1.PREDICTINGHOUSEPRICES

EX.N0:1	**PredictingHousePrices**
DATE:24/07/2024	

PROBLEM STATEMENT: Build a regression model to predict house prices based on features like location, size, and amenities.

PYTHONCONCEPTS: Functions,classes,numerictypes, sequences.

VISUALIZATION: Plottingregressionline,residualplots.

MULTIVARIATEANALYSIS: Multipleregression.

DATASET: KaggleHouse Prices

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

6:Print equal metric & test the cell.

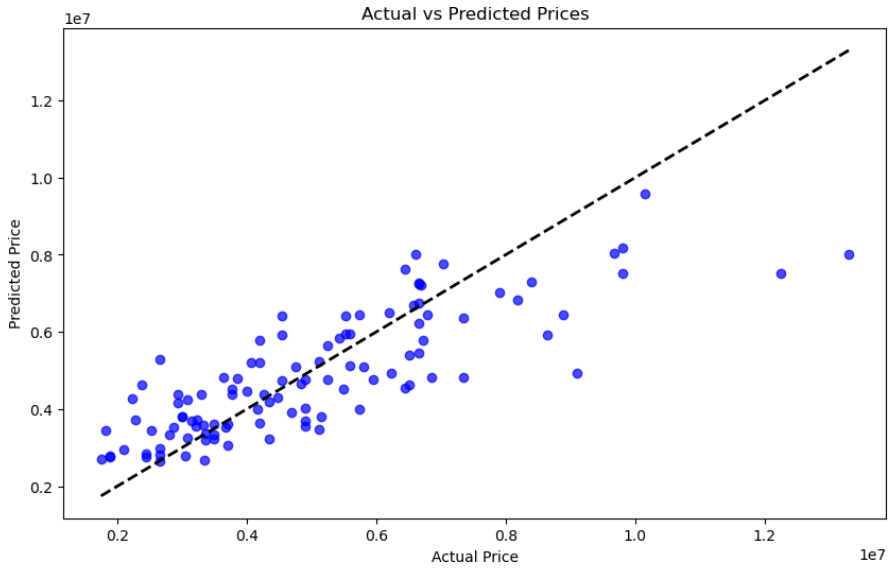
PROGRAM:

```
importpandasaspd

from sklearn.preprocessing import LabelEncoder

fromsklearn.model_selectionimporttrain_test_split
```

```
fromsklearn.linear_modelimportLinearRegression

fromsklearn.metricsimportr2_score,mean_absolute_error import

matplotlib.pyplot as plt

file_path='C:/Users/APPU/Downloads/Housing.csv'

housing_data = pd.read_csv(file_path)

categorical_features=['mainroad','guestroom','basement','hotwaterheating','airconditioning',
'prefarea', 'furnishingstatus']

le=LabelEncoder()

forfeature in categorical_features:

housing_data[feature]=le.fit_transform(housing_data[feature]) X

= housing_data.drop('price', axis=1)y = housing_data['price']

X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42)

model = LinearRegression()

model.fit(X_train, y_train)

y_pred=model.predict(X_test)

r2 = r2_score(y_test, y_pred)

mae=mean_absolute_error(y_test,y_pred)

plt.figure(figsize=(10, 6))

plt.scatter(y_test,y_pred,alpha=0.7,color='b')

plt.plot([y_test.min(), y_test.max()],

[y_test.min(),y_test.max()],'k--',lw=2)

plt.xlabel('Actual Price')

plt.ylabel('Predicted Price')

plt.title('Actual vs Predicted Prices')

plt.show()
```

print(f'R-squared(R^2):{r2}')

print(f'MeanAbsoluteError(MAE):{mae}')




```
import numpy as np
test=np.array([ 7420,4,2,3,1,0,0,0,1,2,1,0]).reshape(-12,12)
model.predict(test)
```

```
array([8004072.41154001])
```

RESULT:

Thus,theprogramforhousepricepredictionis executed successfully.

2. CUSTOMERSEGMENTATIONFORANE-COMMERCECOMPANY

EX.N0:2	CustomerSegmentationforanE-commerce Company
DATE:05/08/2024	

PROBLEMSTATEMENT: Performclusteranalysistosegmentcustomersbasedonpurchasing behaviour.

PYTHONCONCEPTS: Datastructures,file reading/writing.

VISUALIZATION: Clusterplots.

MULTIVARIATEANALYSIS: Clusteranalysiswithk-means,hierarchicalclustering.

DATASET: OnlineRetail Dataset

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

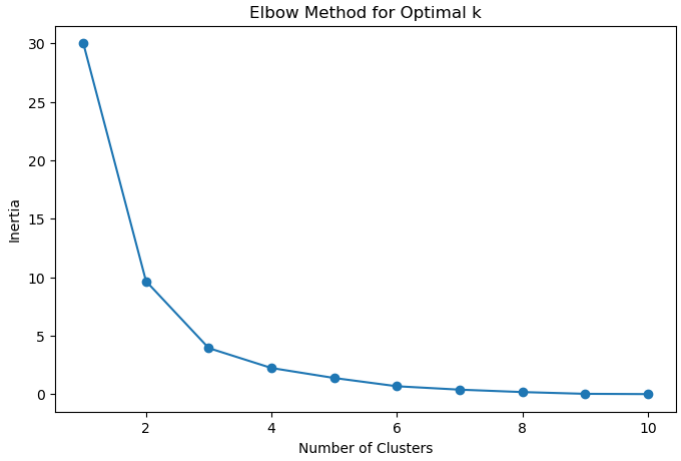
6:Print equal metric & test the cell.

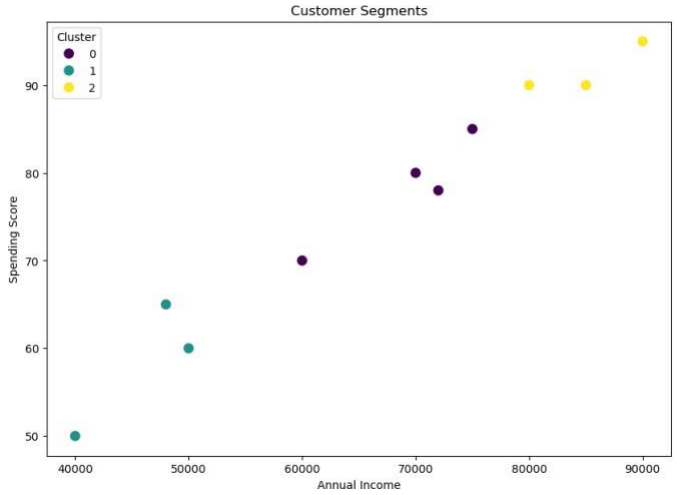
PROGRAM:

```
importpandasaspd
importnumpyasnp
fromsklearn.preprocessingimportStandardScaler
from sklearn.cluster import KMeans
importmatplotlib.pyplotasplt
import seaborn as sns
importos
```

```
os.environ['OMP_NUM_THREADS']='1'
data= {'CustomerID':[1, 2,3, 4,5, 6,7, 8,9, 10],
'Age':[25, 45,35, 50, 23,33, 43,36, 29, 55],
'AnnualIncome':[50000, 60000,70000, 80000, 40000,75000, 85000,72000, 48000, 90000],
'SpendingScore':[60, 70,80, 90,50, 85,90, 78,65, 95] }
df = pd.DataFrame(data)
features=df[['Age','AnnualIncome','SpendingScore']] scaler
= StandardScaler()
scaled_features=scaler.fit_transform(features)inertia=[] k_range
= range(1, 11) for k in k_range:
kmeans=KMeans(n_clusters=k,n_init=10,random_state=0)
kmeans.fit(scaled_features)
inertia.append(kmeans.inertia_)plt.figure(figsize=(8,5)) plt.plot(k_range,
inertia, marker='o')
plt.xlabel('Number of Clusters') plt.ylabel('Inertia')
plt.title('ElbowMethodforOptimalk')plt.show()optimal_k=3
kmeans=KMeans(n_clusters=optimal_k,n_init=10,random_state=0)
df['Cluster'] = kmeans.fit_predict(scaled_features)
plt.figure(figsize=(10, 7))
sns.scatterplot(data=df,x='AnnualIncome',y='SpendingScore',hue='Cluster',palette='viridis',
s=100)
plt.title('CustomerSegments')
plt.xlabel('Annual Income')
plt.ylabel('Spending Score')
plt.legend(title='Cluster')
plt.show()
print(df)
```

OUTPUT:





	CustomerID	Age	AnnualIncome	SpendingScore	Cluster
0	1	25	50000	60	1
1	2	45	60000	70	0
2	3	35	70000	80	0
3	4	50	80000	90	2
4	5	23	40000	50	1
5	6	33	75000	85	0
6	7	43	85000	90	2
7	8	36	72000	78	0
8	9	29	48000	65	1
9	10	55	90000	95	2

RESULT:

Thus,theprogramforCustomerSegmentationforanE-commerceCompanyisexecuted successfully.

3. SENTIMENTANALYSIS OFMOVIEREVIEWS

EX.N0:3	SENTIMENTANALYSISOFMOVIE REVIEWS
DATE:07/08/2024	

PROBLEMSTATEMENT: Classifymoviereviewsaspositiveornegativeusingtext Data.

PYTHONCONCEPTS: Textfiles,sequences,flowcontrols.

VISUALIZATION: Wordcloud,bar plots.

MULTIVARIATEANALYSIS:PCAfortextdata,logisticregression.

DATASET:IMDB Movie Reviews.

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

6:Print equal metric & test the cell.

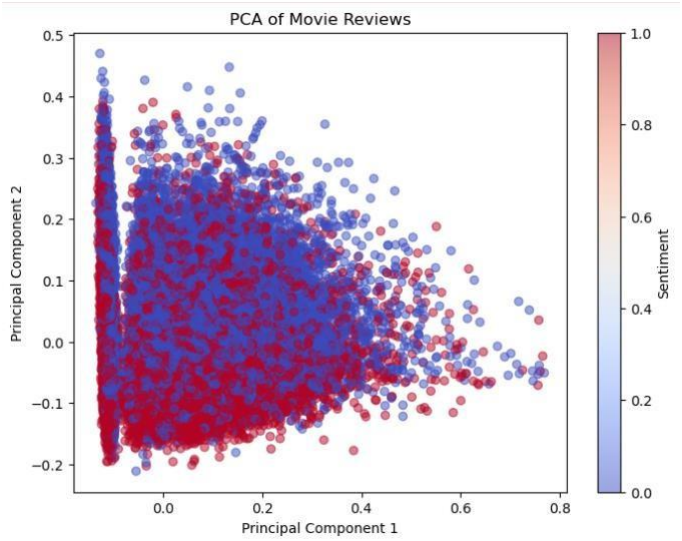
PROGRAM:

```
importpandasaspd
import matplotlib.pyplot as
pltfromwordcloudimportWordClou
d
fromsklearn.feature_extraction.textimportTfidfVectorizer
from sklearn.decomposition import PCA
```

```
fromsklearn.linear_modelimportLogisticRegression
fromsklearn.metricsimportclassification_report,confusion_matrix from
sklearn.model_selection import train_test_split
fromsklearn.preprocessingimportLabelEncoder
import nltk
fromnltk.corpusimportstopwords
fromnltk.tokenizeimportword_tokenize
from nltk.stem import PorterStemmer
import seaborn as sns
nltk.download('punkt')
nltk.download('stopwords')
df=pd.read_csv('C:/Users/AI_LAB/Downloads/IMDBDataset.csv')
stop_words = set(stopwords.words('english'))
stemmer=PorterStemmer()
def preprocess_text(text):
tokens=word_tokenize(text.lower())
tokens=[stemmer.stem(word)forwordintokensif word.isalpha()andwordnotinstop_words] return
''.join(tokens)
df['cleaned_review']=df['review'].apply(preprocess_text)
vectorizer = TfidfVectorizer(max_features=5000)
X=vectorizer.fit_transform(df['cleaned_review']).toarray()
encoder = LabelEncoder()
y=encoder.fit_transform(df['sentiment'])
pca = PCA(n_components=2)
X_pca=pca.fit_transform(X)
plt.figure(figsize=(8, 6))
plt.scatter(X_pca[:,0],X_pca[:,1],c=y,cmap='coolwarm',alpha=0.5)
plt.title('PCA of Movie Reviews')
plt.xlabel('PrincipalComponent1')
plt.ylabel('PrincipalComponent2')
plt.colorbar(label='Sentiment')
plt.show()
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42)
model = LogisticRegression(max_iter=1000)
model.fit(X_train,y_train)
```

```
y_pred = model.predict(X_test)
print("Confusion Matrix:")
print(confusion_matrix(y_test, y_pred))
print("\nClassification Report:")
print(classification_report(y_test, y_pred))
positive_reviews = ".join(df[df['sentiment'] == 1]['cleaned_review'])
negative_reviews=".join(df[df['sentiment']==0]['cleaned_review'])
plt.figure(figsize=(12, 6))
iflen(positive_reviews.strip())>0:
plt.subplot(1, 2, 1)
plt.imshow(WordCloud(width=800,height=400,
background_color='white').generate(positive_reviews), interpolation='bilinear')
plt.title('Positive Reviews')
plt.axis('off')
else:print("Nocontentavailableforpositivereviews.") if
len(negative_reviews.strip()) > 0:
plt.subplot(1,2,2)
plt.imshow(WordCloud(width=800, height=400,
background_color='white').generate(negative_reviews), interpolation='bilinear')
plt.title('NegativeReviews')
plt.axis('off') else:
print("Nocontentavailablefornegativereviews.")
plt.show()
sns.countplot(x='sentiment',data=df)
plt.title('Sentiment Distribution')
plt.xlabel('Sentiment')
plt.ylabel('Count')
plt.show()
```

OUTPUT:




```
Confusion Matrix:
[[4306  655]
 [ 511 4528]]

Classification Report:
              precision    recall  f1-score   support

           0       0.89      0.87      0.88      4961
           1       0.87      0.90      0.89      5039

    accuracy                           0.88     10000
   macro avg       0.88      0.88      0.88     10000
weighted avg       0.88      0.88      0.88     10000
```

RESULT:

Thus,theprogramforsentimentanalysis ofmoviereviewsis executedsuccessfully.

4. STOCKMARKET ANALYSIS

EX.N0:4	**STOCKMARKETANALYSIS**
DATE:14/08/2024	

PROBLEMSTATEMENT: Analysestockmarketdatatopredictfuturestockprices.

PYTHONCONCEPTS: Datastructures,filereading/writing,functions.

VISUALIZATION: Line plots, candlestick charts.

MULTIVARIATEANALYSIS: Timeseriesanalysis,regression.

DATASET: Yahoo Finance Stock Data.

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

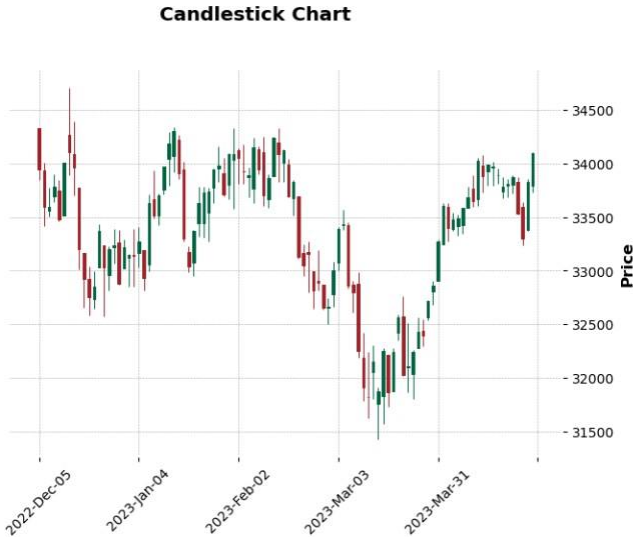
6:Print equal metric & test the cell.

PROGRAM:

```
importpandasaspd
importmatplotlib.pyplotasplt
import mplfinance as mpf
fromstatsmodels.tsa.arima.modelimportARIMA from
sklearn.metrics import mean_squared_error import
numpy as np
```

```
file_path= r'C:\Users\APPU\Downloads\yahoo_data.xlsx'
data = pd.read_excel(file_path, index_col='Date', parse_dates=True)
data.rename(columns={'Close*':'Close','AdjClose**':'AdjClose'},inplace=True)
data.sort_index(inplace=True)
data.ffill(inplace=True)
if'AdjClose'indata.columns:
plt.figure(figsize=(12,6))
plt.plot(data['AdjClose'],label='AdjustedClosePrice')
plt.title('Adjusted Close Price Over Time')
plt.xlabel('Date')
plt.ylabel('Price(USD)')
plt.legend()
plt.show()
reduced_data = data[-100:]# Reduce data points for candlestick chart
mpf.plot(reduced_data,type='candle',style='charles',title='CandlestickChart')
train_data,test_data=data['AdjClose'][:int(len(data)*0.8)],data['AdjClose'][int(len(data)*0.8):]
model = ARIMA(train_data, order=(5, 1, 0))
model_fit=model.fit()
forecast=model_fit.forecast(steps=len(test_data))
mse = mean_squared_error(test_data, forecast)
rmse = np.sqrt(mse)
print(f'RMSE: {rmse}')
plt.figure(figsize=(12,6))
plt.plot(train_data.index,train_data,label='TrainData')
plt.plot(test_data.index, test_data, label='Test Data')
plt.plot(test_data.index, forecast, label='Forecast')
plt.title('Stock Price Prediction')
plt.xlabel('Date')
plt.ylabel('Price(USD)')
plt.legend()
plt.show()
```

OUTPUT:



RESULT:

Thus,theprogramforstockmarketanalysisisexecutedsuccessfully.

5. LOANDEFAULT PREDICTION

EX.N0:5	**LOANDEFAULT PREDICTION**
DATE:21/08/2024	

PROBLEMSTATEMENT: Predictloandefaultprobabilitybasedonborrowerinformation.

PYTHONCONCEPTS: Classes,functions,sequences.

VISUALIZATION:ROCcurve,bar plots.

MULTIVARIATEANALYSIS: Logisticregression,factoranalysis.

DATASET: LendingClubLoanData

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

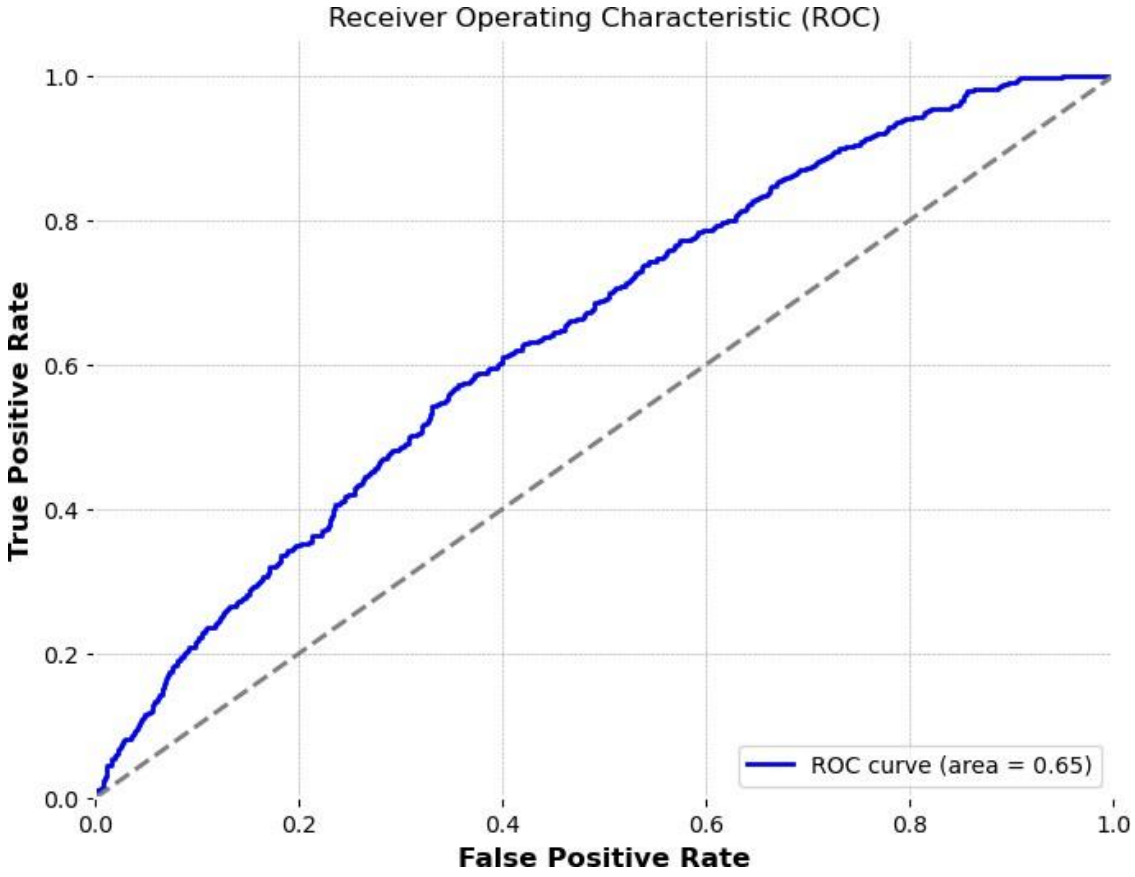
6:Print equal metric & test the cell.

PROGRAM:

```
importpandasaspd
importmatplotlib.pyplotasplt
import seaborn as sns
from sklearn.model_selection import train_test_split
fromsklearn.linear_modelimportLogisticRegression
from sklearn.metrics import roc_curve, auc
fromsklearn.preprocessingimportStandardScaler from
sklearn.decomposition import PCA
importos
```

```
file_path='C:/Users/APPU/Downloads/loan_data.csv'#Updatepathaccordingly if
os.path.exists(file_path):
df =
pd.read_csv(file_path)print("Dataload
edsuccessfully.")else:
print(f"Filenotfound: {file_path}")
dummies=pd.get_dummies(df['purpose'],drop_first=True)
df = pd.concat([df, dummies], axis=1)
df.drop('purpose',inplace=True,axis=1) X
= df.drop(['not.fully.paid'], axis=1)
y = df['not.fully.paid']
scaler=StandardScaler()
X_scaled=scaler.fit_transform(X)
pca = PCA(n_components=2)
X_pca= pca.fit_transform(X_scaled)
X_train,X_test,y_train,y_test=train_test_split(X_pca,y,test_size=0.33,random_state=42) model =
LogisticRegression()
model.fit(X_train,y_train)
y_pred_prob=model.predict_proba(X_test)[:,1]
fpr, tpr, _ = roc_curve(y_test, y_pred_prob)
roc_auc = auc(fpr, tpr)
plt.figure(figsize=(8,6))
plt.plot(fpr,tpr,color='blue',lw=2,label=f'ROCcurve(area={roc_auc:.2f})') plt.plot([0, 1],
[0, 1], color='gray', linestyle='--')
plt.xlim([0.0,1.0])
plt.ylim([0.0, 1.05])
plt.xlabel('FalsePositiveRate')
plt.ylabel('True Positive Rate')
plt.title('ReceiverOperatingCharacteristic(ROC)')
plt.legend(loc='lower right')
plt.show()
```

OUTPUT:



RESULT:

Thus,theprogramforloandefaultpredictionisexecutedsuccessfully.

6. IMAGECLASSIFICATION

EX.N0:6	**IMAGECLASSIFICATION**
DATE:04/09/2024	

PROBLEMSTATEMENT: Classifyimagesintocategoriesusingvariousfeatures.

PYTHON CONCEPTS: File handling, classes.

VISUALIZATION: Imageplots,featureimportanceplots.

MULTIVARIATE ANALYSIS:PCA, clustering.

DATASET:CIFAR-10Dataset

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

6:Print equal metric & test the cell.

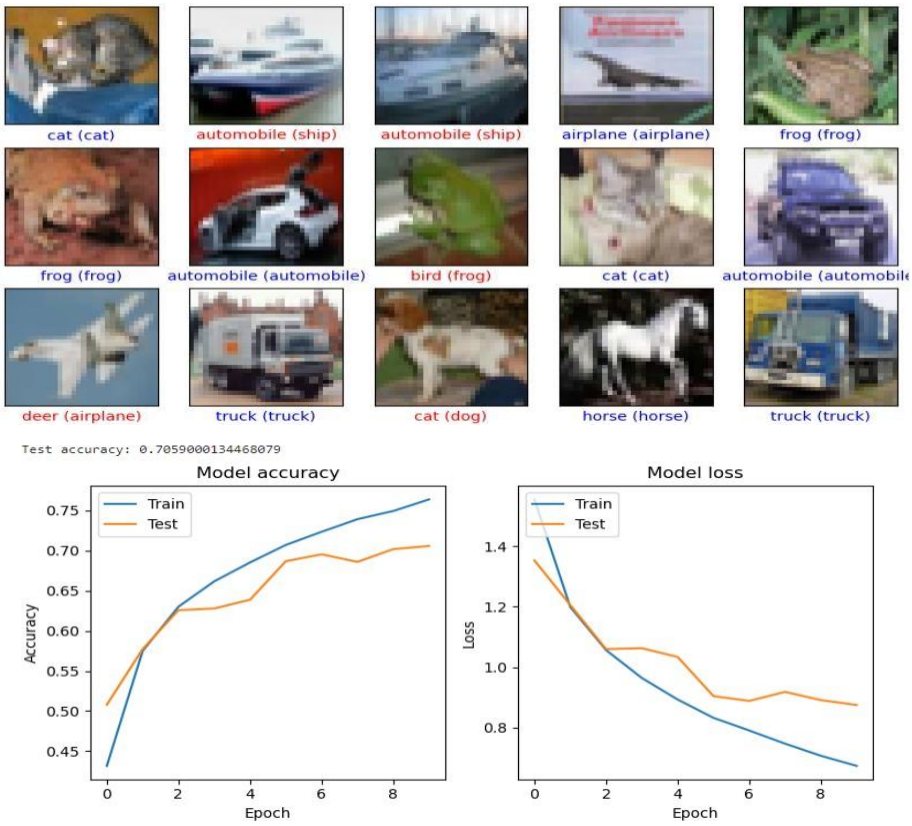
PROGRAM:

```
importtensorflowastf
fromtensorflow.kerasimportlayers,models
fromtensorflow.keras.preprocessing.imageimportImageDataGenerator
import matplotlib.pyplot as plt
importnumpyasnp
```

```
(X_train,y_train),(X_test,y_test)= tf.keras.datasets.cifar10.load_data()
X_train, X_test = X_train / 255.0, X_test / 255.0
class_names=['airplane','automobile','bird','cat','deer',
'dog', 'frog', 'horse', 'ship', 'truck']
plt.figure(figsize=(10,10))
for i in range(25): plt.subplot(5,5,i+1)
plt.xticks([]) plt.yticks([]) plt.grid(False)
plt.imshow(X_train[i],cmap=plt.cm.binary)
plt.xlabel(class_names[y_train[i][0]])
plt.show() model = models.Sequential([
layers.Conv2D(32,(3,3),activation='relu',input_shape=(32,32,3)),
layers.MaxPooling2D((2,2)),
layers.Conv2D(64,(3,3),activation='relu'),
layers.MaxPooling2D((2,2)),
layers.Conv2D(64, (3, 3), activation='relu'),
layers.Flatten(), layers.Dense(64, activation='relu'),
layers.Dense(10)])model.compile(optimizer='adam',
loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
metrics=['accuracy'])
history=model.fit(X_train,y_train,epochs=10,
validation_data=(X_test, y_test))
test_loss,test_acc=model.evaluate(X_test,y_test,verbose=2)
print(f"\nTest accuracy: {test_acc}")
plt.figure(figsize=(8,4))
plt.subplot(1,2,1)plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])plt.title('Model
accuracy')
plt.ylabel('Accuracy') plt.xlabel('Epoch')
plt.legend(['Train', 'Test'], loc='upper left')
plt.subplot(1,2,2)plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])plt.title('Model
loss') plt.ylabel('Loss') plt.xlabel('Epoch')
plt.legend(['Train','Test'],loc='upperleft')
plt.tight_layout() plt.show()
```

```
predictions=model.predict(X_test)
plt.figure(figsize=(10, 10))
for i in range(25): plt.subplot(5, 5, i+1)
plt.xticks([]) plt.yticks([]) plt.grid(False)
plt.imshow(X_test[i], cmap=plt.cm.binary)
predicted_label=np.argmax(predictions[i])
true_label = y_test[i][0]
color = 'blue' if predicted_label == true_label else 'red'
plt.xlabel(f"{class_names[predicted_label]}({class_names[true_label]})",color=color)
plt.show()
```

OUTPUT:



RESULT:

Thus,theprogramforImageClassificationisexecutedsuccessfully.

7.PREDICTING DIABETES

EX.N0:7	**PREDICTINGDIABETES**
DATE:11/09/2024	

PROBLEMSTATEMENT: Predicttheonsetofdiabetesbasedonmedical measurements.

PYTHONCONCEPTS: Datastructures,numerictypes, functions.

VISUALIZATION: Scatter plots, heatmaps.

MULTIVARIATEANALYSIS: Logisticregression,LDA.

DATASET: Pima Indians Diabetes Database

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset, createtrainedmodel. Step

6:Print equal metric & test the cell.

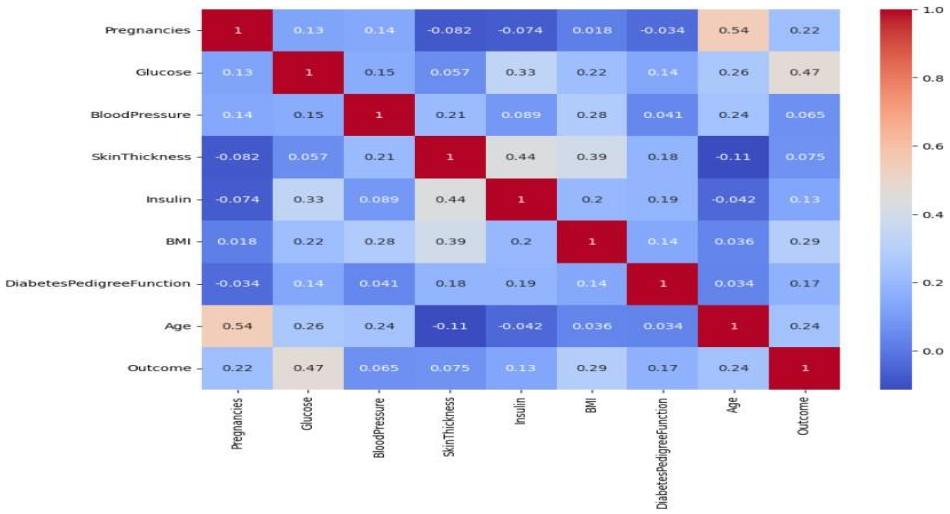
PROGRAM:

```
import pandas as pd
importseabornassns
importmatplotlib.pyplotasplt
from sklearn.model_selection import train_test_split
fromsklearn.linear_modelimportLogisticRegression
fromsklearn.metricsimportclassification_report,confusion_matrix, accuracy_score
url=https://raw.githubusercontent.com/jbrownlee/Datasets/master/pima-indians-diabetes.data.csv
columns = ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin','BMI',
'DiabetesPedigreeFunction', 'Age', 'Outcome']
```

```
data=pd.read_csv(url,header=None,names=columns)
print("First 5 records:\n", data.head())
print("\nStatistical Summary:\n", data.describe())
print("\nDataset Info:\n")
print(data.info())
sns.pairplot(data,hue='Outcome')
plt.show()
correlation_matrix=data.corr()
plt.figure(figsize=(10, 8))
sns.heatmap(correlation_matrix,annot=True,cmap='coolwarm')
plt.show()
X=data.drop('Outcome',axis=1) y
= data['Outcome']
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.3,random_state=42)
model = LogisticRegression(max_iter=1000)
model.fit(X_train, y_train)
y_pred=model.predict(X_test)
print("Confusion Matrix:")
print(confusion_matrix(y_test, y_pred))
print("\nClassification Report:")
print(classification_report(y_test,y_pred))
accuracy=accuracy_score(y_test,y_pred)
print(f"\nModelAccuracy:{accuracy*100:.2f}%")
sample = X_test.iloc[0].values.reshape(1, -1)
sample_prediction = model.predict(sample)
print(f"\nPredictionforsamplecase(1=Diabetes,0=NoDiabetes):{sample_prediction[0]}")
```

OUTPUT:

```
First 5 records:
   Pregnancies  Glucose  BloodPressure  SkinThickness  Insulin   BMI  \
0            6      148             72             35        0  33.6
1            1       85             66             29        0  26.6
2            8      183             64              0        0  23.3
3            1       89             66             23       94  28.1
4            0      137             40             35      168  43.1
```




```
Confusion Matrix:
[[120  31]
 [ 30  50]]

Classification Report:
              precision    recall  f1-score   support

           0       0.80      0.79      0.80       151
           1       0.62      0.62      0.62        80

    accuracy                           0.74       231
   macro avg       0.71      0.71      0.71       231
weighted avg       0.74      0.74      0.74       231


Model Accuracy: 73.59%

Prediction for sample case (1 = Diabetes, 0 = No Diabetes): 0
```

RESULT:

Thus,theprogramforpredictingdiabetesis executedsuccessfully.

8. WINEQUALITY PREDICTION

EX.N0:8	**WINE QUALITYPREDICTION**
DATE:18/09/2024	

PROBLEMSTATEMENT: Predictthequalityofwinebasedonvariouschemicalproperties.

PYTHONCONCEPTS: Classes,sequences,filehandling.

VISUALIZATION: Histograms,box plots.

MULTIVARIATEANALYSIS: Multipleregression,factoranalysis.

DATASET: WineQuality Dataset

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

6:Print equal metric & test the cell.

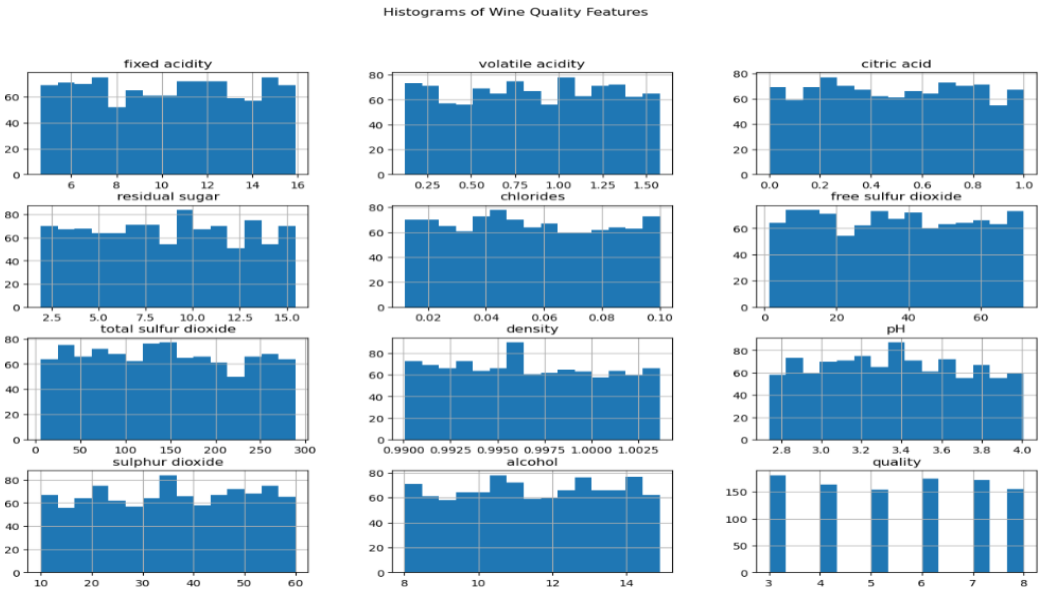
PROGRAM:

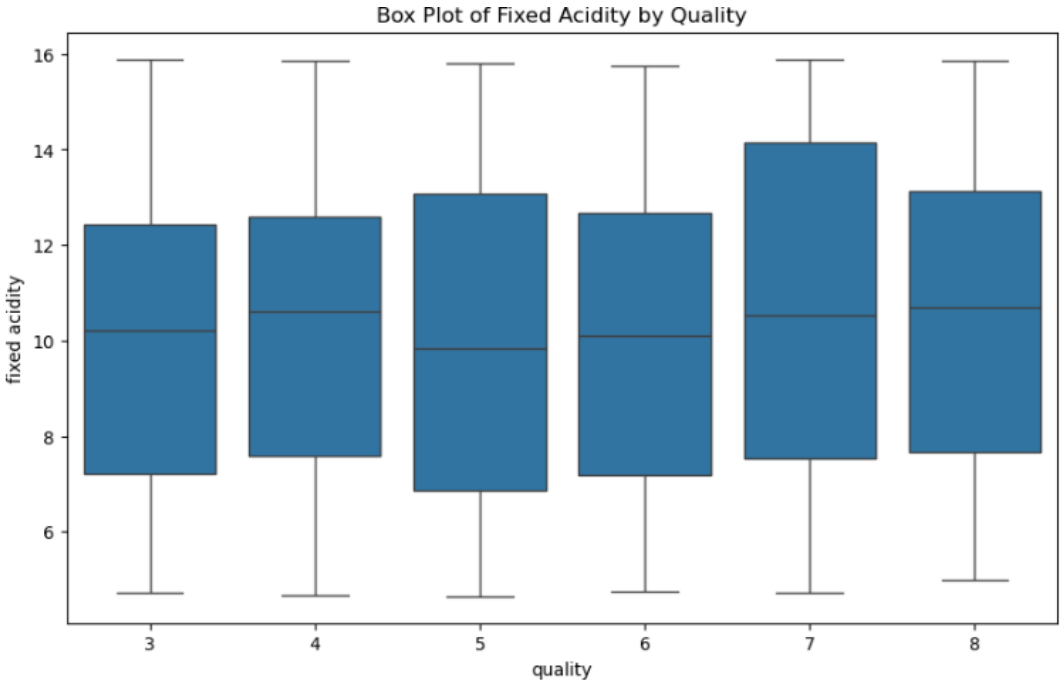
```
importpandasaspd
importnumpyasnp
importmatplotlib.pyplotasplt
import seaborn as sns
fromsklearn.model_selectionimporttrain_test_split
fromsklearn.linear_modelimportLinearRegression
```

```
fromsklearn.metricsimportmean_squared_error,r2_score
class WineQualityPredictor:
definit(self,num_samples=1000):
self.num_samples=num_samples
self.data = None
self.model=None
def generate_data(self):
np.random.seed(42)
quality=np.random.randint(3,9,self.num_samples)#Qualityscoresbetween3and8 fixed_acidity =
np.random.uniform(4.6, 15.9, self.num_samples)
volatile_acidity = np.random.uniform(0.12, 1.58, self.num_samples)
citric_acid = np.random.uniform(0, 1, self.num_samples)
residual_sugar = np.random.uniform(1.9, 15.5, self.num_samples)
chlorides = np.random.uniform(0.012, 0.1, self.num_samples)
free_sulfur_dioxide = np.random.uniform(1, 72, self.num_samples)
total_sulfur_dioxide=np.random.uniform(6,289,self.num_samples)
density = np.random.uniform(0.99007, 1.00369, self.num_samples)
pH = np.random.uniform(2.74, 4.01, self.num_samples)
sulfur_dioxide = np.random.uniform(10, 60, self.num_samples)
alcohol = np.random.uniform(8.0, 14.9, self.num_samples)
self.data=pd.DataFrame({
'fixed acidity': fixed_acidity, 'volatile acidity': volatile_acidity, 'citric acid': citric_acid,
'residualsugar':residual_sugar,'chlorides':chlorides, 'freesulfurdioxide':free_sulfur_dioxide,
'total sulfur dioxide': total_sulfur_dioxide, 'density': density, 'pH': pH,
'sulphurdioxide':sulfur_dioxide,'alcohol':alcohol, 'quality':quality})
print(f"SyntheticDataGenerated:{self.data.shape[0]}rowsand{self.data.shape[1]}columns") def
visualize_data(self):
self.data.hist(bins=15, figsize=(15, 10))
plt.suptitle('Histograms of Wine Quality Features')
plt.show() plt.figure(figsize=(10, 6))
sns.boxplot(x='quality',y='fixedacidity',data=self.data)
plt.title('Box Plot of Fixed Acidity by Quality')
plt.show() def preprocess_data(self):
X=self.data.drop('quality',axis=1) y
= self.data['quality']
```

```
returnX,ydeftrain_model(self,X,y):
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42)
self.model = LinearRegression()
self.model.fit(X_train, y_train)
y_pred=self.model.predict(X_test)
return y_train, y_test, y_pred
defevaluate_model(self,y_test,y_pred):
mse=mean_squared_error(y_test,y_pred) r2
= r2_score(y_test, y_pred)
print(f'MeanSquaredError:{mse}')print(f'R^2Score:{r2}') def
predict_quality(self, input_features):
input_df=pd.DataFrame([input_features],columns=self.data.columns[:-1])
prediction = self.model.predict(input_df) return prediction[0]
defrun(self):self.generate_data()self.visualize_data() X,
y = self.preprocess_data()
y_train,y_test,y_pred=self.train_model(X,y) self.evaluate_model(y_test,
y_pred)
ifname_____=="main":
wine_predictor=WineQualityPredictor(num_samples=1000)
wine_predictor.run()
example_features={
'fixedacidity':7.4,'volatileacidity':0.7,'citricacid':0.0,
'residualsugar':1.9,'chlorides':0.076,'freesulfurdioxide':11.0,
'totalsulfurdioxide':34.0, 'density':0.9978,'pH':3.51,
'sulphurdioxide':45.0,'alcohol':9.4}
predicted_quality=wine_predictor.predict_quality(example_features)
print(f'Predicted Wine Quality: {predicted_quality:.2f}')
```

OUTPUT:






```
Mean Squared Error: 2.8525212491984275
R^2 Score: -0.0010251435985495494
Predicted Wine Quality: 5.51
```

RESULT:

Thus,theprogramforwinequalitypredictionisexecutedsuccessfully.

9. HEART DISEASE PREDICTION

EX.N0:9	**HEARTDISEASEPREDICTION**
DATE:07/10/2024	

PROBLEMSTATEMENT: Predictheartdiseasebasedonclinical parameters

PYTHONCONCEPTS: Functions,datastructures.

VISUALIZATION: Pair plots, ROC curve.

MULTIVARIATEANALYSIS: Logisticregression,PCA.

DATASET: Heart Disease Dataset

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

6:Print equal metric & test the cell.

PROGRAM:

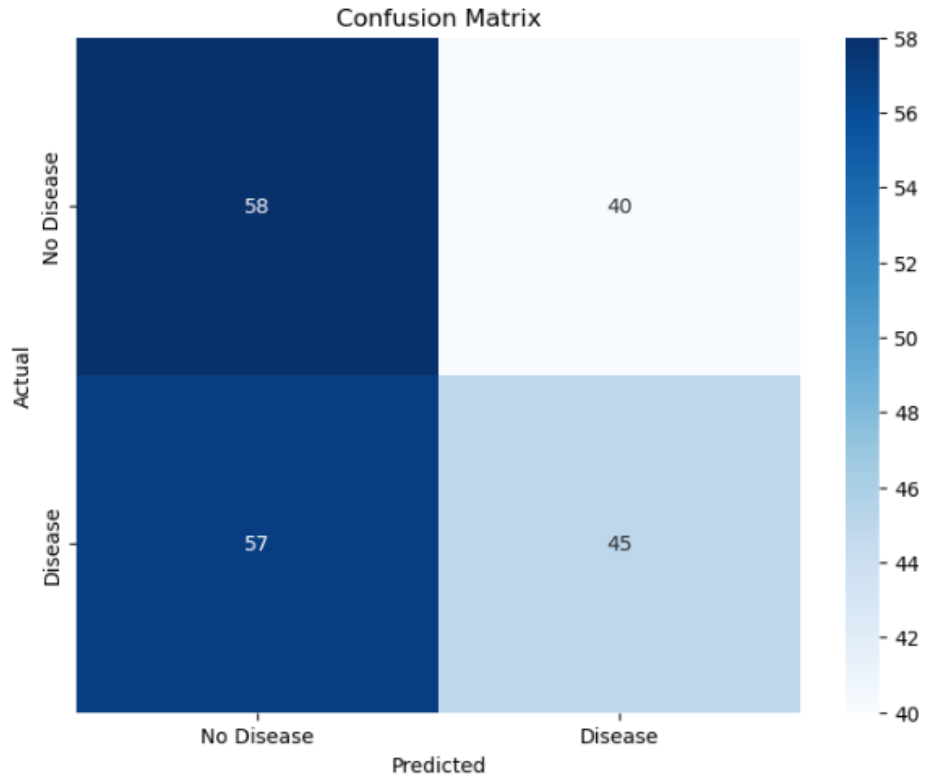
```
importnumpyasnp
importpandasaspd
importmatplotlib.pyplotasplt
import seaborn as sns
fromsklearn.model_selectionimporttrain_test_split
from sklearn.preprocessing import StandardScaler
```

```
fromsklearn.linear_modelimportLogisticRegression
fromsklearn.metricsimportaccuracy_score,confusion_matrix,classification_report
np.random.seed(42)# For reproducibility
num_samples= 1000
age=np.random.randint(30,80,num_samples)
sex = np.random.randint(0, 2, num_samples)cp
= np.random.randint(0, 4, num_samples)
trestbps=np.random.randint(90,200,num_samples)
chol = np.random.randint(150, 300, num_samples)
fbs = np.random.randint(0, 2, num_samples)
restecg = np.random.randint(0, 2, num_samples)
thalach=np.random.randint(60,200,num_samples)
exang = np.random.randint(0, 2, num_samples)
oldpeak = np.random.uniform(0, 6, num_samples)
slope = np.random.randint(0, 3, num_samples)
ca = np.random.randint(0, 4, num_samples)
thal = np.random.randint(1, 4, num_samples)
target=np.random.randint(0,2,num_samples)
data = pd.DataFrame({
'age': age, 'sex': sex, 'cp': cp,
'trestbps':trestbps,'chol':chol,
'fbs':fbs,'restecg':restecg,'thalach':thalach, 'exang':exang,
'oldpeak': oldpeak, 'slope': slope, 'ca': ca,
'thal':thal,'target': target})
X=data.drop('target',axis=1) y
= data['target']
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42)
scaler = StandardScaler()
X_train=scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
model = LogisticRegression()
model.fit(X_train, y_train)
y_pred=model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
conf_matrix=confusion_matrix(y_test,y_pred)
```

```
class_report=classification_report(y_test,y_pred)
print(f'Accuracy: {accuracy:.2f}')
print('Confusion Matrix:')
print(conf_matrix)
print('ClassificationReport:')
print(class_report)
plt.figure(figsize=(8, 6))
sns.heatmap(conf_matrix,annot=True,fmt='d',cmap='Blues',xticklabels=['NoDisease',
'Disease'], yticklabels=['No Disease', 'Disease'])
plt.title('ConfusionMatrix')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.show()
importance=model.coef_[0]
features = X.columns
importance_df=pd.DataFrame({'Feature':features,'Importance':importance})
importance_df=importance_df.sort_values(by='Importance',ascending=False)
plt.figure(figsize=(10, 6))
sns.barplot(data=importance_df,x='Importance',y='Feature',palette='viridis')
plt.title('Feature Importance')
plt.xlabel('CoefficientValue')
plt.ylabel('Features')
plt.axvline(0,color='red',linestyle='--')#Addingaverticallineat0 plt.show()
```

OUTPUT:

```
Accuracy: 0.52
Confusion Matrix:
[[58 40]
 [57 45]]
Classification Report:
              precision    recall  f1-score   support

           0       0.50      0.59      0.54        98
           1       0.53      0.44      0.48       102

    accuracy                           0.52       200
   macro avg       0.52      0.52      0.51       200
weighted avg       0.52      0.52      0.51       200
```



RESULT:

Thus,theprogramforheartdiseasepredictionisexecutedsuccessfully.

10. BREASTCANCER DIAGNOSIS

EX.N0:10	**BreastCancerDiagnosis**
DATE:09/10/2024	

PROBLEMSTATEMENT: Classifytumorsasbenignormalignantbasedonfeatures.

PYTHON CONCEPTS: Classes, sequences.

VISUALIZATION: Confusion matrix, bar plots.

MULTIVARIATEANALYSIS:LDA,logisticregression.

DATASET: Breast Cancer Wisconsin Dataset

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

6:Print equal metric & test the cell.

PROGRAM:

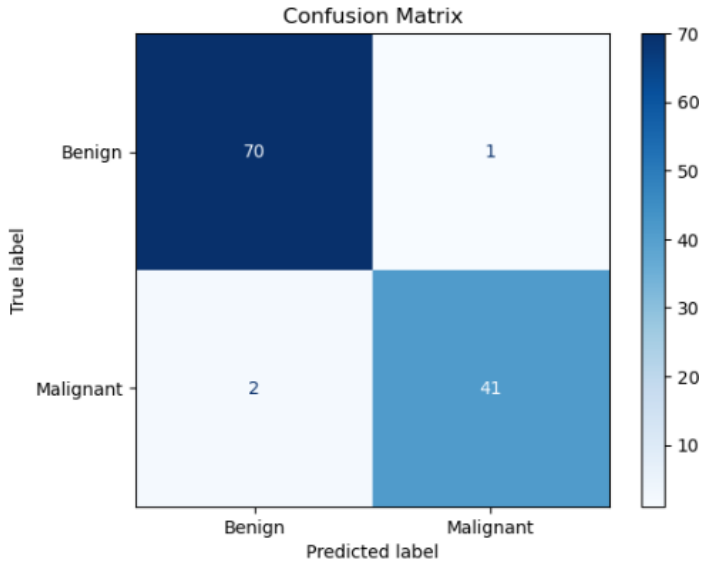
```
importnumpyasnp
importpandasaspd
importmatplotlib.pyplotasplt
import seaborn as sns
fromsklearn.model_selectionimporttrain_test_split
from sklearn.preprocessing import StandardScaler
```

```
fromsklearn.linear_modelimportLogisticRegression
fromsklearn.metricsimportaccuracy_score,confusion_matrix,classification_report
np.random.seed(42)# For reproducibility
num_samples= 1000
age=np.random.randint(30,80,num_samples)
sex = np.random.randint(0, 2, num_samples)cp
= np.random.randint(0, 4, num_samples)
trestbps=np.random.randint(90,200,num_samples)
chol = np.random.randint(150, 300, num_samples)
fbs = np.random.randint(0, 2, num_samples)
restecg = np.random.randint(0, 2, num_samples)
thalach=np.random.randint(60,200,num_samples)
exang = np.random.randint(0, 2, num_samples)
oldpeak = np.random.uniform(0, 6, num_samples)
slope = np.random.randint(0, 3, num_samples)
ca = np.random.randint(0, 4, num_samples)
thal = np.random.randint(1, 4, num_samples)
target=np.random.randint(0,2,num_samples)
data = pd.DataFrame({
'age': age, 'sex': sex, 'cp': cp,
'trestbps':trestbps,'chol':chol,
'fbs':fbs,'restecg':restecg,'thalach':thalach, 'exang':exang,
'oldpeak': oldpeak, 'slope': slope, 'ca': ca,
'thal':thal,'target': target})
X=data.drop('target',axis=1) y
= data['target']
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42)
scaler = StandardScaler()
X_train=scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
model = LogisticRegression()
model.fit(X_train, y_train)
y_pred=model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
conf_matrix=confusion_matrix(y_test,y_pred)
```

```
class_report=classification_report(y_test,y_pred)
print(f'Accuracy: {accuracy:.2f}')
print('Confusion Matrix:')
print(conf_matrix)
print('ClassificationReport:')
print(class_report)
plt.figure(figsize=(8, 6))
sns.heatmap(conf_matrix,annot=True,fmt='d',cmap='Blues',xticklabels=['NoDisease',
'Disease'], yticklabels=['No Disease', 'Disease'])
plt.title('ConfusionMatrix')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.show()
importance=model.coef_[0]
features = X.columns
importance_df=pd.DataFrame({'Feature':features,'Importance':importance})
importance_df=importance_df.sort_values(by='Importance',ascending=False)
plt.figure(figsize=(10, 6))
sns.barplot(data=importance_df,x='Importance',y='Feature',palette='viridis')
plt.title('Feature Importance')
plt.xlabel('CoefficientValue')
plt.ylabel('Features')
plt.axvline(0,color='red',linestyle='--')#Addingaverticallineat0 plt.show()
```

OUTPUT:

	precision	recall	f1-score	support
0	0.97	0.99	0.98	71
1	0.98	0.95	0.96	43
accuracy			0.97	114
macro avg	0.97	0.97	0.97	114
weighted avg	0.97	0.97	0.97	114




```
Enter the following features for prediction:
radius_mean:  14.5
texture_mean:  20.0
perimeter_mean:  90.0
area_mean:  560.0
smoothness_mean:  0.1
compactness_mean:  0.15
concavity_mean:  0.2
concave points_mean:  0.1
symmetry_mean:  0.18
fractal_dimension_mean:  0.06
radius_se:  0.6
texture_se:  1.2
perimeter_se:  10.0
area_se:  40.0
smoothness_se:  0.007
compactness_se:  0.03
concavity_se:  0.03
concave points_se:  0.02
symmetry_se:  0.02
fractal_dimension_se:  0.003
radius_worst:  16.0
texture_worst:  25.0
perimeter_worst:  100.0
area_worst:  800.0
smoothness_worst:  0.14
compactness_worst:  0.25
concavity_worst:  0.3
concave points_worst:  0.15
symmetry_worst:  0.25
fractal_dimension_worst:  0.08
The tumor is predicted to be: Malignant
Based on the symptoms provided, the person may be at risk.
```

RESULT:

Thus,theprogramforbreastcancerdiagnosisisexecutedsuccessfully.

11. PREDICTINGFLIGHT DELAYS

EX.N0:11	**PREDICTING FLIGHTDELAYS**
DATE:16/10/2024	

PROBLEMSTATEMENT: Predictflightdelaysbasedonhistoricaldata.

PYTHONCONCEPTS: Filereading/writing,functions.

VISUALIZATION: Line plots, scatter plots.

MULTIVARIATEANALYSIS: Regression,clustering.

DATASET: Flight Delay Dataset

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

6:Print equal metric & test the cell.

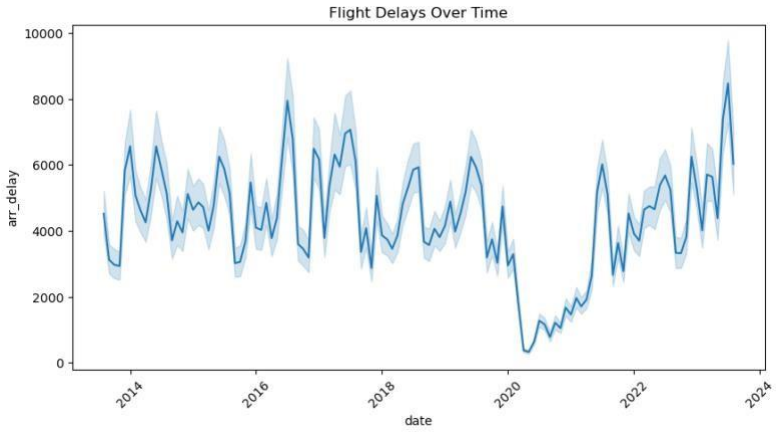
PROGRAM:

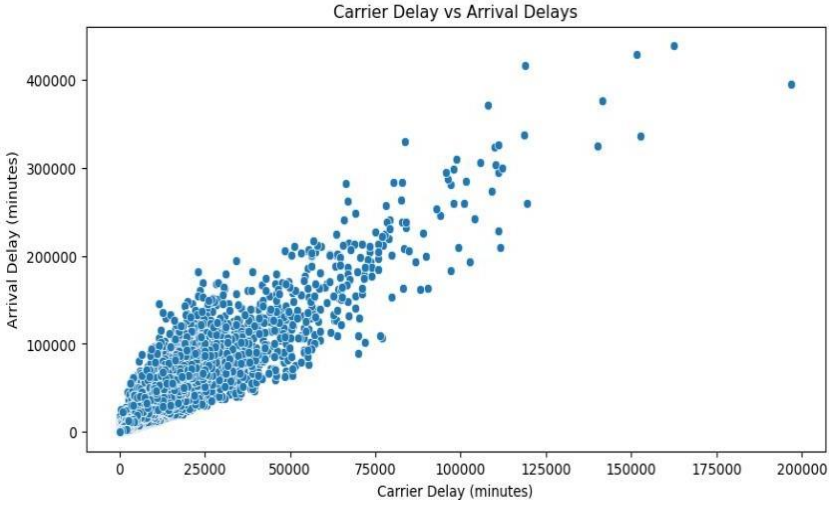
```
importpandasaspd
importnumpyasnp
importmatplotlib.pyplotasplt
import seaborn as sns
fromsklearn.model_selectionimporttrain_test_split
fromsklearn.linear_modelimportLinearRegression
```

```
fromsklearn.metricsimportmean_absolute_error,mean_squared_error,r2_score df
= pd.read_csv('C:/Users/APPU/Downloads/Airline_Delay_Cause.csv')
print(df.columns)
print(df.isnull().sum())
df.dropna(inplace=True)#ordf.fillna(method='ffill',inplace=True) if
'year' in df.columns and 'month' in df.columns:
df['date']=pd.to_datetime(df[['year','month']].assign(day=1))
plt.figure(figsize=(10, 5))
sns.lineplot(data=df,x='date',y='arr_delay')#Adjustifnecessary
plt.title('Flight Delays Over Time')
plt.xticks(rotation=45)
plt.show()
delay_column='arr_delay'#Using'arr_delay'fornow
if'carrier_delay'indf.columnsanddelay_columnin df.columns:
plt.figure(figsize=(10, 5))
sns.scatterplot(data=df,x='carrier_delay',y=delay_column)#Adjustasneeded
plt.title('Carrier Delay vs Arrival Delays') plt.xlabel('Carrier Delay (minutes)')
plt.ylabel('Arrival Delay (minutes)') plt.show()
else:print("Checkthedelaycolumns:'carrier_delay'or'arr_delay'donotexistinthe
DataFrame.")
df['day_of_week'] = df['date'].dt.dayofweek# Monday=0, Sunday=6
features=['day_of_week','arr_flights','carrier_ct']#Modifyasneeded X =
df[features] y = df[delay_column]
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42)
model = LinearRegression()
model.fit(X_train, y_train)
predictions=model.predict(X_test)
print('MeanAbsoluteError:',mean_absolute_error(y_test,predictions))
print('Mean Squared Error:', mean_squared_error(y_test, predictions))
print('R-squared:', r2_score(y_test, predictions))
plt.figure(figsize=(10,5))plt.scatter(y_test,predictions)
plt.plot([min(y_test),max(y_test)],[min(y_test),max(y_test)],color='red',linewidth=2)#Line of
equality
plt.title('PredictionsvsActualDelays')plt.xlabel('ActualDelays')
plt.ylabel('Predicted Delays') plt.show()
```

OUTPUT:

```
Index(['year', 'month', 'carrier', 'carrier_name', 'airport', 'airport_name',
       'arr_flights', 'arr_del15', 'carrier_ct', 'weather_ct', 'nas_ct',
       'security_ct', 'late_aircraft_ct', 'arr_cancelled', 'arr_diverted',
       'arr_delay', 'carrier_delay', 'weather_delay', 'nas_delay',
       'security_delay', 'late_aircraft_delay'],
      dtype='object')
year                    0
month                   0
carrier                 0
carrier_name            0
airport                 0
airport_name            0
arr_flights           240
arr_del15             443
carrier_ct            240
weather_ct            240
nas_ct                240
security_ct           240
late_aircraft_ct      240
arr_cancelled         240
arr_diverted          240
arr_delay             240
carrier_delay         240
weather_delay         240
nas_delay             240
security_delay        240
late_aircraft_delay   240
dtype: int64
```






```
Mean Absolute Error: 1592.2201262853362
Mean Squared Error: 25524907.35571326
R-squared: 0.8439698040165798
```

RESULT:

Thus,theprogramforpredictingflightdelaysisexecutedsuccessfully.

12. ENERGYCONSUMPTIONFORECASTING

EX.N0:12	**ENERGYCONSUMPTIONFORECASTING**
DATE:23/10/2024	

PROBLEMSTATEMENT: Forecastenergyconsumptionbasedonhistoricaldata.

PYTHONCONCEPTS: Functions,numeric types.

VISUALIZATION: Lineplots,heatmaps.

MULTIVARIATEANALYSIS: Timeseriesanalysis,regression.

DATASET: EnergyConsumptionDataset

ALGORITHM:

Step1:Starttheprogram.

Step2:Importnecessarylibraries.

Step 3: Load the dataset.

Step4:Encodecategoricalvariable,definefeature&testingset.

Step5:Splitthedatasetintotraining&testingset,createtrainedmodel. Step

6:Print equal metric & test the cell.

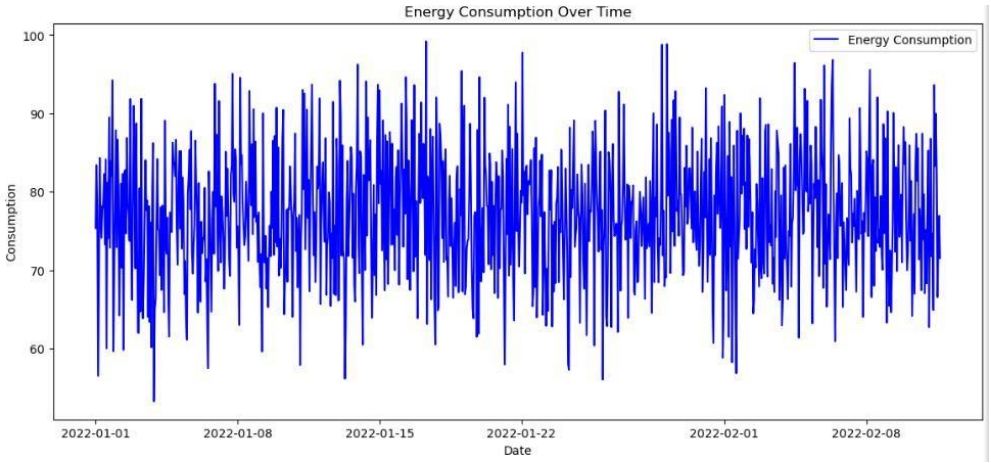
PROGRAM:

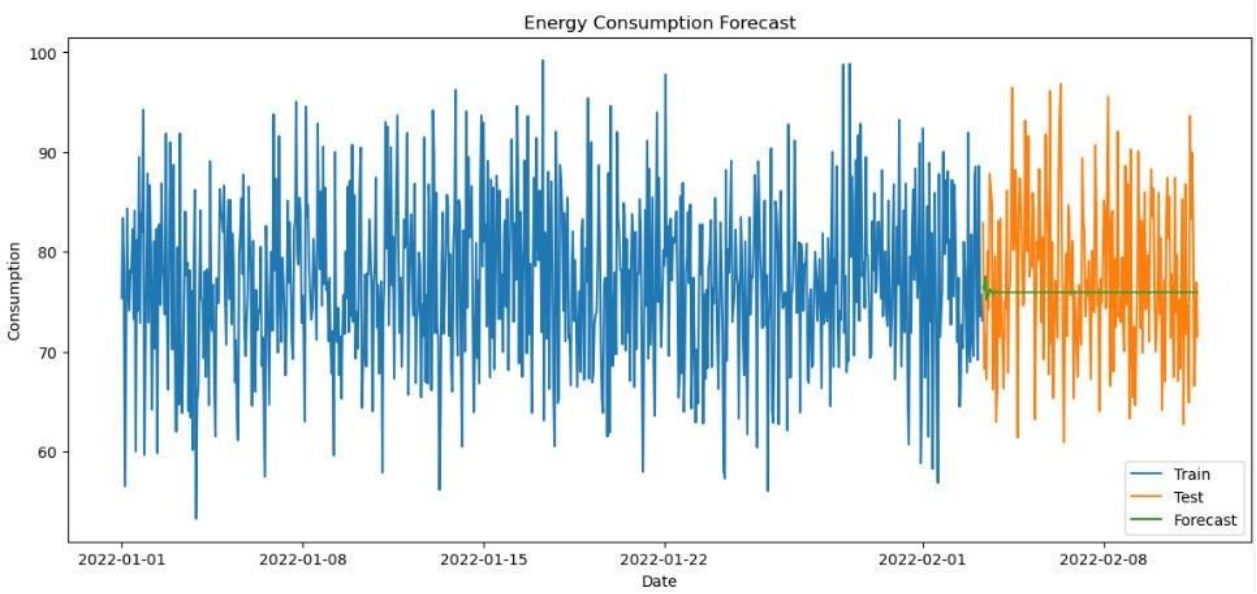
```
importpandasaspd
importnumpyasnp
importmatplotlib.pyplotasplt
import seaborn as sns
fromstatsmodels.tsa.arima.modelimportARIMA from
sklearn.metrics import mean_squared_error
data=pd.read_csv('C:/Users/APPU/Downloads/energy_consumption_dataset.csv',
parse_dates=['Timestamp'], index_col='Timestamp')
print(data.head())print(data.info())
```

```
data=data.fillna(method='ffill')
plt.figure(figsize=(14, 6))
plt.plot(data['EnergyConsumption'],color='blue',label='EnergyConsumption')
plt.title('Energy Consumption Over Time')
plt.xlabel('Date')plt.ylabel('Consumption')
plt.legend() plt.show()
numeric_data=data.select_dtypes(include=[np.number])
plt.figure(figsize=(10, 8))
sns.heatmap(numeric_data.corr(),annot=True,cmap='coolwarm')
plt.title('Correlation Matrix') plt.show()
fromstatsmodels.tsa.seasonalimportseasonal_decompose
result=seasonal_decompose(data['EnergyConsumption'],model='additive',period=24)#Adjust
period based on your data's frequency
result.plot() plt.show()
train_size=int(len(data)*0.8)
train,test=data['EnergyConsumption'][:train_size],data['EnergyConsumption'][train_size:]
model = ARIMA(train, order=(5, 1, 0))# Adjust (p,d,q) based on your data's behavior
fitted_model = model.fit()
forecast=fitted_model.forecast(steps=len(test))
forecast_index = test.index
mse=mean_squared_error(test,forecast)
rmse = np.sqrt(mse)
print(f'RMSE: {rmse}')
plt.figure(figsize=(14, 6))
plt.plot(train,label='Train')
plt.plot(test, label='Test')
plt.plot(forecast_index,forecast,label='Forecast')
plt.title('Energy Consumption Forecast')
plt.xlabel('Date')
plt.ylabel('Consumption')
plt.legend()
plt.show()
```

OUTPUT:

Timestamp	Temperature	Humidity	SquareFootage	Occupancy	HVACUsage	LightingUsage	RenewableEnergy	DayOfWeek
2022-01-01 00:00:00	25.139433	43.431581	1565.693999	5	On	Off	2.774699	Monday
2022-01-01 01:00:00	27.731651	54.225919	1411.064918	1	On	On	21.831384	Saturday
2022-01-01 02:00:00	28.704277	58.907658	1755.715009	2	Off	Off	6.764672	Sunday
2022-01-01 03:00:00	20.080469	50.371637	1452.316318	1	Off	On	8.623447	Wednesday
2022-01-01 04:00:00	23.097359	51.401421	1094.130359	9	On	Off	3.071969	Friday





RESULT:

Thus,theprogramforenergyconsumptionforecastingisexecutedsuccessfully.