Arab Academy for Science, Technology & Maritime TransportCollege of Computing & Information Technology

Department of Computer Science

HEART DISEASE

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Presented To

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List of Abbreviations

Abbreviation	Meaning
EKG	Electrocardiography
ECG	electrocardiogram
CT	Computed tomography
MRI	Magnetic resonance imaging
CVD	Cardiovascular disease
WEKA	Waikato Environment for Knowledge Analysis
SMO	Social Media Optimization
KNN	k-nearest neighbors' algorithm
ANN	Artificial neural network
LMT	licensed massage therapist
DNFS	Data based Neural Fuzzy System

Chapter1. Introduction

Heart disease is broad term used for diseases and conditions affecting the heart and circulatory system. They are also referred as cardiovascular diseases. It is a major cause of disability all around the world. Since heart is amongst the most vital organs of the body, its diseases affect other organs and part of the body as well. There are several different types and forms of heart diseases. The most common one's cause narrowing or blockage of the coronary arteries, malfunctioning in the valves of the heart, enlargement in the size of heart and several others leading to heart failure and heart attack [1].

Studying this disease makes us advance in knowing this disease well and analyzing the disease so that we can deal with it and predict it and thus reduce it and gradually eliminate it to some extent[1].

Previous studies have stated that the doctor will examine you and ask you questions about your personal and family medical history. [1].

Several different tests are used to diagnose heart disease. In addition to blood tests and a chest X-ray, tests to diagnose heart disease may include:

Electrocardiography. An EKG is a quick, painless test that records the electrical signals in the heart. It can show whether the heart is beating too fast or too slowly.

Monitoring with a Holter monitor. A Holter monitor is a portable ECG device that can be worn for one or more days to record the heart's activity during daily activities. This test can detect heart arrhythmias that are not detected during a normal EKG.

Echocardiogram. This noninvasive test uses sound waves to take detailed pictures of the heart in motion. It explains how blood travels through the heart and its valves. An echocardiogram can help determine if the valve is narrowed or leaking[1].

stress tests. These tests often involve walking on a treadmill or riding a stationary bike while your heart is monitored. Stress tests help reveal the nature of the heart's response to physical activities and whether symptoms of heart disease appear during exercise or not. If you are unable to exercise, you may be given medications.

An electrocardiogram (ECG) is a test that records the electrical activity of the heart. The ECG reflects what's happening in different areas of the heart and helps identify any problems with the rhythm or rate of your heart. The ECG is painless and takes around 5-10 minutes to perform.

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Cardiac catheterization. This test can show blockages in the arteries of the heart. The doctor inserts a long, thin, flexible tube (catheter) into a blood vessel, usually in the groin or wrist, and guides it toward the heart. The dye flows through the catheter into the arteries inside the heart. The dye helps show the arteries more clearly on X-ray images taken during the test[1].

Computed tomography of the heart. During a cardiac CT scan, you lie on a table inside a doughnut-shaped machine. An X-ray tube inside the machine rotates around your body and takes pictures of your heart and chest.

Magnetic resonance imaging of the heart. A cardiac MRI uses a magnetic field and radio waves generated by a computer to take detailed pictures of your heart.

Heart disease is broad term used for diseases and conditions affecting the heart and circulatory system. They are also referred as cardiovascular diseases. It is a major cause of disability all around the world. Since heart is amongst the most vital organs of the body, its diseases affect other organs and part of the body as well. There are several different types and forms of heart diseases. The most common one’s cause narrowing or blockage of the coronary arteries, malfunctioning in the valves of the heart, enlargement in the size of heart and several others leading to heart failure and heart attack[1].

Problem statement:

-Cardiovascular diseases (CVDs) are the leading cause of death globally.

-An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke.

-Over three quarters of CVD deaths take place in low- and middle-income countries.

-Out of the 17 million premature deaths (under the age of 70) due to noncommunicable diseases in 2019, 38% were caused by CVDs.

-Most cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol.

-It is important to detect cardiovascular disease as early as possible so that management with counselling and medicines can begin.

Trying to help heart patients and trying to avoid this disease by healthy people, so it was necessary to work.

The organization we target are general hospitals and clinics, especially hospitals for heart disease[1].

Chapter2. Literature Review

There are numerous works has been done related to disease prediction systems using different data mining techniques and machine learning algorithms in medical centers.

proposed Prediction of Heart Disease using Multiple Regression Model and it proves that Multiple Linear Regression is appropriate for predicting heart disease chance. The work is performed using training data set consists of 600 instances with 13 different attributes which has mentioned earlier. The data set is divided into two parts that is 70% of the data are used for training and 30% used for testing. Based on the results, it is clear that the classification accuracy of Regression algorithm is better compared to other algorithms.

developed heart disease prediction using Bayes Net and Multilayer perception using WEKA software. Based on performance from different factor SMO and Bayes Net achieve optimum performance than K Star, Multilayer perception and techniques using k- fold cross validation. The accuracy performances achieved by those algorithms are still not satisfactory. Therefore, the accuracy's performance is improved more to give better decision to diagnosis disease.

focuses on techniques that can predict chronic disease by mining the data containing in historical health records using Naïve Bayes, Decision tree, Support Vector Machine (SVM) and Artificial Neural Network (ANN). A comparative study is performed on classifiers to measure the better performance on an accurate rate. From this experiment, SVM gives highest accuracy rate, whereas for diabetes Naïve Bayes gives the highest accuracy.

recommended different algorithms like Naive Bayes, Classification Tree, KNN, Logistic Regression, SVM and ANN. The Logistic Regression gives better accuracy compared to other algorithms. suggested Heart Disease Prediction System using Data Mining Techniques. WEKA software used for automatic diagnosis of disease and to give qualities of services in healthcare centers. The paper used various algorithms like SVM, Naïve Bayes, Association rule, KNN, ANN, and Decision Tree. The paper recommended SVM is effective and provides more accuracy as compared with other data mining algorithms.

recommended Prediction and Analysis the occurrence of Heart Disease Using Data Mining Techniques. The main objective is to predict the occurrence of heart disease for early automatic diagnosis of the disease within result in short time. The proposed methodology is also critical in healthcare organization with experts that have no more knowledge and skill. It uses different medical attributes such as blood sugar and heart rate, age, sex is some of the attributes are included to identify if the person has heart disease or not. Analyses of dataset are computed using WEKA software.

use non- linear classification algorithm for heart disease prediction. It is proposed to use bigdata tools such as Hadoop Distributed File System (HDFS), MapReduce along with SVM for prediction of heart disease with optimized attribute set. This work made an investigation on the use of different data mining techniques for predicting heart diseases. It suggests to use HDFS for storing large data in different nodes and executing the prediction algorithm using SVM in more than one node simultaneously using SVM. SVM is used in parallel fashion which yielded better computation time than sequential SVM.

suggested heart disease prediction using data mining and machine learning algorithm. The goal of this study is to extract hidden patterns by applying data mining techniques. The best algorithm J48 based on UCI data has the highest accuracy rate compared to LMT.

proposed an efficient heart disease prediction system using data mining. This system helps medical practitioner to make effective decision making based on the certain parameter. By testing and training phase a

certain parameter, it provides 86.3% accuracy in testing phase and 87.3% in training phase. suggested multi disease prediction using data mining techniques. Nowadays, data mining play's vital role in predicting multiple disease. By using data mining techniques, the number of tests can be reduced. This paper mainly concentrates on predicting the heart disease, diabetes and breast cancer etc., proposed heart disease prediction using ANN algorithm in data mining. Due to increasing expenses of heart disease diagnosis disease, there was a need to develop new system which can predict heart disease. Prediction model is used to predict the condition of the patient after evaluation on the basis of various parameters like heart beat rate, blood pressure, cholesterol etc. The accuracy of the system is proved in java.

recommended to develop the prediction system which will diagnosis the heart disease from patient's medical dataset. 13 risk factors of input attributes have taken into account to build the system. After analysis of the data from the dataset, data cleaning and data integration was performed.

suggested data mining techniques and machine learning to predict heart disease. There are two objectives to predict the heart system. 1. This system not assume any knowledge in prior about the patient's records. 2. The system which chosen must be scalar to run against the large number of records. This system can be implemented using WEKA software. For testing, the classification tools and explorer mode of WEKA are used.

developed different data mining techniques to evaluate the prediction and diagnosis of heart disease. The main objective is to evaluate the different classification techniques such as, Decision Tree, KNN, SMO and Naïve Bayes. After this, evaluating some performance in measures of accuracy, precision, sensitivity, specificity is evaluated and compared. decision tree gives the best technique for heart disease prediction.

recommended artificial neural network for heart disease diagnosis. Based on their ability, Feed forward Back propagation learning algorithms have used to test the model. By considering appropriate function, classification accuracy reached to 88% and 20 neurons in hidden layer. ANN shows result significantly for heart disease prediction. suggested big data for heart attack prediction. The objective of this paper is to provide prototype using big data and data modelling techniques. It can be also.

used to extract patterns and relationships from database which associated with heart disease. This system consists of two databases namely, original big dataset and another is updated one. A java-file system named HDFS used to provide a user with reliable. This system can assist the healthcare practitioners to make intelligent decisions. The automation in this system would be advantageous.

Decision tree based Neural Fuzzy System (DNFS) technique to analyses and predict of various heart disease. This paper reviews the research on heart disease diagnosis. DNFS stand for Decision tree based Neural Fuzzy System. This research is to create an intelligent and cost-effective system, and also to improve the performance of the existing system. Specifically in this paper, data mining techniques are used to enhance heart disease prediction. The result of this research shows that the SVM and neural networks results highly positive manner to predict heart disease. Still the data mining techniques are not encouraging for heart disease prediction.

k-means and naïve bayes to predict heart disease. This paper is to build the system using historical heart database that gives diagnosis. attributes have considered for building the system. To extract knowledge from database, data mining techniques such as clustering, classification methods can be used. 13 attributes with total of 300 records were used from the Cleveland Heart Database. This model is to predict whether the patient have heart disease or not based on the values of 13 attributes.

proposed an analysis of cardiovascular disease. This paper proposed data mining techniques to predict the disease. It is intended to provide the survey of current techniques to extract information from dataset and it will useful for healthcare practitioners. The performance can be obtained based on the time taken to build the decision tree for the system. The primary objective is to predict the disease with a smaller number of attributes.

rules and partial tree technique to predict heart disease. This paper can discover set of rules to predict the risk levels of patients based on given parameter about their health. The performance can be calculated in measures of accuracy classification, error classification, rules generated and the results. Then comparison has done using and partial tree. The result shows that there is potential prediction and more efficient. Table 2 describes the accuracy of the heart disease with different techniques are shown below.

Table 1 A comparative study of various algorithms in literature review.

YEAR	AUTHOR	PURPOSE	TECHNIQUES USED	ACCURACY
2015	Sharma Purushottam et al,[15]	Efficient Heart Disease Prediction System using Decision Tree.	Decision tree classifier	86.3% for testing phase. 87.3% for training phase.
2015	Bushra Brahmi et al, [20]	Prediction and Diagnosis of Heart Disease by Data Mining Techniques.	J48, Naïve Bayes, KNN, SMO	J48 gives better accuracy than other three techniques.
2015	Sarabi H. Munawar et al, [24]	Prediction of HeartDisease using Modified K-means and by using	Modified k-means algorithm, naive bayes algorithm.	Heart Disease detection=93%. Heart Disease

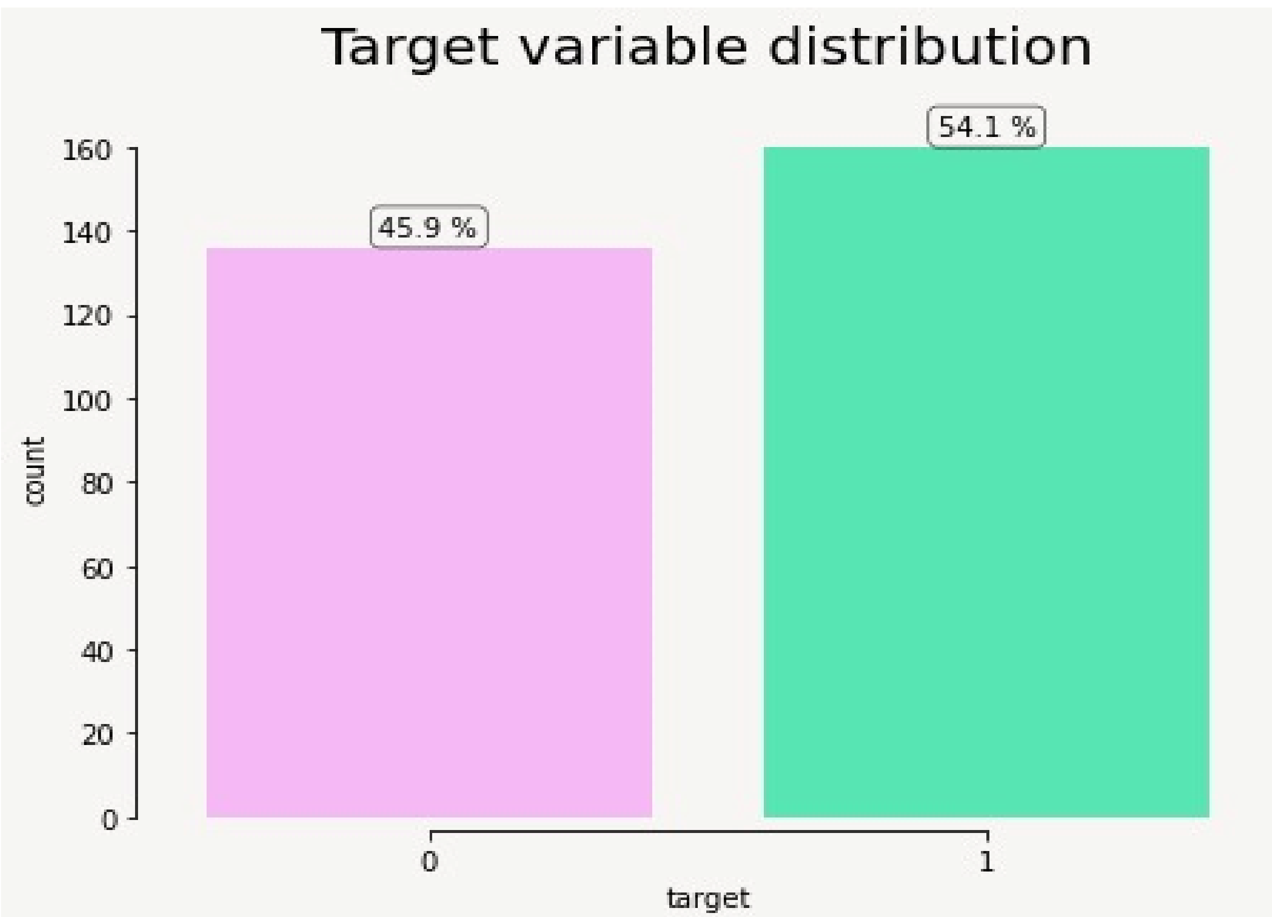


Figure 1target variable distribution.[1]

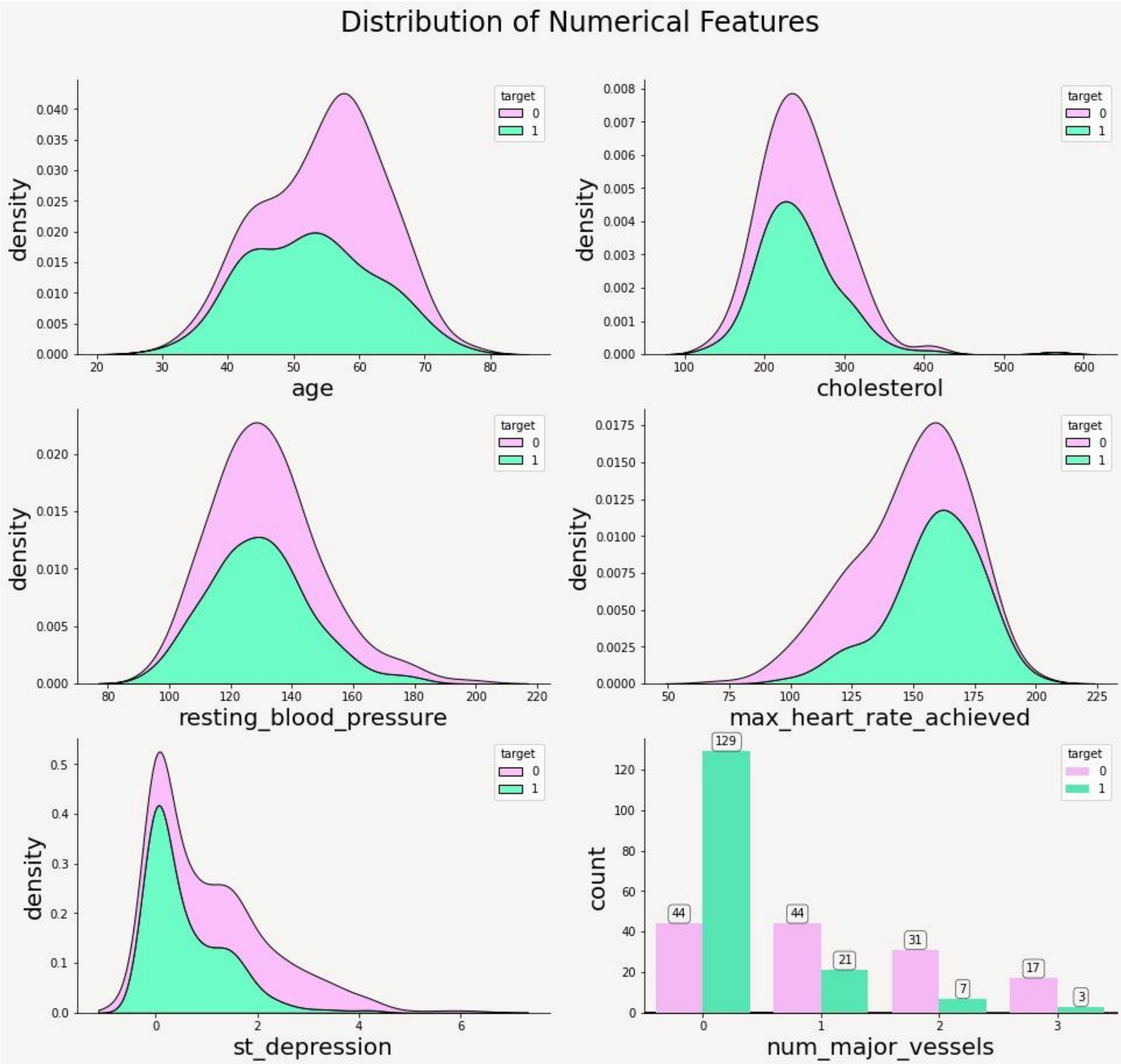


Figure 2 distribution of numerical features.[2]

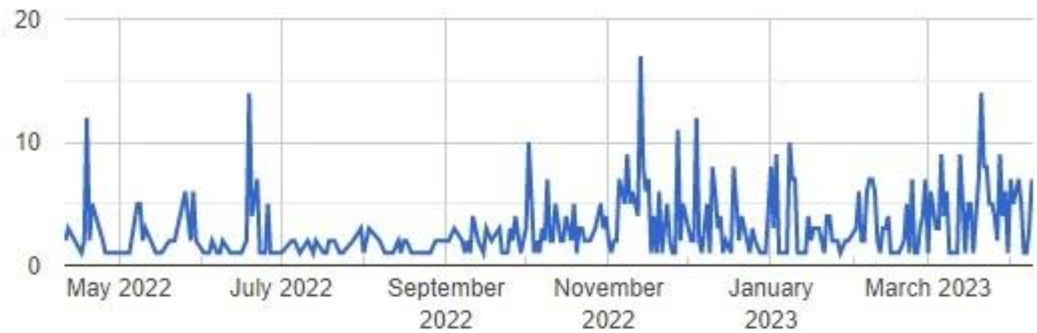


Figure 3 Diagram Dataset.[3]

O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	
	target	thal	ca	slope	oldpeak	exang	thalach	restecg	fbs	chol	trestbps	cp	sex	age	1
	1	1	0	0	2.3	0	150	0	1	233	145	3	1	63	2
	1	2	0	0	3.5	0	187	1	0	250	130	2	1	37	3
	1	2	0	2	1.4	0	172	0	0	204	130	1	0	41	4
	1	2	0	2	0.8	0	178	1	0	236	120	1	1	56	5
	1	2	0	2	0.6	1	163	1	0	354	120	0	0	57	6
	1	1	0	1	0.4	0	148	1	0	192	140	0	1	57	7
	1	2	0	1	1.3	0	153	0	0	294	140	1	0	56	8
	1	3	0	2	0	0	173	1	0	263	120	1	1	44	9
	1	3	0	2	0.5	0	162	1	1	199	172	2	1	52	10
	1	2	0	2	1.6	0	174	1	0	168	150	2	1	57	11
	1	2	0	2	1.2	0	160	1	0	239	140	0	1	54	12
	1	2	0	2	0.2	0	139	1	0	275	130	2	0	48	13
	1	2	0	2	0.6	0	171	1	0	266	130	1	1	49	14
	1	2	0	1	1.8	1	144	0	0	211	110	3	1	64	15
	1	2	0	2	1	0	162	0	1	283	150	3	0	58	16
	1	2	0	1	1.6	0	158	1	0	219	120	2	0	50	17
	1	2	0	2	0	0	172	1	0	340	120	2	0	58	18
	1	2	0	0	2.6	0	114	1	0	226	150	3	0	66	19
	1	2	0	2	1.5	0	171	1	0	247	150	0	1	43	20
	1	2	2	2	1.8	0	151	1	0	239	140	3	0	69	21
	1	3	0	1	0.5	0	161	1	0	234	135	0	1	59	22
	1	2	0	2	0.4	1	179	1	0	233	130	2	1	44	23
	1	2	0	2	0	0	178	1	0	226	140	0	1	42	24

Figure 4 dataset excel.[4]

OUR DATASET:

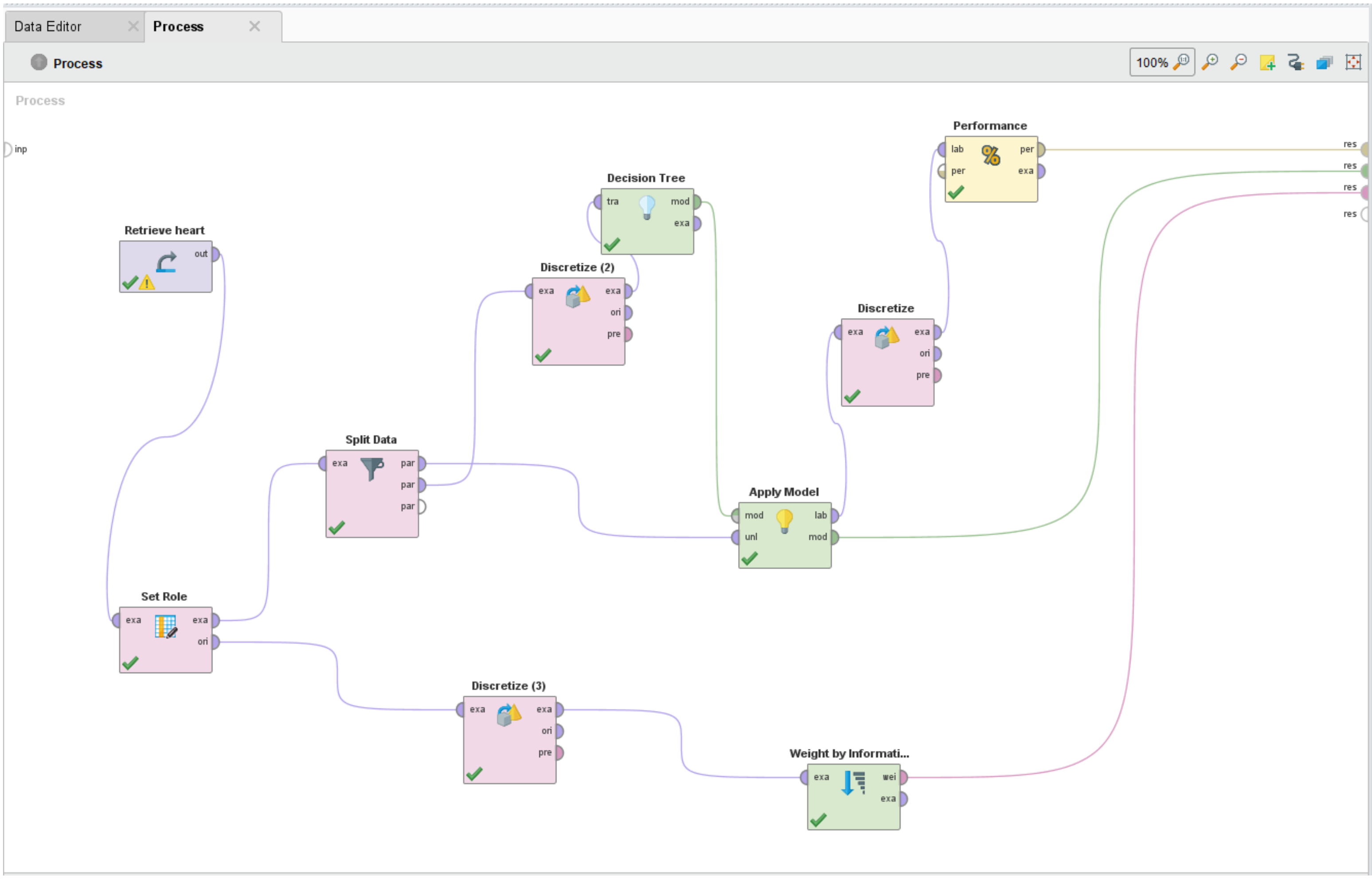
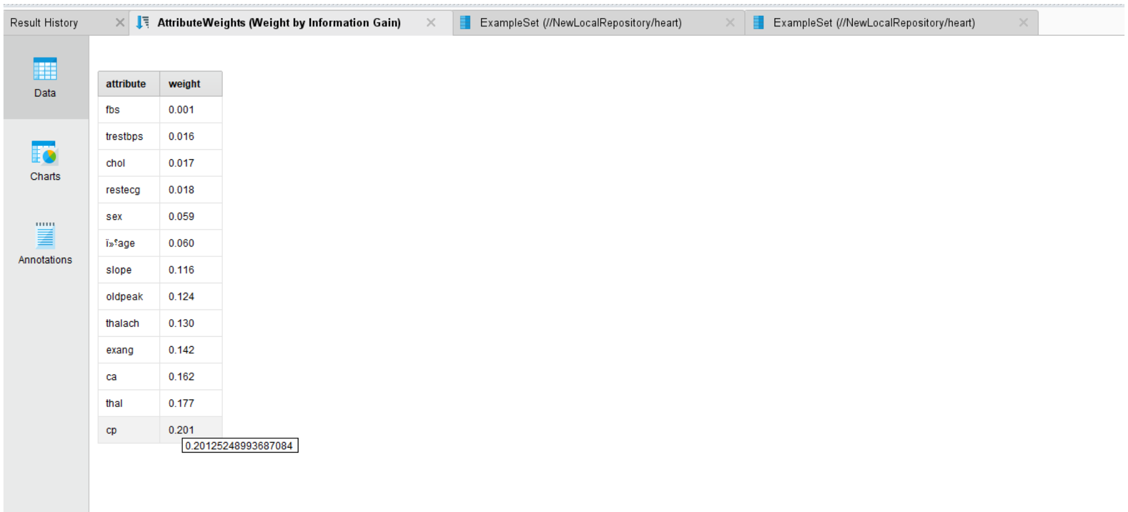


Figure 5 DESIGN INFOTMATION GAIN AND DECISION TREE[5]



attribute	weight
fbs	0.001
trestbps	0.016
chol	0.017
restecg	0.018
sex	0.059
ï»¿age	0.060
slope	0.116
oldpeak	0.124
thalach	0.130
exang	0.142
ca	0.162
thal	0.177
cp	0.201

Figure 6 VALUE (OUTPUT)INFORMATION GAIN[6]

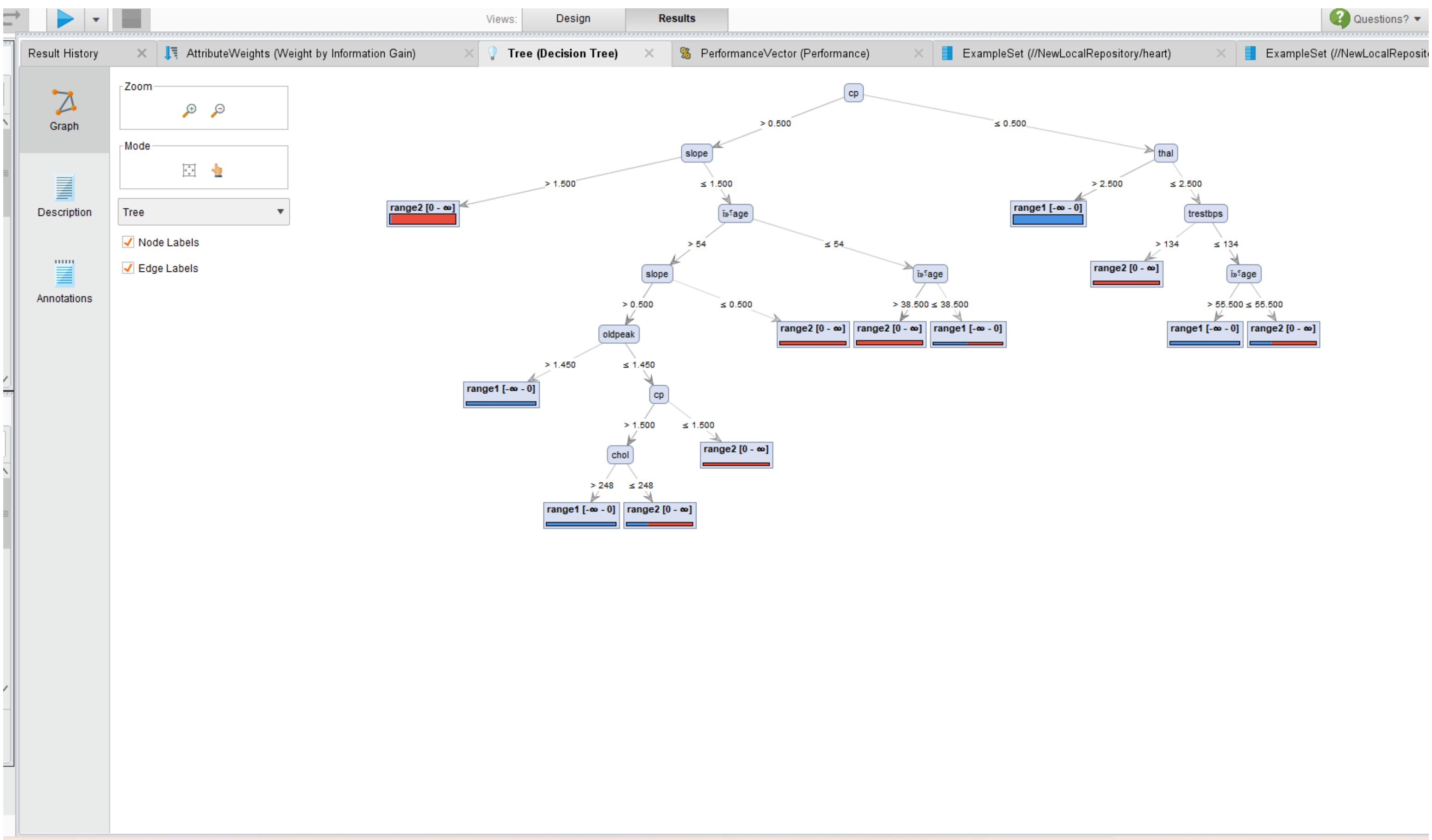


Figure 7 VALUE OF DECISION TREE :[7]

Tree

```
cp > 0.500
|   slope > 1.500: range2 [0 - ∞] {range1 [-∞ - 0]=1, range2 [0 - ∞]=28}
|   slope ≤ 1.500
|   |   ï»¿age > 54
|   |   |   slope > 0.500
|   |   |   |   oldpeak > 1.450: range1 [-∞ - 0] {range1 [-∞ - 0]=4, range2 [0 - ∞]=0}
|   |   |   |   oldpeak ≤ 1.450
|   |   |   |   |   cp > 1.500
|   |   |   |   |   |   chol > 248: range1 [-∞ - 0] {range1 [-∞ - 0]=3, range2 [0 - ∞]=0}
|   |   |   |   |   |   chol ≤ 248: range2 [0 - ∞] {range1 [-∞ - 0]=1, range2 [0 - ∞]=2}
|   |   |   |   |   cp ≤ 1.500: range2 [0 - ∞] {range1 [-∞ - 0]=0, range2 [0 - ∞]=2}
|   |   |   slope ≤ 0.500: range2 [0 - ∞] {range1 [-∞ - 0]=0, range2 [0 - ∞]=3}
|   |   ï»¿age ≤ 54
|   |   |   ï»¿age > 38.500: range2 [0 - ∞] {range1 [-∞ - 0]=0, range2 [0 - ∞]=8}
|   |   |   ï»¿age ≤ 38.500: range1 [-∞ - 0] {range1 [-∞ - 0]=1, range2 [0 - ∞]=1}
cp ≤ 0.500
|   thal > 2.500: range1 [-∞ - 0] {range1 [-∞ - 0]=26, range2 [0 - ∞]=0}
|   thal ≤ 2.500
|   |   trestbps > 134: range2 [0 - ∞] {range1 [-∞ - 0]=0, range2 [0 - ∞]=4}
|   |   trestbps ≤ 134
|   |   |   ï»¿age > 55.500: range1 [-∞ - 0] {range1 [-∞ - 0]=4, range2 [0 - ∞]=0}
|   |   |   ï»¿age ≤ 55.500: range2 [0 - ∞] {range1 [-∞ - 0]=1, range2 [0 - ∞]=2}
```

Figure 8 DESCRIPTION OF DECISION TREE :[8]

LINK OF ES BUILDER:
http://www.mcgoo.com.au/esbuilder/viewer/viewES.php?es=c783b37315fa378bc77d1cc637a88e39

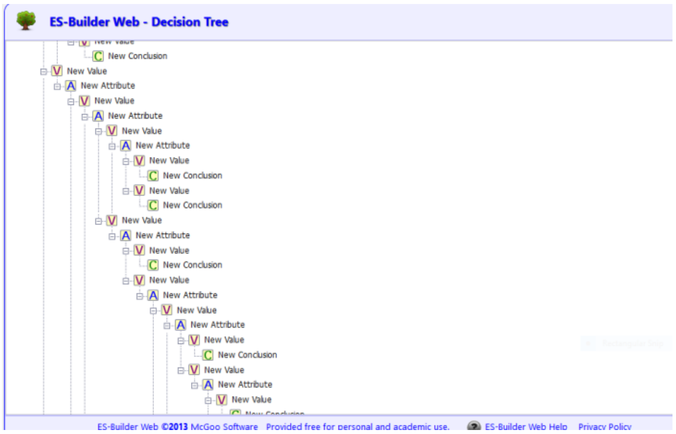


Figure 9 pic ES BUILDER[9]

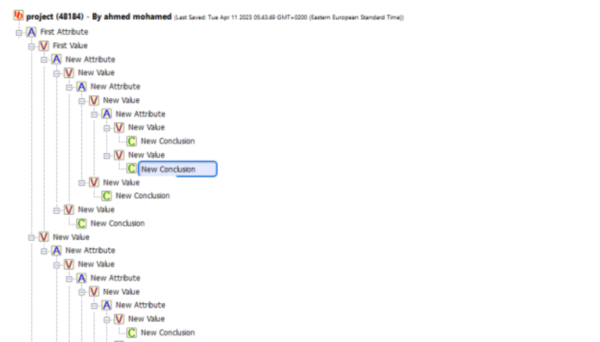


Figure 10 PIC 2[10]

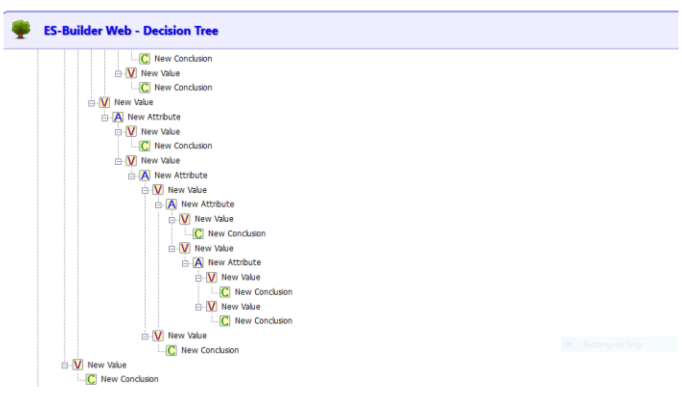


Figure 11 PIC3[11]

Power BI :

- **STEP 1 : TRANSFORM MODE.**

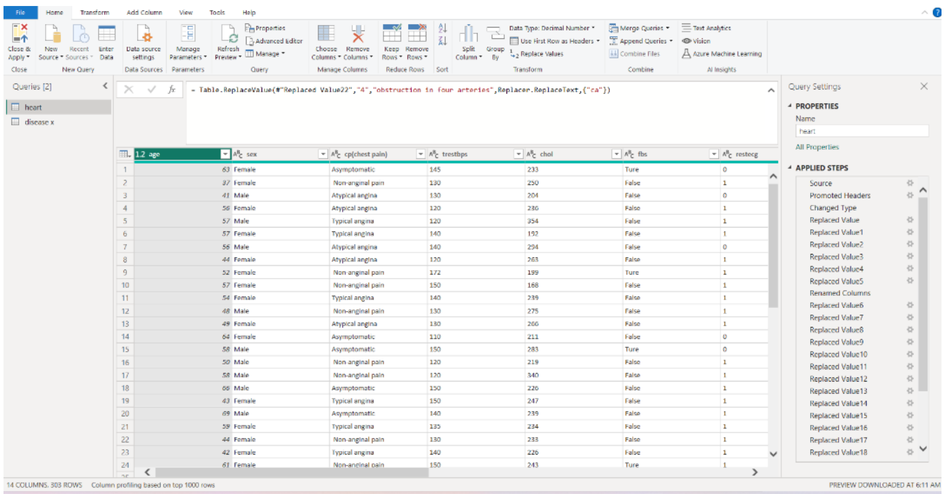


Figure 12 Transform mode heart dataset.[12]

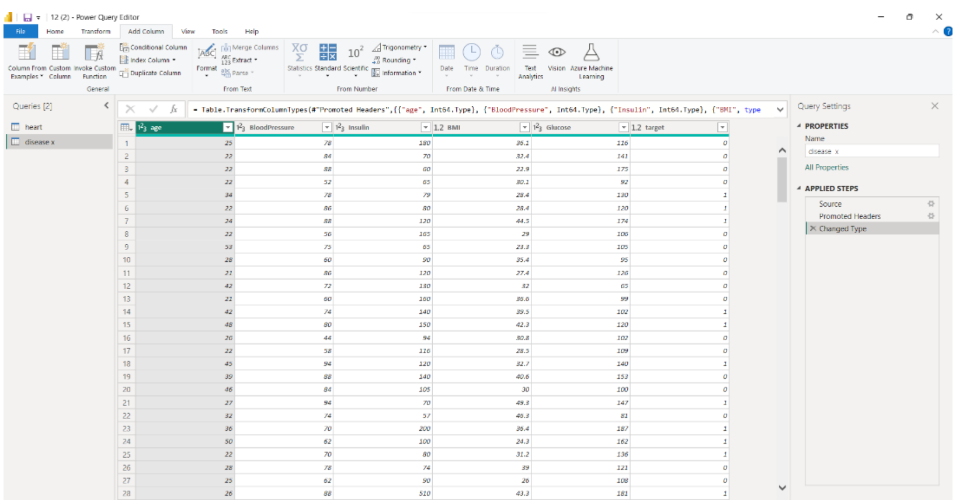


Figure 13 Transform mode disease dataset.[13]

- **STEP 2 : IMPORTE DATA**

Data View:

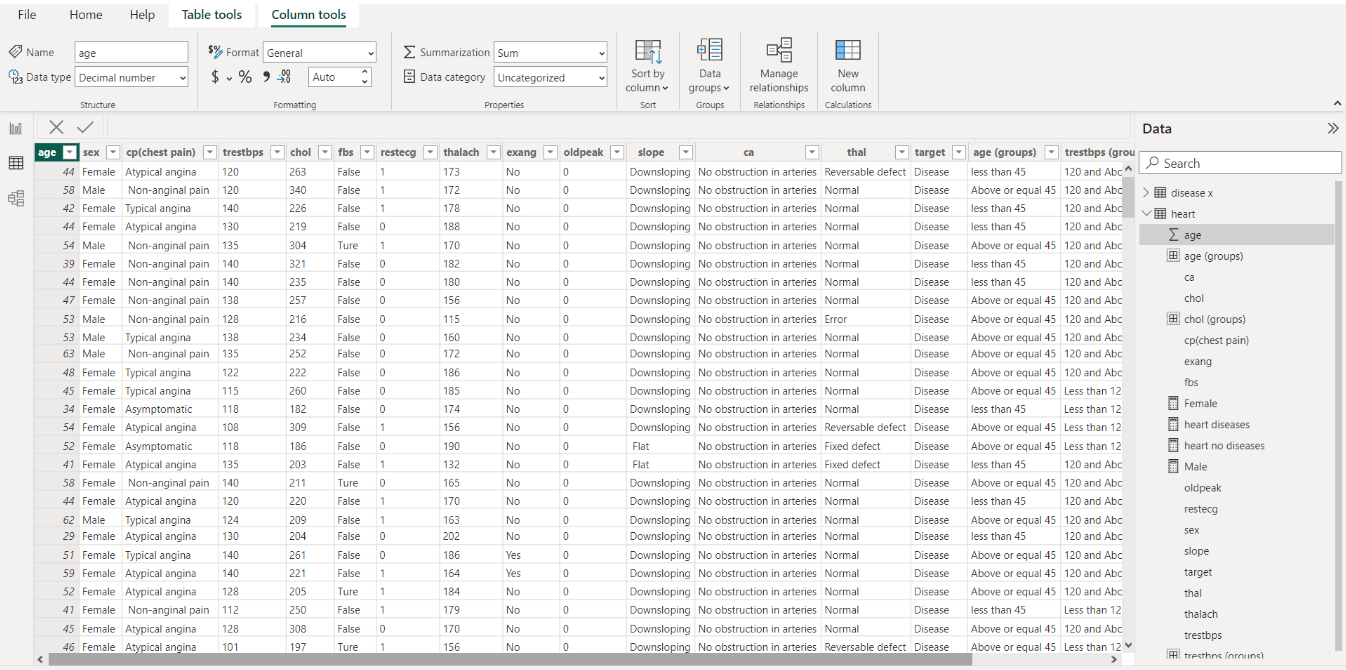


Figure 14 Transform mode heart data view. [14]

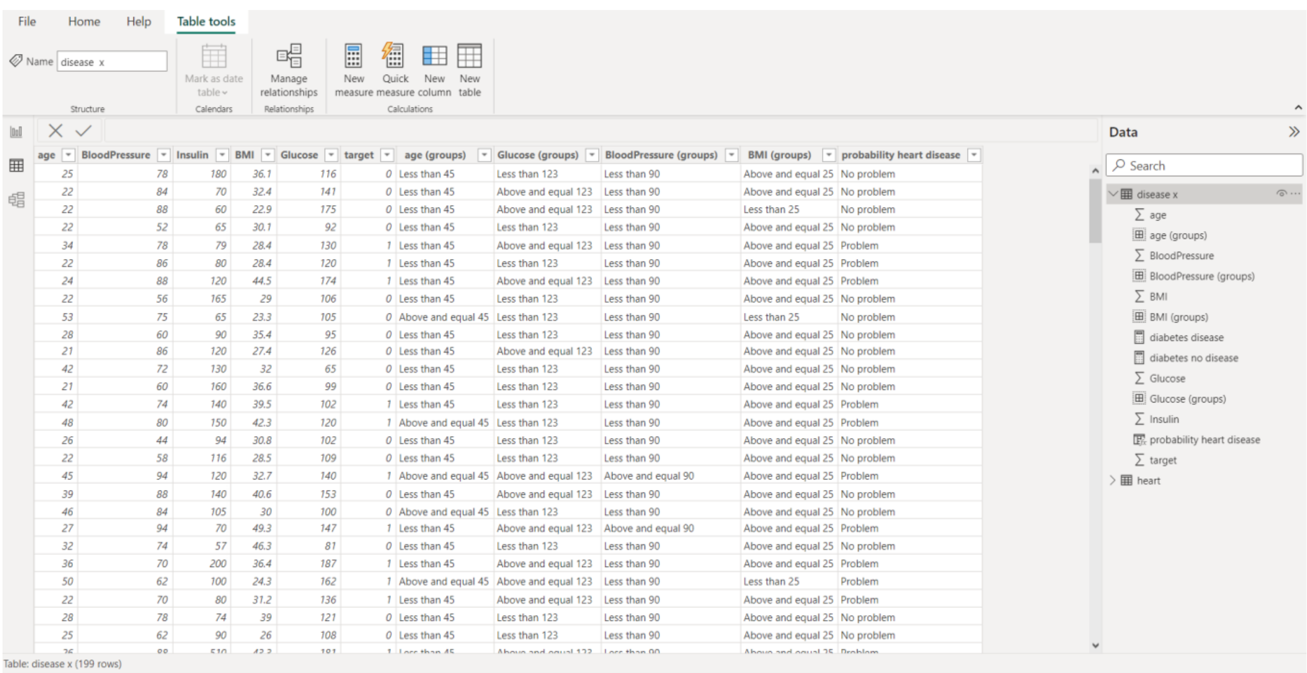


Figure 15 Transform mode disease data view.[15]

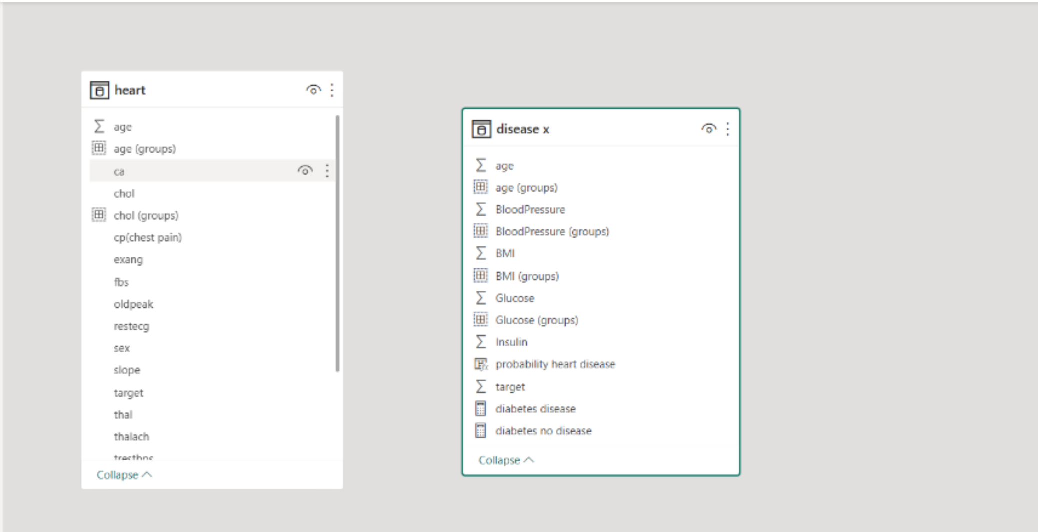


Figure 16 model view datasets[16]

- STEP 3 :MODEL VIEW

Relationship :

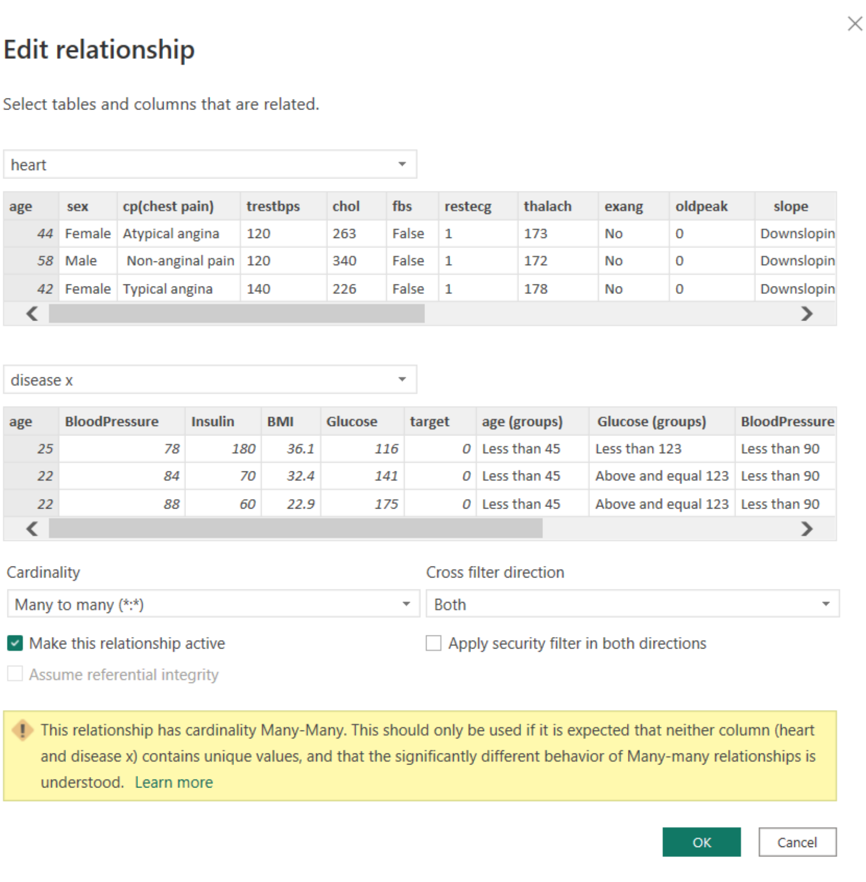


Figure 17 Edit relationship.[17]

Many to Many relationships:

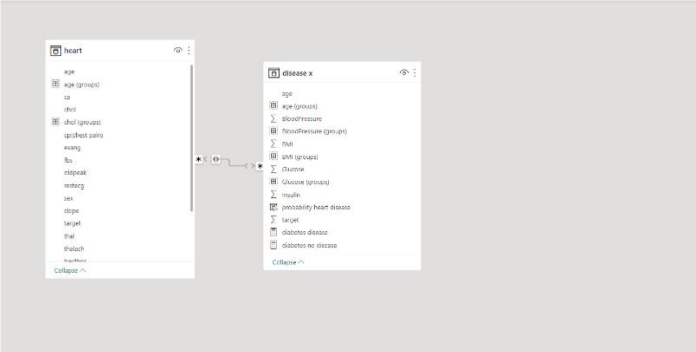
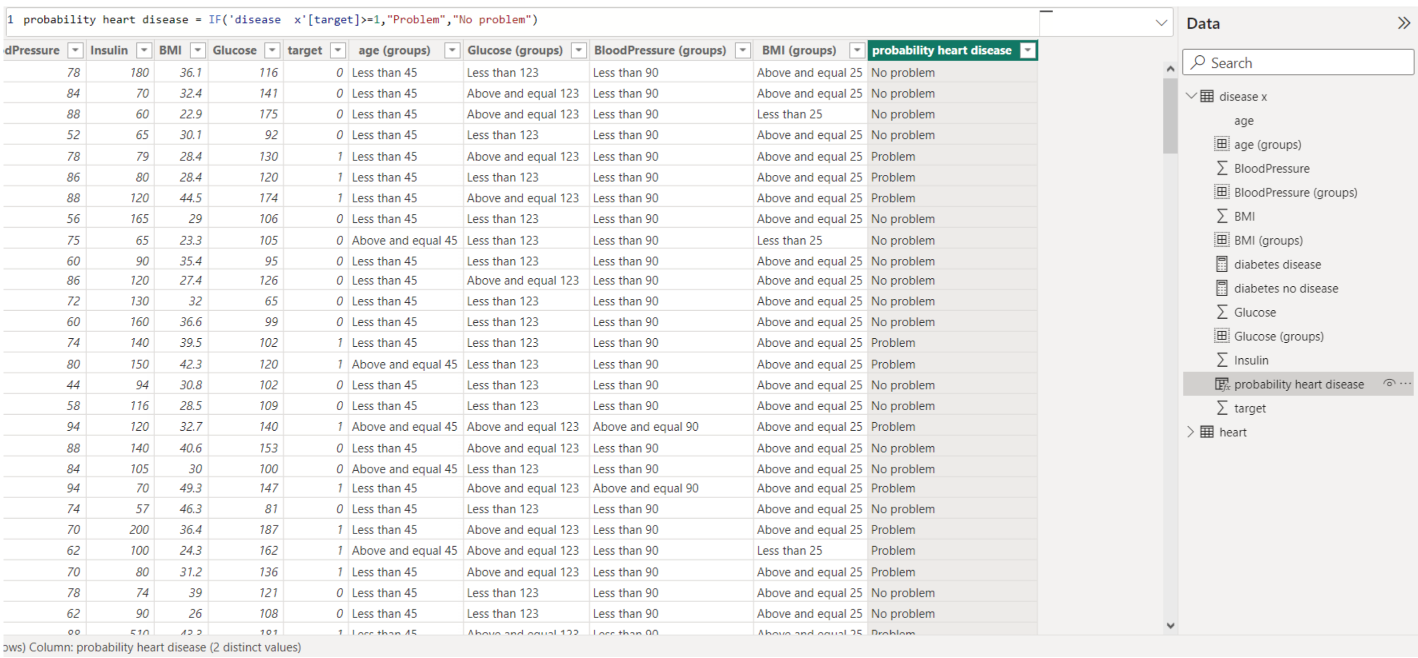


Figure 18 many to many relationship[18]

- STEP 4: DAX language



```
1 probability heart disease = IF('disease  x'[target]>=1,"Problem","No problem")
```

dPressure	Insulin	BMI	Glucose	target	age (groups)	Glucose (groups)	BloodPressure (groups)	BMI (groups)	probability heart disease
78	180	36.1	116	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
84	70	32.4	141	0	Less than 45	Above and equal 123	Less than 90	Above and equal 25	No problem
88	60	22.9	175	0	Less than 45	Above and equal 123	Less than 90	Less than 25	No problem
52	65	30.1	92	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
78	79	28.4	130	1	Less than 45	Above and equal 123	Less than 90	Above and equal 25	Problem
86	80	28.4	120	1	Less than 45	Less than 123	Less than 90	Above and equal 25	Problem
88	120	44.5	174	1	Less than 45	Above and equal 123	Less than 90	Above and equal 25	Problem
56	165	29	106	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
75	65	23.3	105	0	Above and equal 45	Less than 123	Less than 90	Less than 25	No problem
60	90	35.4	95	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
86	120	27.4	126	0	Less than 45	Above and equal 123	Less than 90	Above and equal 25	No problem
72	130	32	65	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
60	160	36.6	99	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
74	140	39.5	102	1	Less than 45	Less than 123	Less than 90	Above and equal 25	Problem
80	150	42.3	120	1	Above and equal 45	Less than 123	Less than 90	Above and equal 25	Problem
44	94	30.8	102	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
58	116	28.5	109	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
94	120	32.7	140	1	Above and equal 45	Above and equal 123	Above and equal 90	Above and equal 25	Problem
88	140	40.6	153	0	Less than 45	Above and equal 123	Less than 90	Above and equal 25	No problem
84	105	30	100	0	Above and equal 45	Less than 123	Less than 90	Above and equal 25	No problem
94	70	49.3	147	1	Less than 45	Above and equal 123	Above and equal 90	Above and equal 25	Problem
74	57	46.3	81	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
70	200	36.4	187	1	Less than 45	Above and equal 123	Less than 90	Above and equal 25	Problem
62	100	24.3	162	1	Above and equal 45	Above and equal 123	Less than 90	Less than 25	Problem
70	80	31.2	136	1	Less than 45	Above and equal 123	Less than 90	Above and equal 25	Problem
78	74	39	121	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem
62	90	26	108	0	Less than 45	Less than 123	Less than 90	Above and equal 25	No problem

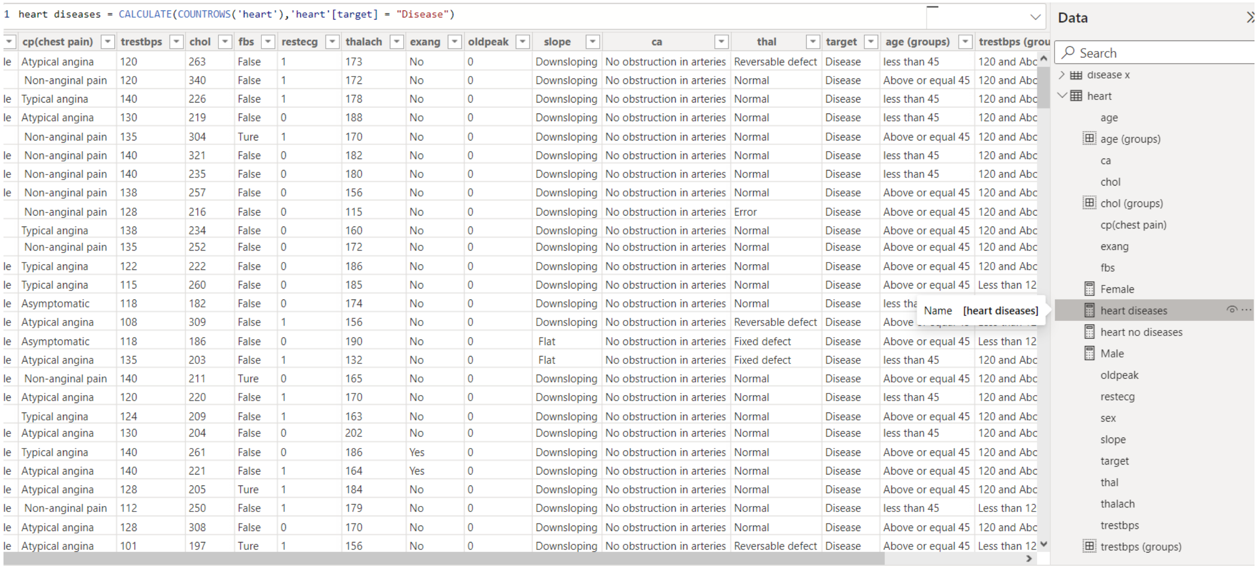
ows) Column: probability heart disease (2 distinct values)

Data

Search

disease x
age
age (groups)
BloodPressure
BloodPressure (groups)
BMI
BMI (groups)
diabetes disease
diabetes no disease
Glucose
Glucose (groups)
Insulin
probability heart disease
target
heart

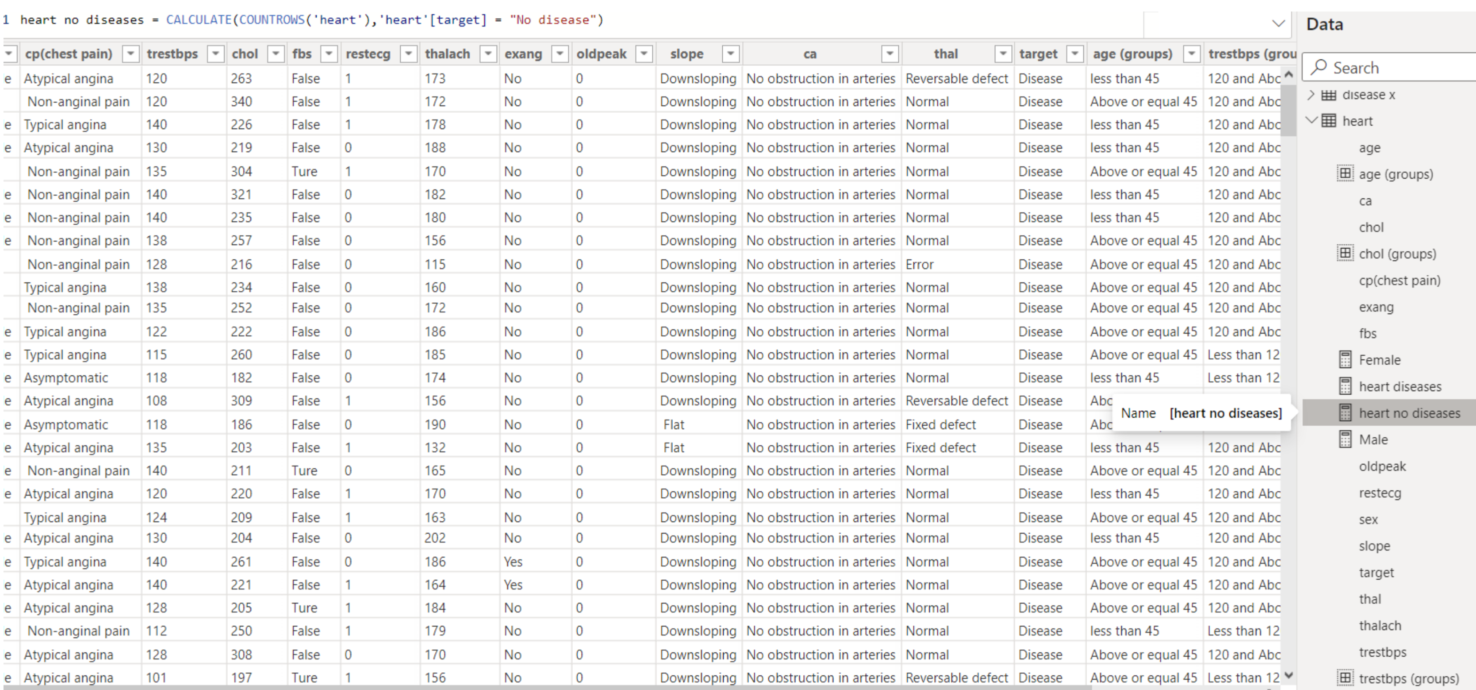
Figure 19 Dax function if[19]



```
1 heart diseases = CALCULATE(COUNTROWS('heart'),'heart'[target] = "Disease")
```

	cp(chest pain)	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target	age (groups)	trestbps (grou
le	Atypical angina	120	263	False	1	173	No	0	Downsloping	No obstruction in arteries	Reversable defect	Disease	less than 45	120 and Abc
	Non-anginal pain	120	340	False	1	172	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Typical angina	140	226	False	1	178	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
le	Atypical angina	130	219	False	0	188	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
	Non-anginal pain	135	304	Ture	1	170	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Non-anginal pain	140	321	False	0	182	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
le	Non-anginal pain	140	235	False	0	180	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
le	Non-anginal pain	138	257	False	0	156	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
	Non-anginal pain	128	216	False	0	115	No	0	Downsloping	No obstruction in arteries	Error	Disease	Above or equal 45	120 and Abc
	Typical angina	138	234	False	0	160	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
	Non-anginal pain	135	252	False	0	172	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Typical angina	122	222	False	0	186	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Typical angina	115	260	False	0	185	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	Less than 12
le	Asymptomatic	118	182	False	0	174	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less tha	
le	Atypical angina	108	309	False	1	156	No	0	Downsloping	No obstruction in arteries	Reversable defect	Disease	Above	
le	Asymptomatic	118	186	False	0	190	No	0	Flat	No obstruction in arteries	Fixed defect	Disease	Above or equal 45	Less than 12
le	Atypical angina	135	203	False	1	132	No	0	Flat	No obstruction in arteries	Fixed defect	Disease	less than 45	120 and Abc
le	Non-anginal pain	140	211	Ture	0	165	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Atypical angina	120	220	False	1	170	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
	Typical angina	124	209	False	1	163	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Atypical angina	130	204	False	0	202	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
le	Typical angina	140	261	False	0	186	Yes	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Atypical angina	140	221	False	1	164	Yes	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Atypical angina	128	205	Ture	1	184	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Non-anginal pain	112	250	False	1	179	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	Less than 12
le	Atypical angina	128	308	False	0	170	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
le	Atypical angina	101	197	Ture	1	156	No	0	Downsloping	No obstruction in arteries	Reversable defect	Disease	Above or equal 45	Less than 12

Figure 20 Dax calculator heart disease[20]



```
1 heart no diseases = CALCULATE(COUNTROWS('heart'),'heart'[target] = "No disease")
```

	cp(chest pain)	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target	age (groups)	trestbps (grou
e	Atypical angina	120	263	False	1	173	No	0	Downsloping	No obstruction in arteries	Reversable defect	Disease	less than 45	120 and Abc
	Non-anginal pain	120	340	False	1	172	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Typical angina	140	226	False	1	178	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
e	Atypical angina	130	219	False	0	188	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
	Non-anginal pain	135	304	Ture	1	170	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Non-anginal pain	140	321	False	0	182	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
e	Non-anginal pain	140	235	False	0	180	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
e	Non-anginal pain	138	257	False	0	156	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
	Non-anginal pain	128	216	False	0	115	No	0	Downsloping	No obstruction in arteries	Error	Disease	Above or equal 45	120 and Abc
	Typical angina	138	234	False	0	160	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
	Non-anginal pain	135	252	False	0	172	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Typical angina	122	222	False	0	186	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Typical angina	115	260	False	0	185	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	Less than 12
e	Asymptomatic	118	182	False	0	174	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	Less than 12
e	Atypical angina	108	309	False	1	156	No	0	Downsloping	No obstruction in arteries	Reversable defect	Disease	Abc	
e	Asymptomatic	118	186	False	0	190	No	0	Flat	No obstruction in arteries	Fixed defect	Disease	Abc	
e	Atypical angina	135	203	False	1	132	No	0	Flat	No obstruction in arteries	Fixed defect	Disease	less than 45	120 and Abc
e	Non-anginal pain	140	211	Ture	0	165	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Atypical angina	120	220	False	1	170	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
	Typical angina	124	209	False	1	163	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Atypical angina	130	204	False	0	202	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	120 and Abc
e	Typical angina	140	261	False	0	186	Yes	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Atypical angina	140	221	False	1	164	Yes	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Atypical angina	128	205	Ture	1	184	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Non-anginal pain	112	250	False	1	179	No	0	Downsloping	No obstruction in arteries	Normal	Disease	less than 45	Less than 12
e	Atypical angina	128	308	False	0	170	No	0	Downsloping	No obstruction in arteries	Normal	Disease	Above or equal 45	120 and Abc
e	Atypical angina	101	197	Ture	1	156	No	0	Downsloping	No obstruction in arteries	Reversable defect	Disease	Above or equal 45	Less than 12

Figure 21 Dax calculator heart no disease[21]

- STEP 5: Report mode (Visualization)

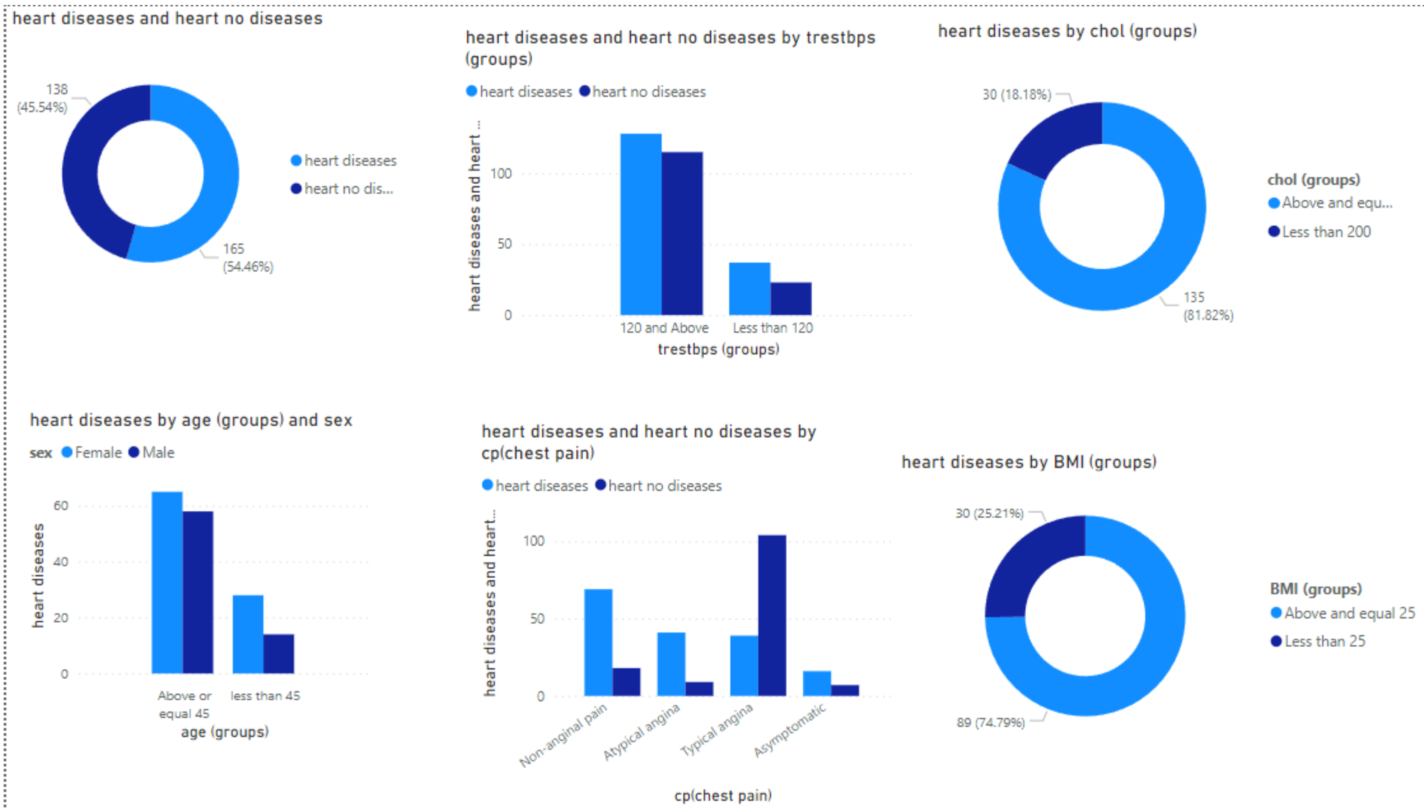


Figure 22 Report mode (Visualization 1)[22]

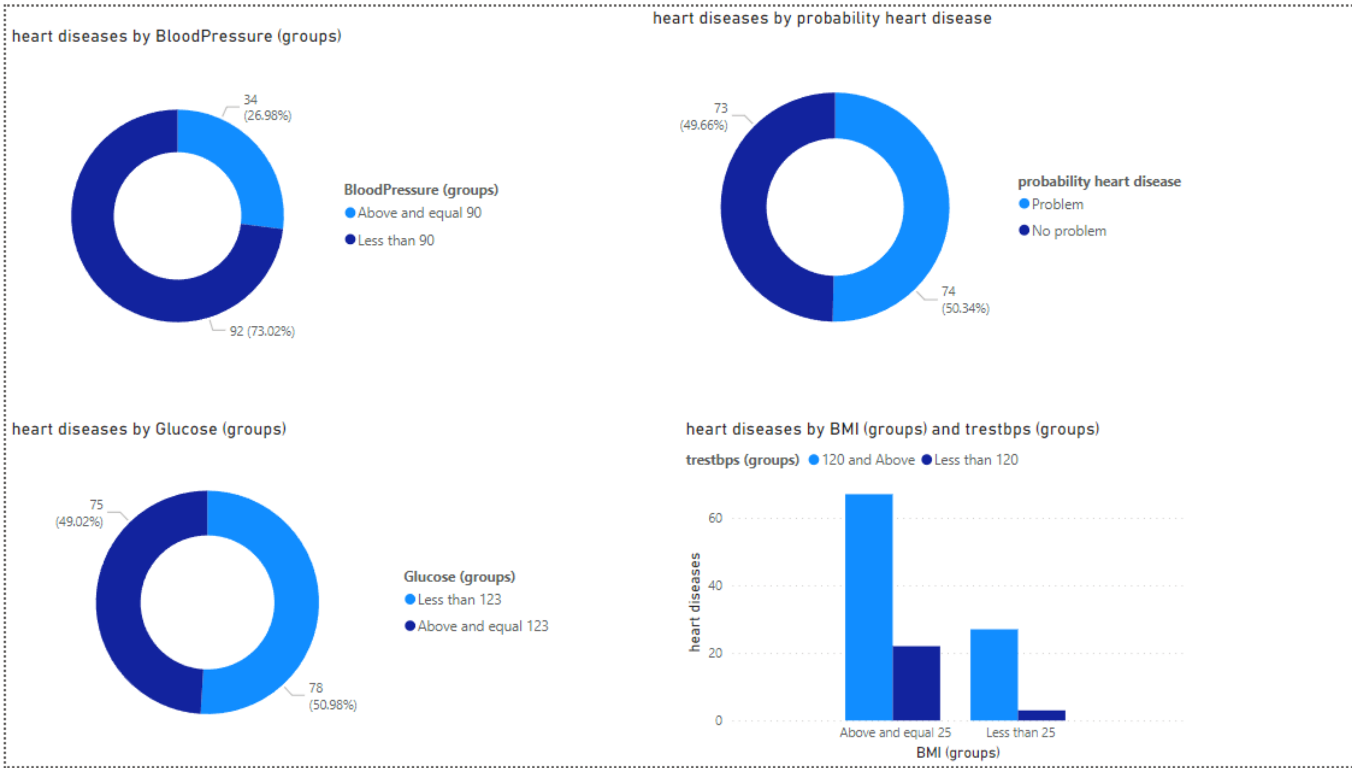


Figure 23 Report mode (Visualization 2)[23]

Figure 24 Report mode (Visualization 3)[24]

Chapter 3 Chat bot:

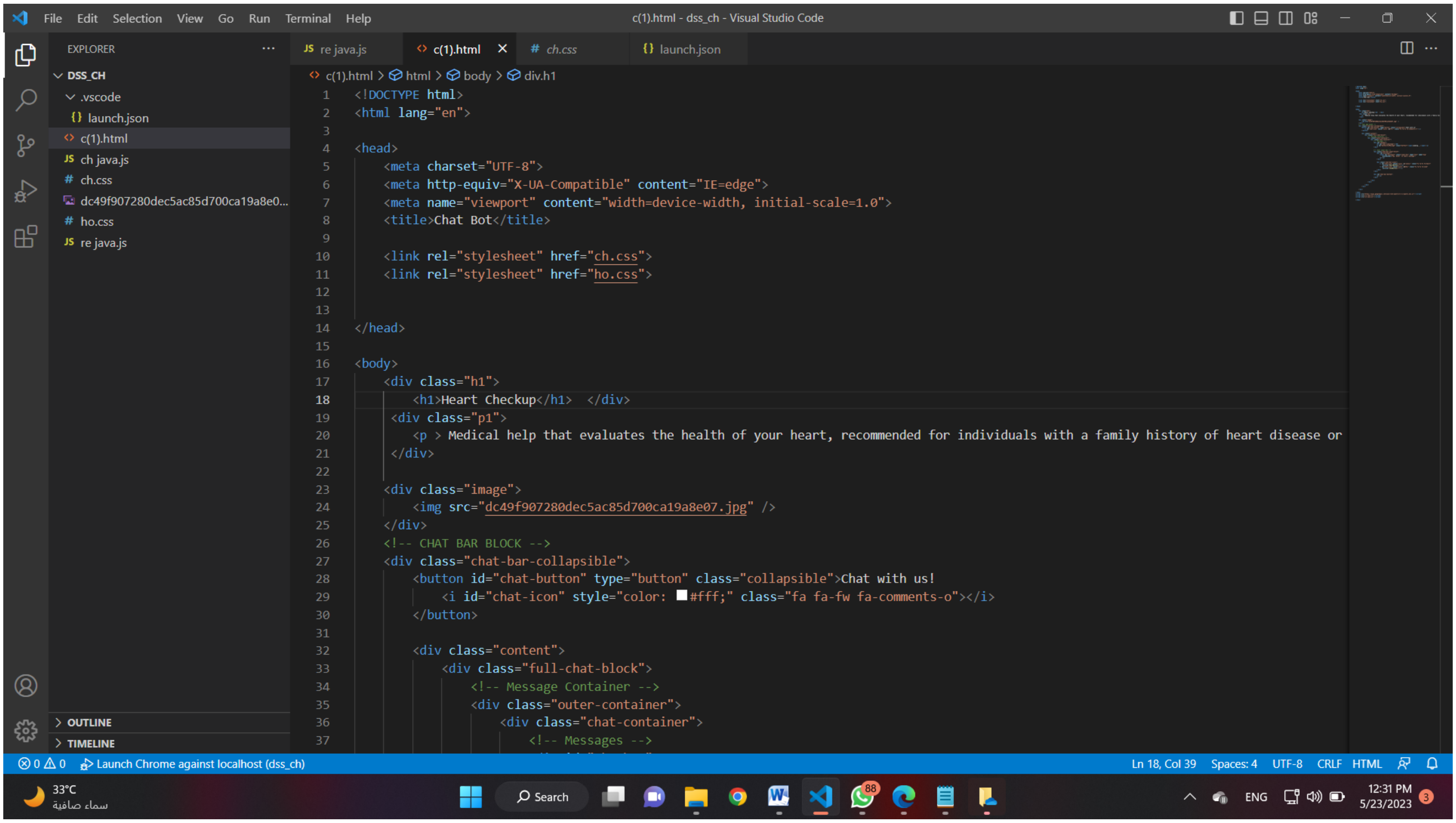


Figure 25Action html

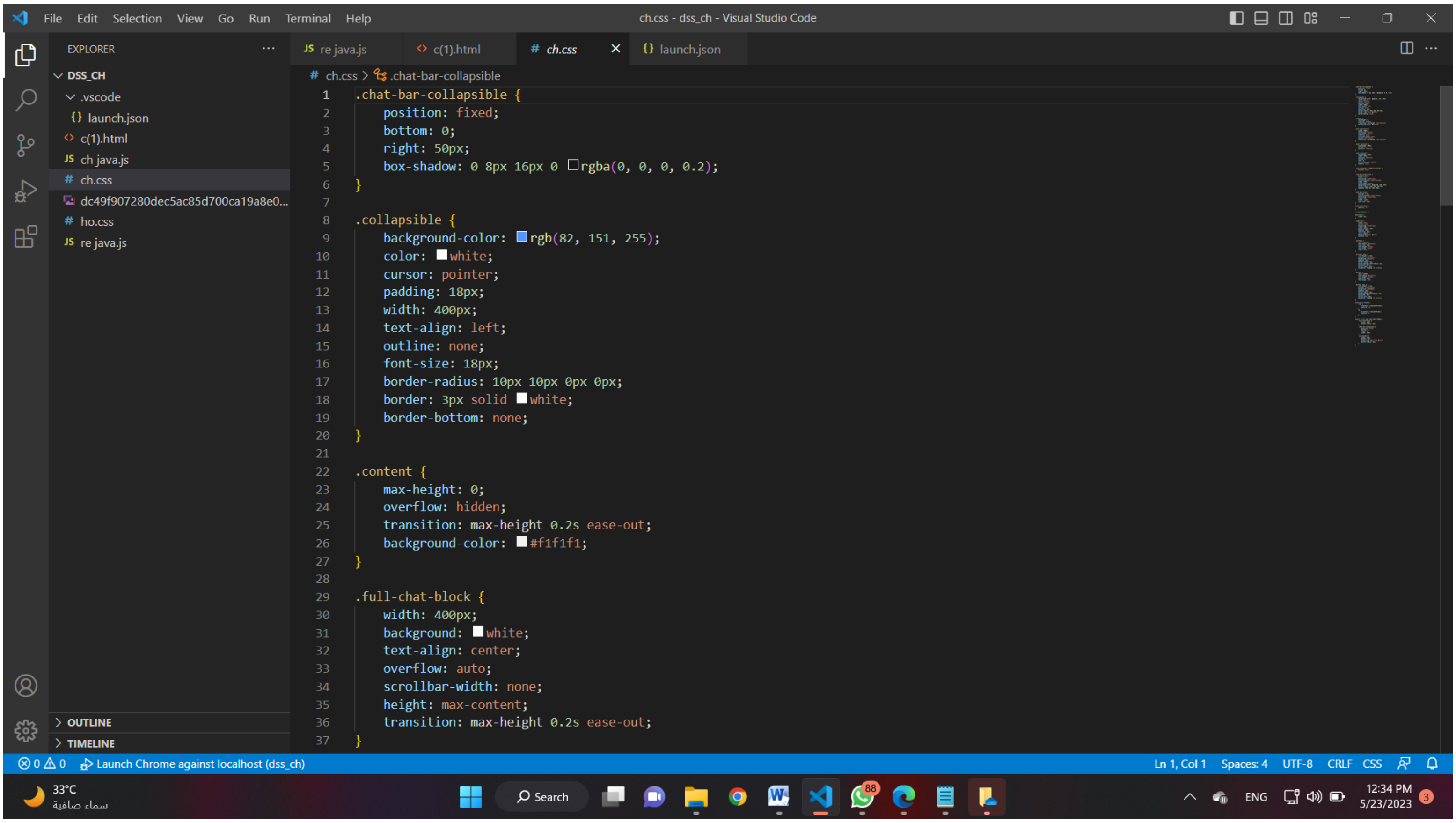


Figure 26 chat.css

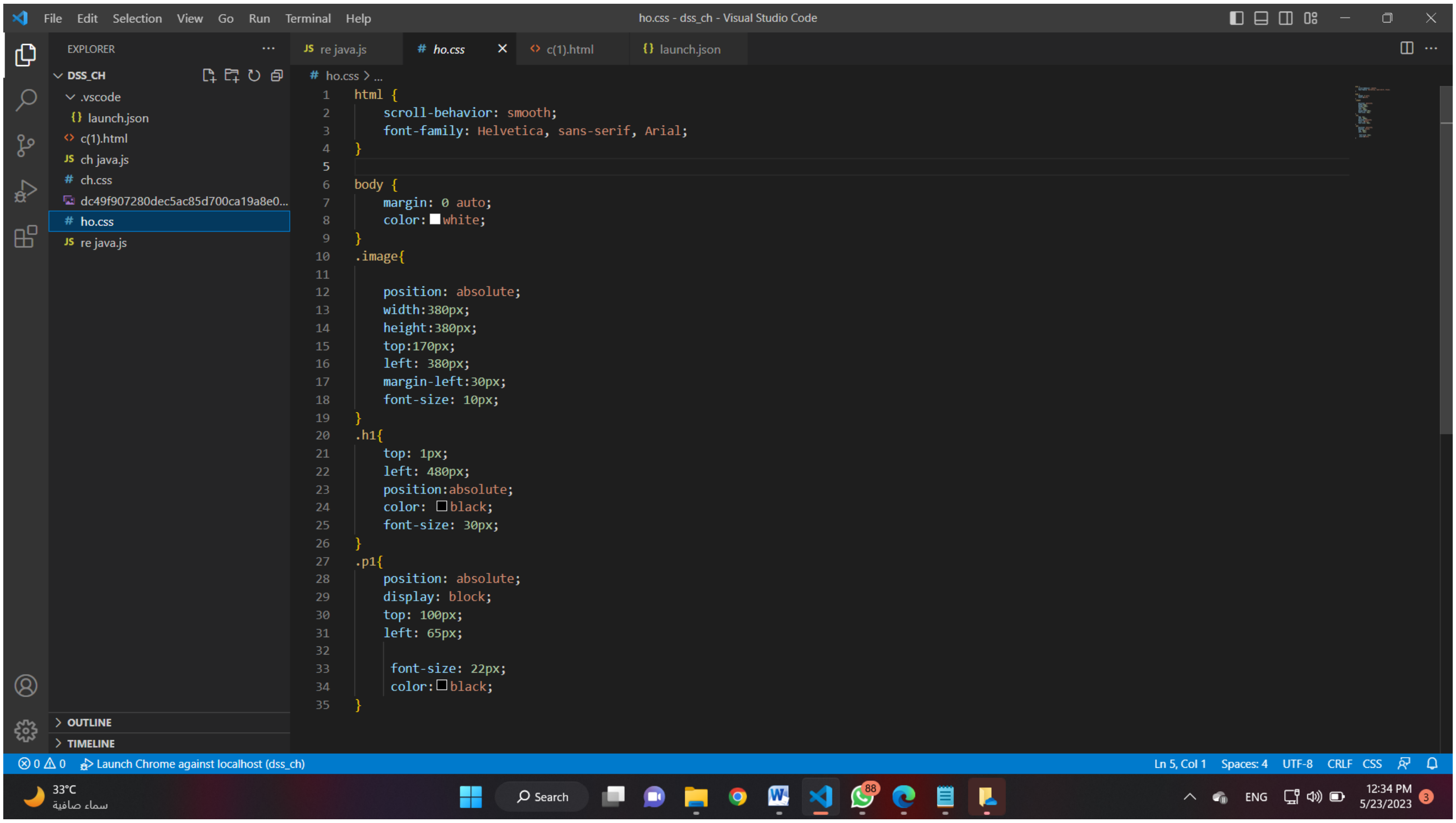


Figure 27Home.css

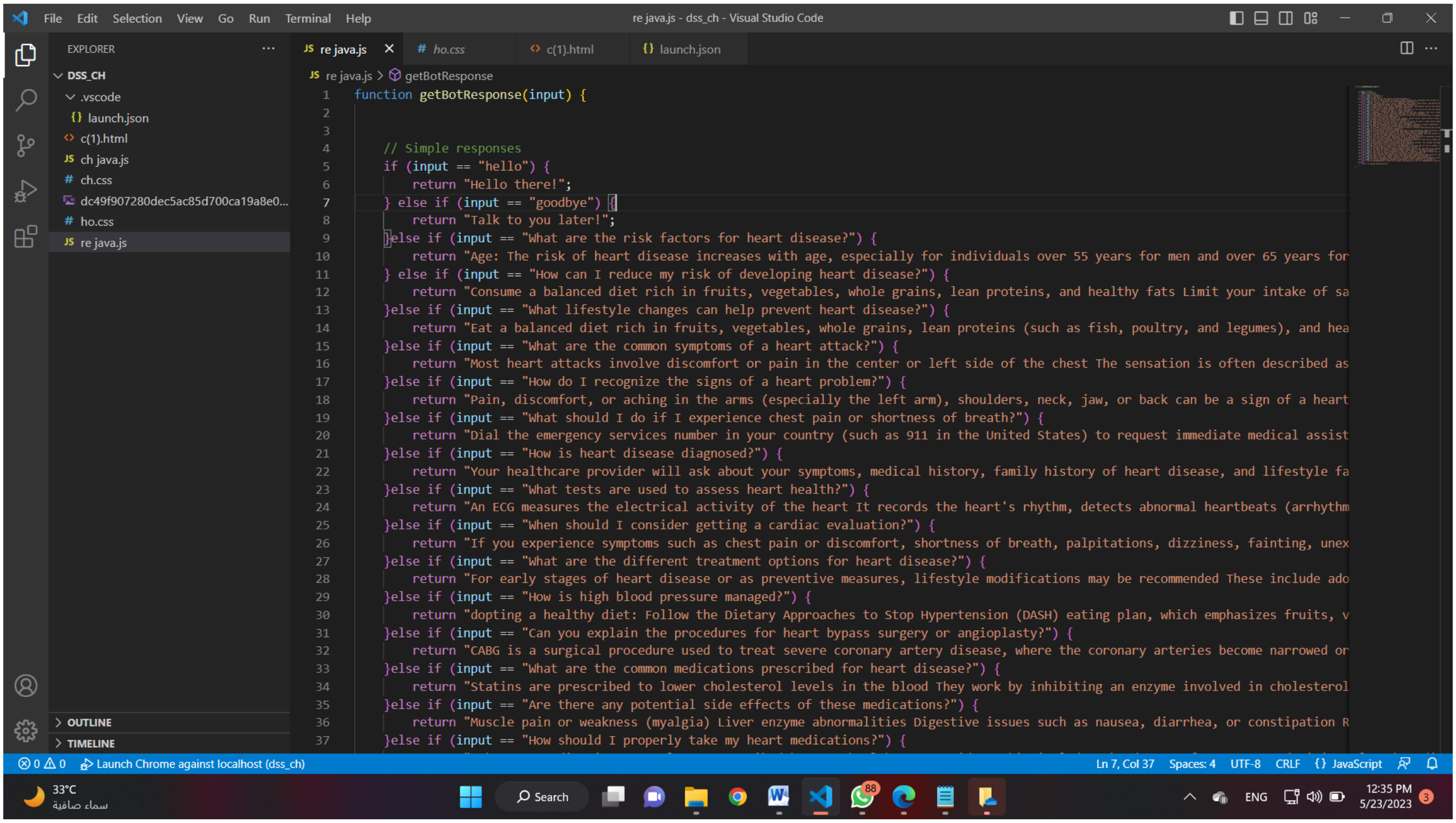


Figure 28Java response

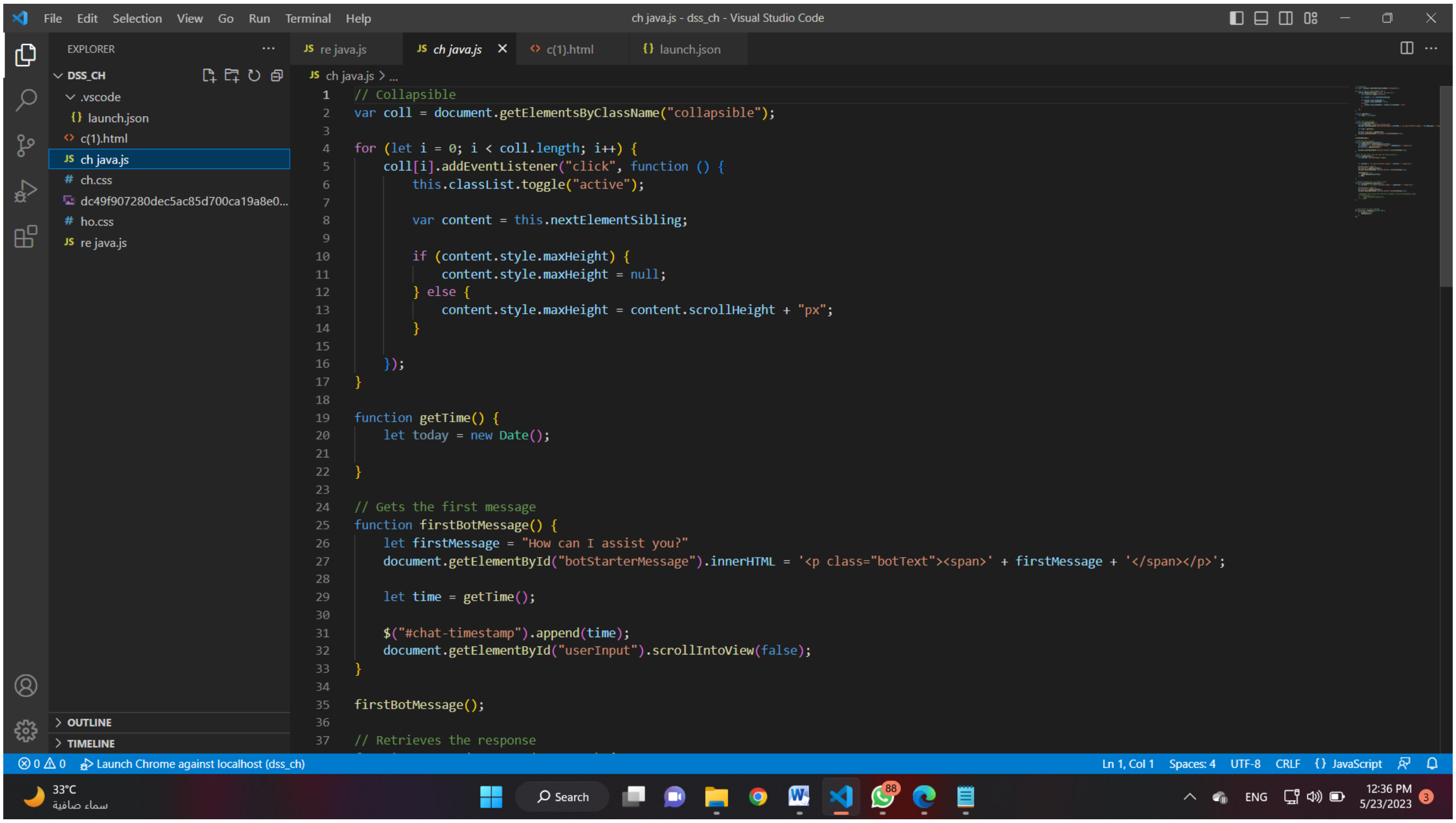


Figure 29Chat java script

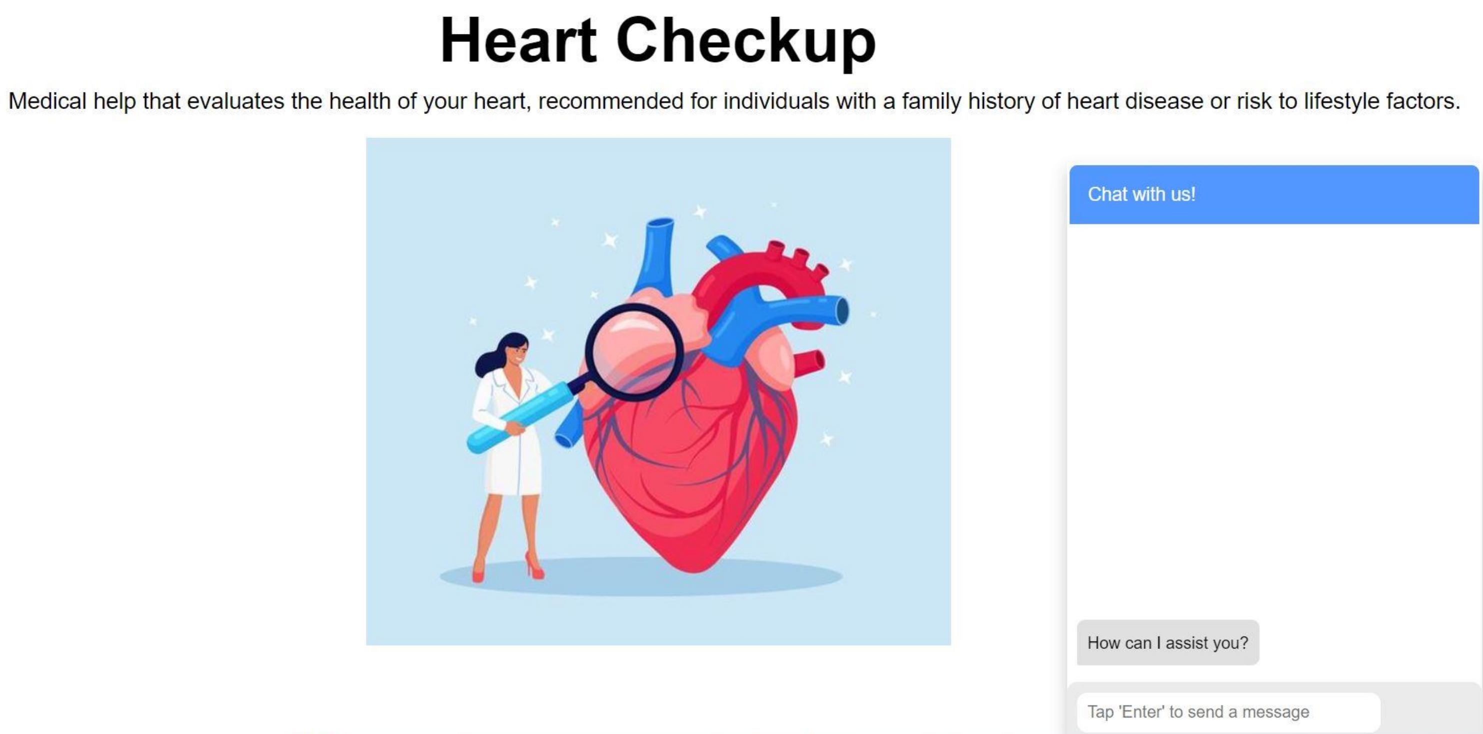


Figure 30 image Chabot

Reference:

[1]: N. Basha, A. Kumar. Krishna, Venkatesh P, “Early Detection of Heart Syndrome Using Machine Learning Technique” In International Conference on Electrical, Electronics, Communication, Computer Technologies and Optimization Techniques, 2019 4th

- ➔ Example [2]:https://www.kaggle.com/code/desalegngeb/heart-disease-predictions . Accessed Abril 9,2023
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