123/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=15

[CV 2/5; 123/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.750 total time= 0.0s  
[CV 3/5; 123/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=15  
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[CV 4/5; 123/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.766 total time= 0.0s  
[CV 5/5; 123/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=15  
[CV 5/5; 123/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=15;, score=0.766 total time= 0.0s  
[CV 1/5; 124/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=25  
[CV 1/5; 124/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=25;, score=0.750 total time= 0.0s  
[CV 2/5; 124/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=25  
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[CV 4/5; 124/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=25  
[CV 4/5; 124/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=25;, score=0.829 total time= 0.0s  
[CV 5/5; 124/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=25  
[CV 5/5; 124/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=25;, score=0.757 total time= 0.0s  
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[CV 1/5; 125/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=50;, score=0.768 total time= 0.1s  
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[CV 2/5; 125/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=50;, score=0.777 total time= 0.1s  
[CV 3/5; 125/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=50  
[CV 3/5; 125/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=50;, score=0.829 total time= 0.1s  
[CV 4/5; 125/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=50  
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[CV 3/5; 126/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=100  
[CV 3/5; 126/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=100;, score=0.802 total time= 0.3s  
[CV 4/5; 126/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=100  
[CV 4/5; 126/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=100;, score=0.793 total time= 0.2s  
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[CV 5/5; 126/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=auto, n\_estimators=100;, score=0.739 total time= 0.4s  
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[CV 1/5; 127/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=5;, score=0.723 total time= 0.0s  
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[CV 2/5; 127/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=5;, score=0.786 total time= 0.0s  
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[CV 5/5; 127/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=5;, score=0.730 total time= 0.0s  
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[CV 1/5; 128/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.723 total time= 0.0s  
[CV 2/5; 128/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=10  
[CV 2/5; 128/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.705 total time= 0.0s  
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[CV 4/5; 128/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=10  
[CV 4/5; 128/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.730 total time= 0.0s  
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[CV 5/5; 128/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=10;, score=0.811 total time= 0.0s  
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[CV 1/5; 129/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.750 total time= 0.0s  
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[CV 2/5; 129/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.768 total time= 0.0s  
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[CV 3/5; 129/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.775 total time= 0.0s  
[CV 4/5; 129/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=15  
[CV 4/5; 129/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.775 total time= 0.0s  
[CV 5/5; 129/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=15  
[CV 5/5; 129/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=15;, score=0.757 total time= 0.0s  
[CV 1/5; 130/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=25  
[CV 1/5; 130/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.759 total time= 0.0s  
[CV 2/5; 130/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=25

[CV 2/5; 130/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.750 total time= 0.0s  
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[CV 4/5; 130/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.793 total time= 0.0s  
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[CV 5/5; 130/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=25;, score=0.766 total time= 0.0s  
[CV 1/5; 131/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50  
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[CV 2/5; 131/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50  
[CV 2/5; 131/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50;, score=0.786 total time= 0.1s  
[CV 3/5; 131/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50  
[CV 3/5; 131/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50;, score=0.793 total time= 0.1s  
[CV 4/5; 131/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50  
[CV 4/5; 131/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50;, score=0.838 total time= 0.1s  
[CV 5/5; 131/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50  
[CV 5/5; 131/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=50;, score=0.730 total time= 0.1s  
[CV 1/5; 132/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 1/5; 132/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.768 total time= 0.3s  
[CV 2/5; 132/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 2/5; 132/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.786 total time= 0.2s  
[CV 3/5; 132/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 3/5; 132/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.811 total time= 0.2s  
[CV 4/5; 132/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 4/5; 132/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.820 total time= 0.2s  
[CV 5/5; 132/168] START bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100  
[CV 5/5; 132/168] END bootstrap=True, criterion=entropy, max\_depth=40, max\_features=log2, n\_estimators=100;, score=0.766 total time= 0.2s  
[CV 1/5; 133/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 1/5; 133/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.723 total time= 0.0s  
[CV 2/5; 133/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 2/5; 133/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.732 total time= 0.0s  
[CV 3/5; 133/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 3/5; 133/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.775 total time= 0.0s  
[CV 4/5; 133/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 4/5; 133/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.811 total time= 0.0s  
[CV 5/5; 133/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5  
[CV 5/5; 133/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=5;, score=0.694 total time= 0.0s  
[CV 1/5; 134/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 1/5; 134/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.741 total time= 0.0s  
[CV 2/5; 134/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 2/5; 134/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.723 total time= 0.0s  
[CV 3/5; 134/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 3/5; 134/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.775 total time= 0.0s  
[CV 4/5; 134/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 4/5; 134/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 5/5; 134/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10  
[CV 5/5; 134/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=10;, score=0.784 total time= 0.0s  
[CV 1/5; 135/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 1/5; 135/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.777 total time= 0.0s  
[CV 2/5; 135/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 2/5; 135/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.732 total time= 0.0s  
[CV 3/5; 135/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 3/5; 135/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.784 total time= 0.0s  
[CV 4/5; 135/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 4/5; 135/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.784 total time= 0.0s  
[CV 5/5; 135/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15  
[CV 5/5; 135/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=15;, score=0.775 total time= 0.0s  
[CV 1/5; 136/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 1/5; 136/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.812 total time= 0.0s  
[CV 2/5; 136/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 2/5; 136/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.777 total time= 0.0s  
[CV 3/5; 136/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 3/5; 136/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 4/5; 136/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 4/5; 136/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.784 total time= 0.0s  
[CV 5/5; 136/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25  
[CV 5/5; 136/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=25;, score=0.730 total time= 0.0s  
[CV 1/5; 137/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 1/5; 137/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.786 total time= 0.1s  
[CV 2/5; 137/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50

[CV 2/5; 137/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.741 total time= 0.1s  
[CV 3/5; 137/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 3/5; 137/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.811 total time= 0.1s  
[CV 4/5; 137/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 4/5; 137/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.784 total time= 0.2s  
[CV 5/5; 137/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50  
[CV 5/5; 137/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=50;, score=0.775 total time= 0.1s  
[CV 1/5; 138/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 1/5; 138/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.777 total time= 0.3s  
[CV 2/5; 138/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 2/5; 138/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.759 total time= 0.3s  
[CV 3/5; 138/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 3/5; 138/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.802 total time= 0.3s  
[CV 4/5; 138/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 4/5; 138/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.829 total time= 0.3s  
[CV 5/5; 138/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100  
[CV 5/5; 138/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=auto, n\_estimators=100;, score=0.757 total time= 0.3s  
[CV 1/5; 139/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 1/5; 139/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.750 total time= 0.0s  
[CV 2/5; 139/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 2/5; 139/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.714 total time= 0.0s  
[CV 3/5; 139/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 3/5; 139/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 4/5; 139/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 4/5; 139/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 5/5; 139/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5  
[CV 5/5; 139/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=5;, score=0.730 total time= 0.0s  
[CV 1/5; 140/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 1/5; 140/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.768 total time= 0.0s  
[CV 2/5; 140/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 2/5; 140/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.750 total time= 0.0s  
[CV 3/5; 140/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 3/5; 140/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.793 total time= 0.0s  
[CV 4/5; 140/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 4/5; 140/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.802 total time= 0.0s  
[CV 5/5; 140/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10  
[CV 5/5; 140/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=10;, score=0.730 total time= 0.0s  
[CV 1/5; 141/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 1/5; 141/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.768 total time= 0.0s  
[CV 2/5; 141/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 2/5; 141/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.777 total time= 0.0s  
[CV 3/5; 141/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 3/5; 141/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.829 total time= 0.0s  
[CV 4/5; 141/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 4/5; 141/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.811 total time= 0.0s  
[CV 5/5; 141/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15  
[CV 5/5; 141/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=15;, score=0.766 total time= 0.0s  
[CV 1/5; 142/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25  
[CV 1/5; 142/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.777 total time= 0.0s  
[CV 2/5; 142/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25  
[CV 2/5; 142/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.768 total time= 0.0s  
[CV 3/5; 142/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25  
[CV 3/5; 142/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.784 total time= 0.0s  
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[CV 4/5; 142/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.775 total time= 0.0s  
[CV 5/5; 142/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25  
[CV 5/5; 142/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=25;, score=0.730 total time= 0.0s  
[CV 1/5; 143/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 1/5; 143/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.768 total time= 0.1s  
[CV 2/5; 143/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 2/5; 143/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.768 total time= 0.1s  
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[CV 3/5; 143/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.820 total time= 0.2s  
[CV 4/5; 143/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 4/5; 143/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.829 total time= 0.1s  
[CV 5/5; 143/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50  
[CV 5/5; 143/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=50;, score=0.784 total time= 0.1s  
[CV 1/5; 144/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100

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[CV 2/5; 144/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 2/5; 144/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.786 total time= 0.2s  
[CV 3/5; 144/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 3/5; 144/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.820 total time= 0.2s  
[CV 4/5; 144/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 4/5; 144/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.793 total time= 0.2s  
[CV 5/5; 144/168] START bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100  
[CV 5/5; 144/168] END bootstrap=True, criterion=entropy, max\_depth=50, max\_features=log2, n\_estimators=100;, score=0.775 total time= 0.5s  
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[CV 1/5; 145/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.741 total time= 0.0s  
[CV 2/5; 145/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5  
[CV 2/5; 145/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.723 total time= 0.0s  
[CV 3/5; 145/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5  
[CV 3/5; 145/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.748 total time= 0.0s  
[CV 4/5; 145/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5  
[CV 4/5; 145/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.766 total time= 0.0s  
[CV 5/5; 145/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5  
[CV 5/5; 145/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=5;, score=0.703 total time= 0.0s  
[CV 1/5; 146/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 1/5; 146/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.741 total time= 0.0s  
[CV 2/5; 146/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 2/5; 146/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.696 total time= 0.0s  
[CV 3/5; 146/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 3/5; 146/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 4/5; 146/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 4/5; 146/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.703 total time= 0.0s  
[CV 5/5; 146/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10  
[CV 5/5; 146/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=10;, score=0.739 total time= 0.0s  
[CV 1/5; 147/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 1/5; 147/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.714 total time= 0.0s  
[CV 2/5; 147/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 2/5; 147/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.732 total time= 0.0s  
[CV 3/5; 147/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 3/5; 147/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.739 total time= 0.0s  
[CV 4/5; 147/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 4/5; 147/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.757 total time= 0.0s  
[CV 5/5; 147/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15  
[CV 5/5; 147/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=15;, score=0.730 total time= 0.0s  
[CV 1/5; 148/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 1/5; 148/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.804 total time= 0.0s  
[CV 2/5; 148/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 2/5; 148/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.786 total time= 0.0s  
[CV 3/5; 148/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 3/5; 148/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.802 total time= 0.0s  
[CV 4/5; 148/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 4/5; 148/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.793 total time= 0.0s  
[CV 5/5; 148/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25  
[CV 5/5; 148/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=25;, score=0.757 total time= 0.0s  
[CV 1/5; 149/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=50  
[CV 1/5; 149/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.777 total time= 0.1s  
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[CV 2/5; 149/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.777 total time= 0.1s  
[CV 3/5; 149/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=50  
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[CV 4/5; 149/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=50  
[CV 4/5; 149/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.793 total time= 0.1s  
[CV 5/5; 149/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=50  
[CV 5/5; 149/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=50;, score=0.748 total time= 0.2s  
[CV 1/5; 150/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=100  
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[CV 2/5; 150/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.786 total time= 0.3s  
[CV 3/5; 150/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=100  
[CV 3/5; 150/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.829 total time= 0.3s  
[CV 4/5; 150/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=100  
[CV 4/5; 150/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.802 total time= 0.3s  
[CV 5/5; 150/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=100

[CV 5/5; 150/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=auto, n\_estimators=100;, score=0.748 total time= 0.3s  
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[CV 2/5; 151/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=5  
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[CV 3/5; 151/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=5;, score=0.730 total time= 0.0s  
[CV 4/5; 151/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=5  
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[CV 1/5; 152/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 1/5; 152/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.732 total time= 0.0s  
[CV 2/5; 152/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 2/5; 152/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.795 total time= 0.0s  
[CV 3/5; 152/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 3/5; 152/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.748 total time= 0.0s  
[CV 4/5; 152/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 4/5; 152/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.793 total time= 0.0s  
[CV 5/5; 152/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10  
[CV 5/5; 152/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=10;, score=0.775 total time= 0.0s  
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[CV 1/5; 153/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.777 total time= 0.0s  
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[CV 2/5; 153/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.759 total time= 0.0s  
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[CV 3/5; 153/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.793 total time= 0.0s  
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[CV 4/5; 153/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.775 total time= 0.0s  
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[CV 5/5; 153/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=15;, score=0.757 total time= 0.0s  
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[CV 2/5; 154/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.777 total time= 0.0s  
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[CV 3/5; 154/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.829 total time= 0.0s  
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[CV 4/5; 154/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.775 total time= 0.0s  
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[CV 5/5; 154/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=25;, score=0.748 total time= 0.0s  
[CV 1/5; 155/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=50  
[CV 1/5; 155/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.786 total time= 0.1s  
[CV 2/5; 155/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=50  
[CV 2/5; 155/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.777 total time= 0.2s  
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[CV 3/5; 155/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.793 total time= 0.2s  
[CV 4/5; 155/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=50  
[CV 4/5; 155/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=50;, score=0.802 total time= 0.1s  
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[CV 1/5; 156/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=100;, score=0.777 total time= 0.3s  
[CV 2/5; 156/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=100  
[CV 2/5; 156/168] END bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=100;, score=0.795 total time= 0.2s  
[CV 3/5; 156/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=100  
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[CV 5/5; 156/168] START bootstrap=True, criterion=entropy, max\_depth=60, max\_features=log2, n\_estimators=100  
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[CV 2/5; 157/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=5;, score=0.732 total time= 0.0s  
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[CV 3/5; 157/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=5;, score=0.757 total time= 0.0s  
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[CV 2/5; 158/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=10

[CV 2/5; 158/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=10;, score=0.741 total time= 0.0s  
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[CV 1/5; 160/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=25;, score=0.786 total time= 0.0s  
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[CV 3/5; 161/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=50;, score=0.820 total time= 0.1s  
[CV 4/5; 161/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=50  
[CV 4/5; 161/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=50;, score=0.820 total time= 0.1s  
[CV 5/5; 161/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=50  
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[CV 4/5; 162/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=100;, score=0.829 total time= 0.2s  
[CV 5/5; 162/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=100  
[CV 5/5; 162/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=auto, n\_estimators=100;, score=0.766 total time= 0.2s  
[CV 1/5; 163/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=5  
[CV 1/5; 163/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.732 total time= 0.0s  
[CV 2/5; 163/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=5  
[CV 2/5; 163/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.768 total time= 0.0s  
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[CV 3/5; 163/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.811 total time= 0.0s  
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[CV 4/5; 163/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.757 total time= 0.0s  
[CV 5/5; 163/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=5  
[CV 5/5; 163/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=5;, score=0.775 total time= 0.0s  
[CV 1/5; 164/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 1/5; 164/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.786 total time= 0.0s  
[CV 2/5; 164/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 2/5; 164/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.714 total time= 0.0s  
[CV 3/5; 164/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 3/5; 164/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.784 total time= 0.0s  
[CV 4/5; 164/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 4/5; 164/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.757 total time= 0.0s  
[CV 5/5; 164/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10  
[CV 5/5; 164/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=10;, score=0.739 total time= 0.0s  
[CV 1/5; 165/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 1/5; 165/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.768 total time= 0.0s  
[CV 2/5; 165/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 2/5; 165/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.768 total time= 0.0s  
[CV 3/5; 165/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15

[CV 3/5; 165/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.757 total time= 0.0s  
[CV 4/5; 165/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 4/5; 165/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.811 total time= 0.0s  
[CV 5/5; 165/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15  
[CV 5/5; 165/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=15;, score=0.748 total time= 0.0s  
[CV 1/5; 166/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 1/5; 166/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.777 total time= 0.0s  
[CV 2/5; 166/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 2/5; 166/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.786 total time= 0.0s  
[CV 3/5; 166/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 3/5; 166/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.811 total time= 0.0s  
[CV 4/5; 166/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 4/5; 166/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.766 total time= 0.0s  
[CV 5/5; 166/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25  
[CV 5/5; 166/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=25;, score=0.757 total time= 0.0s  
[CV 1/5; 167/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50  
[CV 1/5; 167/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50;, score=0.768 total time= 0.1s  
[CV 2/5; 167/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50  
[CV 2/5; 167/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50;, score=0.759 total time= 0.1s  
[CV 3/5; 167/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50  
[CV 3/5; 167/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50;, score=0.811 total time= 0.1s  
[CV 4/5; 167/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50  
[CV 4/5; 167/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50;, score=0.802 total time= 0.1s  
[CV 5/5; 167/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50  
[CV 5/5; 167/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=50;, score=0.757 total time= 0.1s  
[CV 1/5; 168/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100  
[CV 1/5; 168/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100;, score=0.786 total time= 0.4s  
[CV 2/5; 168/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100  
[CV 2/5; 168/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100;, score=0.768 total time= 0.4s  
[CV 3/5; 168/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100  
[CV 3/5; 168/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100;, score=0.829 total time= 0.3s  
[CV 4/5; 168/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100  
[CV 4/5; 168/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100;, score=0.811 total time= 0.2s  
[CV 5/5; 168/168] START bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100  
[CV 5/5; 168/168] END bootstrap=True, criterion=entropy, max\_depth=80, max\_features=log2, n\_estimators=100;, score=0.757 total time= 0.2s

GridSearchCV(estimator=RandomForestClassifier(),  
 param\_grid={'bootstrap': [True], 'criterion': ['gini', 'entropy'],  
 'max\_depth': [5, 10, 20, 40, 50, 60, 80],  
 'max\_features': ['auto', 'log2'],  
 'n\_estimators': [5, 10, 15, 25, 50, 100]},  
 verbose=10)

GCV.best\_params\_

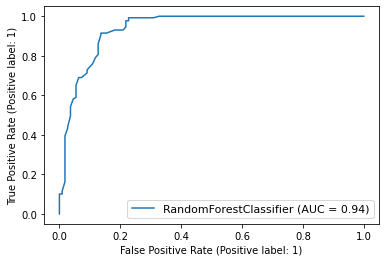
{'bootstrap': True,  
 'criterion': 'entropy',  
 'max\_depth': 20,  
 'max\_features': 'auto',  
 'n\_estimators': 50}

# Final Model

Final\_mod = RandomForestClassifier(bootstrap=True,criterion='entropy',n\_estimators= 50, max\_depth=20 ,max\_features='auto')  
Final\_mod.fit(X\_train,Y\_train)  
y\_pred=Final\_mod.predict(X\_test)  
print('\033[1m'+'Accuracy Score :'+'\033[0m\n', accuracy\_score(Y\_test, y\_pred))

Accuracy Score :  
 0.8870292887029289

from sklearn.metrics import plot\_roc\_curve  
  
disp = plot\_roc\_curve(Final\_mod,X\_test,Y\_test)   
plt.legend(prop={'size':11}, loc='lower right')  
plt.figure(figsize=(10,10))  
plt.show()  
from sklearn.metrics import roc\_auc\_score  
auc\_score = roc\_auc\_score(Y\_test, Final\_mod.predict(X\_test))  
print('\033[1m'+'Auc Score :'+'\033[0m\n',auc\_score)



<Figure size 720x720 with 0 Axes>

Auc Score :  
 0.8846370683579985

## Saving model

import joblib  
joblib.dump(Final\_mod,'Loan\_Status\_Final.pkl')

['Loan\_Status\_Final.pkl']

# Concluding Remarks

1. Accuracy Score of Logistics Regression : 0.8158995815899581
2. Accuracy Score :SVC 0.7824267782426778
3. Accuracy Score of GaussianNB : 0.7698744769874477
4. Accuracy Score of DecisionTreeClassifier :0.7573221757322176
5. Accuracy Score of KNeighborsClassifier(n\_neighbors=3): 0.79916317991631
6. Accuracy Score of RandomForestClassifier: 0.8744769874476988
7. Accuracy Score of ExtraTreesClassifier: 0.8451882845188284

* RandomforestClassifier achieves highest accuracy of 0.8
* k-fold cross validation and Hyper Parameter Tuning using GridSearchCV is performed to test model created on unseen data
* Cross Validation Score RandomForestClassifier is highest whcih is 0.83.