Importing the Dependencies

```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
```

Data collection and Processing

```
 #loading the csv data to Pandas
 heart_data = pd.read_csv('heart_disease_dataset.csv')
```

```
#print first 5 rows
heart_data.head()
```

	Age	Gender	Cholesterol	Blood Pressure	Heart Rate	Smoking	Alcohol Intake	Exercise Hours	Family History	Dia
0	75	Female	228	119	66	Current	Heavy	1	No	
1	48	Male	204	165	62	Current	NaN	5	No	
2	53	Male	234	91	67	Never	Heavy	3	Yes	

```
#print last 5 rows
heart_data.tail()
```

	Age	Gender	Cholesterol	Blood Pressure	Heart Rate	Smoking	Alcohol Intake	Exercise Hours	Family History
995	56	Female	269	111	86	Never	Heavy	5	No
996	78	Female	334	145	76	Never	NaN	6	No
997	79	Male	151	179	81	Never	Moderate	4	Yes
998	60	Female	326	151	68	Former	NaN	8	Yes

```
# no of rows and columns in the dataset
heart_data.shape
```

```
(1000, 16)
```

```
# getting some info about the data
heart_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 16 columns):
 #   Column                   Non-Null Count  Dtype 
---  ------                   --------------  ----- 
 0   Age                      1000 non-null   int64 
 1   Gender                   1000 non-null   object
 2   Cholesterol              1000 non-null   int64 
 3   Blood Pressure           1000 non-null   int64 
 4   Heart Rate               1000 non-null   int64 
 5   Smoking                  1000 non-null   object
 6   Alcohol Intake           660 non-null    object
 7   Exercise Hours           1000 non-null   int64 
 8   Family History           1000 non-null   object
 9   Diabetes                 1000 non-null   object
 10  Obesity                  1000 non-null   object
 11  Stress Level             1000 non-null   int64 
 12  Blood Sugar              1000 non-null   int64 
 13  Exercise Induced Angina  1000 non-null   object
 14  Chest Pain Type          1000 non-null   object
 15  Heart Disease            1000 non-null   int64 
dtypes: int64(8), object(8)
memory usage: 125.1+ KB
```

```
# checking for missing values
heart_data.isnull().sum()
```

	0
Age	0
Gender	0
Cholesterol	0
Blood Pressure	0
Heart Rate	0
Smoking	0
Alcohol Intake	340
Exercise Hours	0
Family History	0
Diabetes	0
Obesity	0
Stress Level	0
Blood Sugar	0
Exercise Induced Angina	0
Chest Pain Type	0
Heart Disease	0

dtype: int64

```
# statistical measures about the data
heart_data.describe()
```

	Age	Cholesterol	Blood Pressure	Heart Rate	Exercise Hours	Stress Level	
count	1000.000000	1000.000000	1000.0000	1000.000000	1000.000000	1000.000000	1000
mean	52.293000	249.939000	135.2810	79.204000	4.529000	5.646000	134
std	15.727126	57.914673	26.3883	11.486092	2.934241	2.831024	36
min	25.000000	150.000000	90.0000	60.000000	0.000000	1.000000	70
25%	39.000000	200.000000	112.7500	70.000000	2.000000	3.000000	104
50%	52.000000	248.000000	136.0000	79.000000	4.500000	6.000000	135
75%	66.000000	299.000000	159.0000	89.000000	7.000000	8.000000	167

```
# checking the distribution of the target value
heart_data['Heart Disease'].value_counts()
```

Heart Disease	count
0	608
1	392

dtype: int64

Bar chart for visualizing the person does not have heart disease and person having heart disease

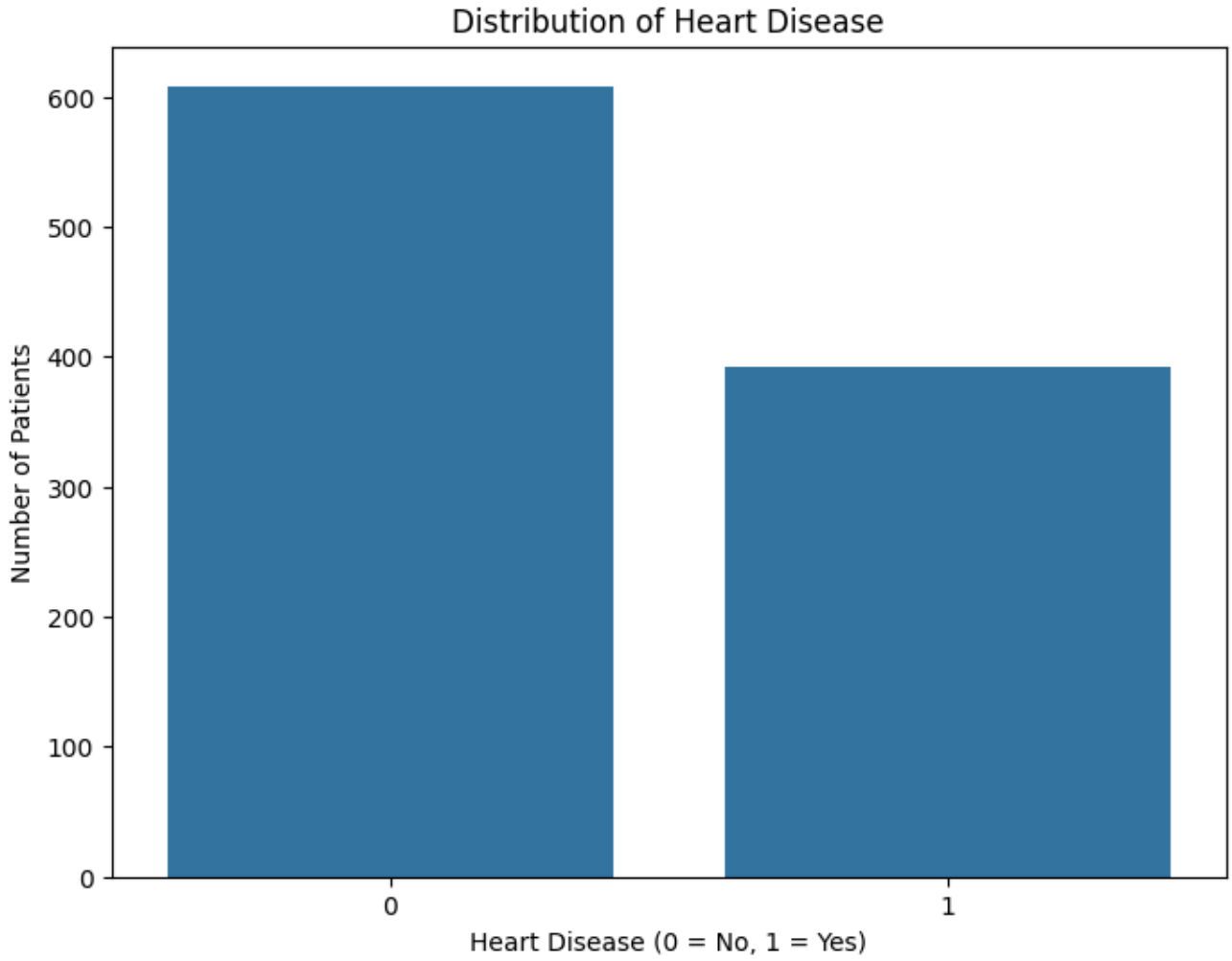
```
# prompt: create an bar chart for visualizing the person does not have heart disease and

import matplotlib.pyplot as plt
import seaborn as sns

# Assuming 'heart_data' DataFrame is already loaded as in your previous code

# Count the occurrences of each target value
heart_disease_counts = heart_data['Heart Disease'].value_counts()

# Create a bar chart
plt.figure(figsize=(8, 6))
sns.barplot(x=heart_disease_counts.index, y=heart_disease_counts.values)
plt.title('Distribution of Heart Disease')
plt.xlabel('Heart Disease (0 = No, 1 = Yes)')
plt.ylabel('Number of Patients')
plt.show()
```



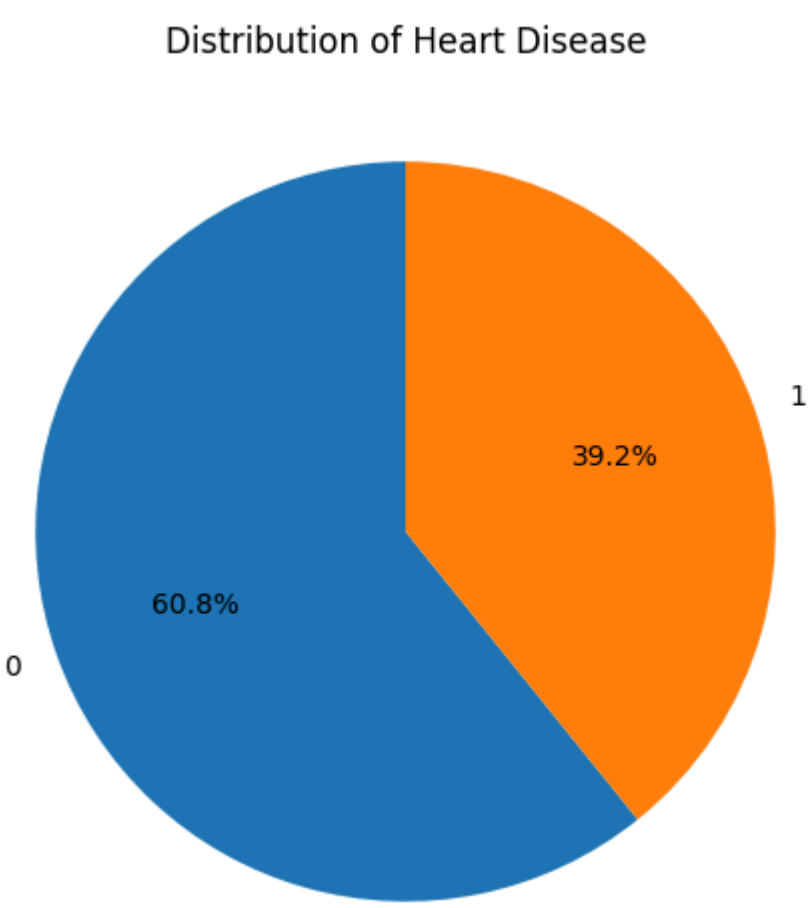
create an pie chart for visualizing the person does not have heart disease and person having heart disease

```
# prompt: create an pie chart for visualizing the person does not have heart disease and

# Assuming 'heart_data' DataFrame is already loaded as in your previous code

# Count the occurrences of each target value
heart_disease_counts = heart_data['Heart Disease'].value_counts()

# Create a pie chart
plt.figure(figsize=(8, 6))
plt.pie(heart_disease_counts, labels=heart_disease_counts.index, autopct='%1.1f%%', start
plt.title('Distribution of Heart Disease')
plt.show()
```



Start coding or generate with AI.

1--> Defective heart 0--> Healthy heart

Splitting the features and data

```
X = heart_data.drop(columns='Heart Disease', axis=1)
Y = heart_data['Heart Disease']
```

```
print(X)
```

```
      Age  Gender  Cholesterol  Blood Pressure  Heart Rate  Smoking  \
0      75  Female          228             119          66  Current
1      48    Male          204             165          62  Current
2      53    Male          234              91          67    Never
3      69  Female          192              90          72  Current
4      62  Female          172             163          93    Never
..    ...     ...          ...             ...         ...      ...
995    56  Female          269             111          86    Never
996    78  Female          334             145          76    Never
997    79    Male          151             179          81    Never
998    60  Female          326             151          68   Former
999    53    Male          226             116          82  Current
```

```
    Alcohol Intake  Exercise Hours Family History Diabetes Obesity  \
0            Heavy               1             No       No     Yes
1              NaN               5             No       No      No
2            Heavy               3            Yes       No     Yes
3              NaN               4             No      Yes      No
4              NaN               6             No      Yes      No
..             ...             ...            ...      ...     ...
995          Heavy               5             No      Yes     Yes
996            NaN               6             No       No      No
997       Moderate               4            Yes       No     Yes
998            NaN               8            Yes      Yes      No
999            NaN               6             No       No     Yes

     Stress Level  Blood Sugar Exercise Induced Angina   Chest Pain Type
0               8          119                      Yes   Atypical Angina
1               9           70                      Yes    Typical Angina
2               5          196                      Yes   Atypical Angina
3               7          107                      Yes  Non-anginal Pain
4               2          183                      Yes      Asymptomatic
..            ...          ...                      ...               ...
995            10          120                       No  Non-anginal Pain
996            10          196                      Yes    Typical Angina
997             8          189                      Yes      Asymptomatic
998             5          174                      Yes   Atypical Angina
999             5          161                      Yes      Asymptomatic

[1000 rows x 15 columns]
```

```
print(Y)
```

```
0      1
1      0
2      1
3      0
4      0
      ..
995    1
996    1
997    0
998    1
999    1
Name: Heart Disease, Length: 1000, dtype: int64
```

Splitting the data into Training data and Testing data

```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, stratify=Y, rand
```

```
print(X.shape, X_train.shape, X_test.shape)
```

```
(1000, 15) (800, 15) (200, 15)
```

Model Training

Logistic Regression

```
model = LogisticRegression()
```

```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
# Assuming 'heart_data' is your original DataFrame

# ... (Your previous code for loading and inspecting the data) ...

# Splitting the features and data
X = heart_data.drop(columns='Heart Disease', axis=1)
Y = heart_data['Heart Disease']

# Get the actual column names from the DataFrame
print(X.columns)

# Perform one-hot encoding on categorical features
# Update the column names to reflect the actual column names
categorical_features = X.select_dtypes(include=['object']).columns.tolist() #Selects only
# Alternatively, manually adjust the column names to match those printed above
# categorical_features = ['Sex', 'ChestPainType', 'FastingBS', 'RestingECG', 'ExerciseAng
print(categorical_features)
X = pd.get_dummies(X, columns=categorical_features, drop_first=True)  # drop_first to avo

# Splitting the data into Training data and Testing data
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, stratify=Y, rand

# Model Training
model = LogisticRegression()

# training the logistic regression model with training data
model.fit(X_train, Y_train)
```

```
Index(['Age', 'Gender', 'Cholesterol', 'Blood Pressure', 'Heart Rate',
       'Smoking', 'Alcohol Intake', 'Exercise Hours', 'Family History',
       'Diabetes', 'Obesity', 'Stress Level', 'Blood Sugar',
       'Exercise Induced Angina', 'Chest Pain Type'],
      dtype='object')
['Gender', 'Smoking', 'Alcohol Intake', 'Family History', 'Diabetes', 'Obesity', 'Exe
/usr/local/lib/python3.11/dist-packages/sklearn/linear_model/_logistic.py:465: Conver
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```

LogisticRegression

```
LogisticRegression()
```

Model Evalution

Accuracy Score

```
# accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
```

```
print('Accuracy on Training data : ', training_data_accuracy)
```

```
Accuracy on Training data :  0.8425
```

```
# accuracy on training data
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
```

```
print('Accuracy on Test data : ', test_data_accuracy)
```

```
Accuracy on Test data :  0.845
```

Building Predictive System

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score

# Assuming 'heart_data' is your original DataFrame and you've loaded it
```

```
# ... (Your previous code for loading and inspecting the data) ...

# Get the actual column names from the DataFrame
# ... (Your code for splitting and printing X.columns) ...

# Perform one-hot encoding on categorical features during training
# ... (Your code for one-hot encoding during training) ...


### Building Predictive System

input_data = (50,'Male',308,166,97,'Current','None',7,'No','No','No',2,116,'Yes','Typical

# Convert input_data to DataFrame for one-hot encoding
# creates a single row dataframe with the same columns as the ORIGINAL heart_data
input_data_df = pd.DataFrame([input_data], columns=heart_data.columns[:-1])
#print(input_data_df) # check what the columns are

# Perform one-hot encoding on the input data using the same columns as in training data
input_data_encoded = pd.get_dummies(input_data_df, columns=categorical_features, drop_fir

# Ensure that the input data has the same columns as the training data after encoding
missing_cols = set(X_train.columns) - set(input_data_encoded.columns) #checks if any colu
for c in missing_cols:
    input_data_encoded[c] = 0 #Add any missing column and set its value to 0 to ensure co
input_data_encoded = input_data_encoded[X_train.columns] # Reorder columns to match train

# Convert the encoded DataFrame back to a NumPy array for prediction
input_data_reshaped = input_data_encoded.to_numpy()


prediction = model.predict(input_data_reshaped)
print(prediction)


if (prediction[0]== 0):
  print('The Person does not have a Heart Disease')
else:
  print('The Person has Heart Disease')
```

```
[0]
The Person does not have a Heart Disease
/usr/local/lib/python3.11/dist-packages/sklearn/utils/validation.py:2739: UserWarning
  warnings.warn(
```

SVM METHOD

```
# prompt: produce prediction by using support vector machine

from sklearn.svm import SVC

# ... (Your existing code for data loading, preprocessing, and one-hot encoding) ...
```

```
# Model Training using Support Vector Machine
model = SVC(kernel='linear')  # You can experiment with different kernels (e.g., 'rbf', '
model.fit(X_train, Y_train)

# Model Evaluation
# ... (Your existing code for model evaluation using accuracy_score) ...

# Building Predictive System
# ... (Your existing code for creating input_data and encoding it) ...

prediction = model.predict(input_data_reshaped)
print(prediction)

if (prediction[0]== 0):
  print('The Person does not have a Heart Disease')
else:
  print('The Person has Heart Disease')
```

```
[0]
The Person does not have a Heart Disease
/usr/local/lib/python3.11/dist-packages/sklearn/utils/validation.py:2739: UserWarning
  warnings.warn(
```

Accuracy for this svm method

```
# prompt: accuracy for this svm method

# ... (Your existing code for data loading, preprocessing, and one-hot encoding) ...

# Model Training using Support Vector Machine
model = SVC(kernel='linear')  # You can experiment with different kernels (e.g., 'rbf', '
model.fit(X_train, Y_train)

# Model Evaluation
# Accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
print('Accuracy on Training data : ', training_data_accuracy)

# Accuracy on test data
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
print('Accuracy on Test data : ', test_data_accuracy)
# Building Predictive System
# ... (Your existing code for creating input_data and encoding it) ...

prediction = model.predict(input_data_reshaped)
print(prediction)

if (prediction[0]== 0):
```

```
  print('The Person does not have a Heart Disease')
else:
  print('The Person has Heart Disease')
```

```
Accuracy on Training data :  0.85875
Accuracy on Test data :  0.885
[0]
The Person does not have a Heart Disease
/usr/local/lib/python3.11/dist-packages/sklearn/utils/validation.py:2739: UserWarning
  warnings.warn(
```

create prediction in random forest method with prediction accuracy

```
# prompt: create prediction in random forest method with prediction accuracy

from sklearn.ensemble import RandomForestClassifier

# ... (Your existing code for data loading, preprocessing, and one-hot encoding) ...

# Model Training using Random Forest
model = RandomForestClassifier(random_state=42)  # You can adjust hyperparameters
model.fit(X_train, Y_train)

# Model Evaluation
# Accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
print('Accuracy on Training data : ', training_data_accuracy)

# Accuracy on test data
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
print('Accuracy on Test data : ', test_data_accuracy)

# Building Predictive System
# ... (Your existing code for creating input_data and encoding it) ...

prediction = model.predict(input_data_reshaped)
print(prediction)

if (prediction[0]== 0):
  print('The Person does not have a Heart Disease')
else:
  print('The Person has Heart Disease')
```

```
Accuracy on Training data :  1.0
Accuracy on Test data :  1.0
[0]
The Person does not have a Heart Disease
/usr/local/lib/python3.11/dist-packages/sklearn/utils/validation.py:2739: UserWarning
  warnings.warn(
```

create prediction in knn method with prediction accuracy

```
# prompt: create prediction in knn method with prediction accuracy

from sklearn.neighbors import KNeighborsClassifier

# ... (Your existing code for data loading, preprocessing, and one-hot encoding) ...

# Model Training using K-Nearest Neighbors
model = KNeighborsClassifier(n_neighbors=5)  # You can adjust the number of neighbors
model.fit(X_train, Y_train)

# Model Evaluation
# Accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
print('Accuracy on Training data : ', training_data_accuracy)

# Accuracy on test data
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
print('Accuracy on Test data : ', test_data_accuracy)

# Building Predictive System
# ... (Your existing code for creating input_data and encoding it) ...

prediction = model.predict(input_data_reshaped)
print(prediction)

if (prediction[0]== 0):
  print('The Person does not have a Heart Disease')
else:
  print('The Person has Heart Disease')
```

```
Accuracy on Training data :  0.95125
Accuracy on Test data :  0.92
[0]
The Person does not have a Heart Disease
/usr/local/lib/python3.11/dist-packages/sklearn/utils/validation.py:2739: UserWarning
  warnings.warn(
```

create prediction in gradient boosting method with prediction accuracy

```
# prompt: create prediction in gradient boosting method with prediction accuracy

from sklearn.ensemble import GradientBoostingClassifier
```

```
# ... (Your existing code for data loading, preprocessing, and one-hot encoding) ...

# Model Training using Gradient Boosting
model = GradientBoostingClassifier(random_state=42)  # You can adjust hyperparameters
model.fit(X_train, Y_train)

# Model Evaluation
# Accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
print('Accuracy on Training data : ', training_data_accuracy)

# Accuracy on test data
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
print('Accuracy on Test data : ', test_data_accuracy)

# Building Predictive System
# ... (Your existing code for creating input_data and encoding it) ...

prediction = model.predict(input_data_reshaped)
print(prediction)

if (prediction[0]== 0):
  print('The Person does not have a Heart Disease')
else:
  print('The Person has Heart Disease')
```

```
Accuracy on Training data :  1.0
Accuracy on Test data :  1.0
[0]
The Person does not have a Heart Disease
/usr/local/lib/python3.11/dist-packages/sklearn/utils/validation.py:2739: UserWarning
  warnings.warn(
```

create prediction in naive bayes method with prediction accuracy

```
# prompt: create prediction in naive bayes method with prediction accuracy

from sklearn.naive_bayes import GaussianNB

# ... (Your existing code for data loading, preprocessing, and one-hot encoding) ...

# Model Training using Naive Bayes
model = GaussianNB()
model.fit(X_train, Y_train)

# Model Evaluation
# Accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
```

```
print('Accuracy on Training data : ', training_data_accuracy)

# Accuracy on test data
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
print('Accuracy on Test data : ', test_data_accuracy)

# Building Predictive System
# ... (Your existing code for creating input_data and encoding it) ...

prediction = model.predict(input_data_reshaped)
print(prediction)

if (prediction[0]== 0):
  print('The Person does not have a Heart Disease')
else:
  print('The Person has Heart Disease')
```

```
Accuracy on Training data :  0.90875
Accuracy on Test data :  0.91
[0]
The Person does not have a Heart Disease
/usr/local/lib/python3.11/dist-packages/sklearn/utils/validation.py:2739: UserWarning
  warnings.warn(
```

create prediction in clustering method with prediction accuracy

```
# prompt: create prediction in clustering method with prediction accuracy

from sklearn.cluster import KMeans
from sklearn.metrics import accuracy_score

# Assuming X_train, X_test, Y_train, Y_test are already defined from your previous code

# Model Training using KMeans (Clustering)
kmeans = KMeans(n_clusters=2, random_state=42)  # Assuming 2 clusters for binary classific
```