

# HEART DISEASE PREDICTION PROJECT:

In [ ]:

In [181]:

```
from IPython.display import Image, display  
display(Image(filename='headerImage.png'))
```

□

**Import the dependencies:**

In [182]:

```
import numpy as np  
import pandas as pd  
  
#for ignoring all warnings (if any) use the below dependency:  
import warnings  
warnings.filterwarnings("ignore")
```

In [ ]:

**Data Collection and Preprocessing:**

In [183]:

```
heart_data = pd.read_csv("heart_disease_data.csv")
```

In [184]:

```
#Print first 5 rows of the dataset:  
heart_data.head()
```

Out[184]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	63	1	3	145	233	1	0	150	0	2.3	0	0	1	1
1	37	1	2	130	250	0	1	187	0	3.5	0	0	2	1
2	41	0	1	130	204	0	0	172	0	1.4	2	0	2	1
3	56	1	1	120	236	0	1	178	0	0.8	2	0	2	1
4	57	0	0	120	354	0	1	163	1	0.6	2	0	2	1

In [185]:

```
#Print last 5 rows of the dataset:  
heart_data.tail()
```

Out[185]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
298	57	0	0	140	241	0	1	123	1	0.2	1	0	3	0
299	45	1	3	110	264	0	1	132	0	1.2	1	0	3	0

300	age	sex	cp	trestbps	chol	fbst	restecg	thalach	exang	oldpeak	slope	ca	thal	target
301	57	1	0	130	131	0	1	115	1	1.2	1	1	3	0
302	57	0	1	130	236	0	0	174	0	0.0	1	1	2	0

In [186]:

```
#Check the dataset-size:  
heart_data.shape
```

Out[186]:

(303, 14)

In [187]:

```
#Getting some basic information about the dataset:  
print("Data's concise summary:")  
heart_data.info()  
  
print("\n\n\n Statistical summary : ")  
heart_data.describe()
```

Data's concise summary:  
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 303 entries, 0 to 302  
Data columns (total 14 columns):  

#	Column	Non-Null Count	Dtype
0	age	303	non-null
1	sex	303	non-null
2	cp	303	non-null
3	trestbps	303	non-null
4	chol	303	non-null
5	fbst	303	non-null
6	restecg	303	non-null
7	thalach	303	non-null
8	exang	303	non-null
9	oldpeak	303	non-null
10	slope	303	non-null
11	ca	303	non-null
12	thal	303	non-null
13	target	303	non-null

dtypes: float64(1), int64(13)  
memory usage: 33.3 KB

Statistical summary :

Out[187]:

	age	sex	cp	trestbps	chol	fbst	restecg	thalach	exang	oldpe
count	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000
mean	54.366337	0.683168	0.966997	131.623762	246.264026	0.148515	0.528053	149.646865	0.326733	1.0396
std	9.082101	0.466011	1.032052	17.538143	51.830751	0.356198	0.525860	22.905161	0.469794	1.1610
min	29.000000	0.000000	0.000000	94.000000	126.000000	0.000000	0.000000	71.000000	0.000000	0.0000
25%	47.500000	0.000000	0.000000	120.000000	211.000000	0.000000	0.000000	133.500000	0.000000	0.0000
50%	55.000000	1.000000	1.000000	130.000000	240.000000	0.000000	1.000000	153.000000	0.000000	0.8000
75%	61.000000	1.000000	2.000000	140.000000	274.500000	0.000000	1.000000	166.000000	1.000000	1.6000
max	77.000000	1.000000	3.000000	200.000000	564.000000	1.000000	2.000000	202.000000	1.000000	6.2000

In [188]:

```
#Check for any missing values in the data for each column:  
heart_data.isnull().sum().reset_index(name="No. of missing values")
```

Out [188] :

index	No. of missing values	
0	age	0
1	sex	0
2	cp	0
3	trestbps	0
4	chol	0
5	fbs	0
6	restecg	0
7	thalach	0
8	exang	0
9	oldpeak	0
10	slope	0
11	ca	0
12	thal	0
13	target	0

In [189] :

```
# Count duplicate values per column  
duplicate_counts = heart_data.apply(lambda x: x.duplicated().sum()).reset_index()  
duplicate_counts.columns = ["Column", "No. of duplicate values"]  
duplicate_counts
```

Out [189] :

Column	No. of duplicate values	
0	age	262
1	sex	301
2	cp	299
3	trestbps	254
4	chol	151
5	fbs	301
6	restecg	300
7	thalach	212
8	exang	301
9	oldpeak	263
10	slope	300
11	ca	298
12	thal	299
13	target	301

In [190] :

```
#No. of row-level duplicate-values:  
heart_data.duplicated().sum()
```

Out [190] :

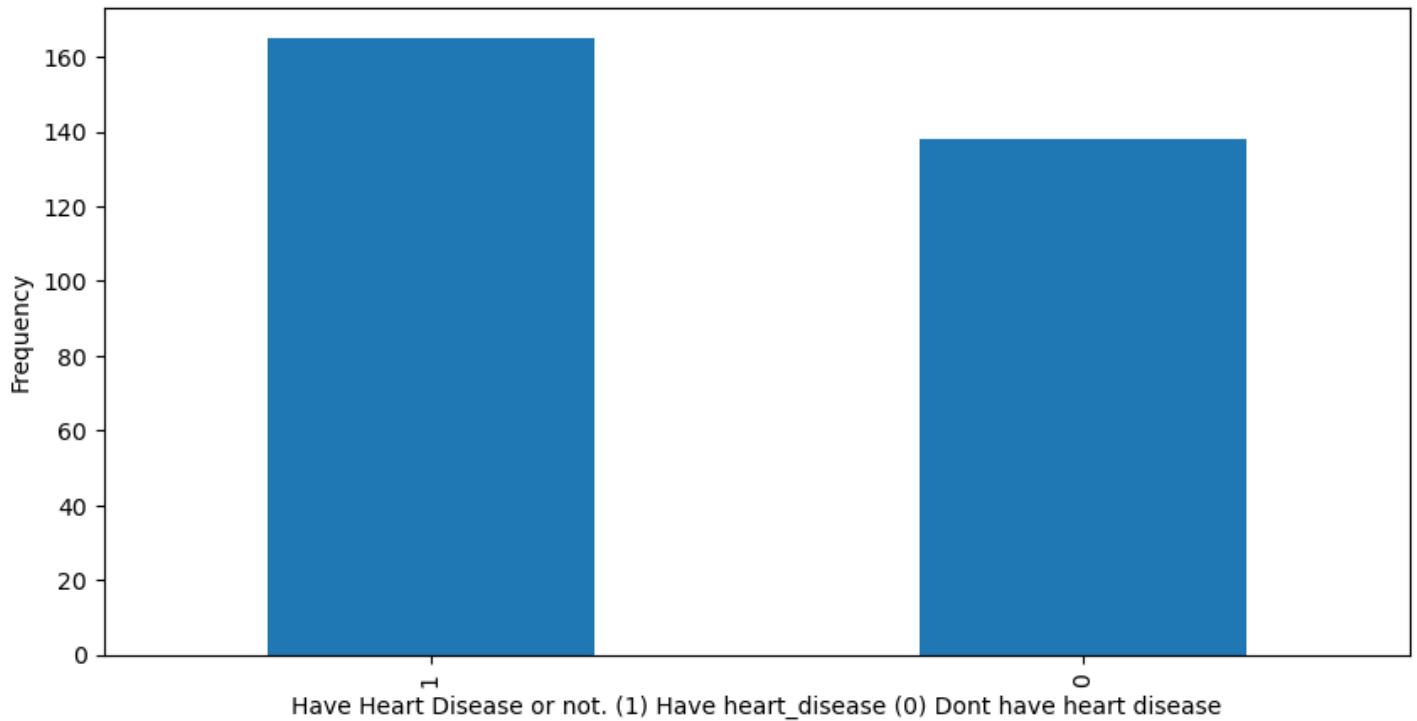
```
np.int64(1)
```

In [191]:

```
#Check how many people have heart-disease and how many don't:  
plt.figure(figsize=(10,5))  
heart_data[ "target" ].value_counts() .plot(kind="bar")  
plt.xlabel("Have Heart Disease or not. (1) Have heart_disease (0) Dont have heart disease")  
plt.ylabel("Frequency")  
  
heart_data[ "target" ].value_counts() .reset_index(name="(1) Have heart_disease (0) Dont have heart disease")
```

Out[191]:

target	(1) Have heart_disease (0) Dont have heart disease
0	165
1	138



In [ ]:

**Machine-learning part (whether a person will have a heart disease or not):**

In [192]:

```
#Import required ML dependencies:  
from sklearn.model_selection import train_test_split  
from sklearn.linear_model import LogisticRegression  
from sklearn.metrics import accuracy_score
```

In [193]:

```
#Splitting the data into training and testing data (in the ratio of 80%-20% respectively)  
:  
X = heart_data.drop(columns="target",axis=1)  
Y = heart_data[ "target" ]  
  
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, stratify=Y, random_state=2)
```

To 10011.

```
#Creating a logistic-regression model and fitting the training data into it:
model = LogisticRegression()
model.fit(X_train,Y_train)
```

Out[194]:

▼  
 LogisticRegression  
 i ?  
 ► Parameters

In [195]:

#Perform 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*100,"%")
```

#Accuracy on testing-data:

```
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
print("Accuracy on testing-data : ",test_data_accuracy*100,"%")
```

Accuracy on training-data : 85.12396694214877 %

Accuracy on testing-data : 81.9672131147541 %

In [196]:

#CONCLUSION AT THIS PART: Our model is not overfitted because there is very less gap between the accuracy scores of both training and testing data

In [197]:

#Building a predictive system for one person:

input\_data = (41, 0, 1, 130, 204, 0, 0, 172, 0, 1.4, 2, 0, 2)

#change the input-data to a numpy array and reshape the resultant array since we are predicting for only one instance:

```
input_data_as_numpy_array = np.asarray(input_data)
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)
```

prediction = model.predict(input\_data\_reshaped)

print(prediction) #If prediction is 1 then that means that the person will have heart-disease. If 0 then he/she will not have heart disease

if prediction[0] == 0:

print("The Person does not have / will not have Heart Disease")

else:

print("The Person has or will have Heart Disease")

[1]

The Person has or will have Heart Disease

In [198]:

#Building a predictive system for second person:

input\_data = (62, 0, 0, 140, 268, 0, 0, 160, 0, 3.6, 0, 2, 2)

#change the input-data to a numpy array and reshape the resultant array since we are predicting for only one instance:

```
input_data_as_numpy_array = np.asarray(input_data)
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)
```

prediction = model.predict(input\_data\_reshaped)

print(prediction) #If prediction is 1 then that means that the person will have heart-disease. If 0 then he/she will not have heart disease

```
if prediction[0] == 0:  
    print("The Person does not have / will not have Heart Disease")  
else:  
    print("The Person has or will have Heart Disease")
```

[0]

The Person does not have / will not have Heart Disease

In [ ]:

[ ]

In [ ]:

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In [ ]:

[ ]