

# Stat 5353 - Fall 2017

## Final Report

Dalton Cole  
Adam Harter  
Samuel Richter

December 3, 2017

## Introduction

In this experiment, k-means clustering was applied to the UCI heart disease data set<sup>1</sup>, with the factors being the distance formula used and the number of clusters formed. The three levels for the distance formula used were Euclidean distance, Cosine distance, and Jaccard distance. The three levels for the number of clusters were 2, 3, and 5. The response variable of interest is the resulting sum squared error of the clusters.

## Design

The design of the experiment was a completely randomized design. To achieve this, every possible combination of the factors was run in random order, with each combination being run twice. The initial starting points for each cluster was also initialized randomly. “Environmental Error” is introduced by randomly choosing data points to train on and data points to test against.

## Procedure and Data Collection

To collect data, k-means clustering was performed using the Python library `nlTK`<sup>2</sup>. The data for the k-means clustering itself was taken from the UCI heart disease data set and each point contained 14 used attributes, which are as follows:

1. Age
2. Sex
3. Chest Pain Type
4. Resting Blood Pressure
5. Cholesterol Level
6. Fasting Blood Sugar > 120 mg/dl
7. Resting ECG Results (normal, ST-T wave abnormality, left ventricular hypertrophy)
8. Maximum heart rate achieved
9. Exercise induced Angina
10. ST Depression Induced by Exercise Relative to Rest
11. Slope of Peak Exercise ST Segment (up-sloping, flat, down-sloping)

---

<sup>1</sup><http://archive.ics.uci.edu/ml/datasets/Heart+Disease>

<sup>2</sup>[http://www.nltk.org/\\_modules/nltk/cluster/kmeans.html](http://www.nltk.org/_modules/nltk/cluster/kmeans.html)

12. Number of Major Vessels Colored by Flourosopy
13. Thalassemia
14. Diagnosis of Heart Disease

The full list of data used can be found in Table 6

## Analysis of Results

Table 1: ANOVA Table

Source	d.f.	SS	MS	F-ratio
Model	8	16247.444	2030.93	44.4189
Error	9	411.500	45.72	Prob > F
Combination Total	17	16658.944		<.0001

Table 2: Effect Tests

Source	Nparm	DF	SS	F Ratio	Prob > F
Number of Clusters	2	2	15786.111	172.6306	<.0001
Distance Metric	2	2	100.000	1.0936	0.3757
Distance Metric * Number of Clusters	4	4	374.222	2.0462	0.1711

Table 3: Tukey's test ( $\alpha = 0.05$ )

LSMean[j]				
LSMean[i]	Mean[i] - Mean[j]	2	3	5
	Std Err Dif			
	Lower CL Dif			
	Upper CL Dif			
	2	0	38.3333	72.5
		0	3.903 94	3.903 94
		0	27.4335	61.6002
		0	49.2332	83.3998
	3	-38.333	0	34.1667
		3.903 94	0	3.903 94
		-49.244	0	23.2668
		-27.433	0	45.0665
	5	-72.5	-34.167	0
		3.903 94	3.903 94	0
		-83.4	-45.067	0
		-61.6	-23.267	0
		Level		Least Sq Mean
		2	A	180.00000
		3	B	141.66667
		5	C	107.50000

## Conclusion

The ANOVA table can be found in Table 1. Using  $\alpha = 0.05$ , the different combinations of factors was significant, as Prob > F < .0001, which is less than 0.05. Using the effect tests table, found in Table 2,

several things can be concluded. There is no interaction between the Distance Metric and the Number of Clusters, as  $\text{Prob} > F = 0.1711$ , which is greater than 0.05. The Distance Metric was also not significant as  $\text{Prob} > F = .3757$ , which is greater than 0.05. The number of clusters, however, was significant, as  $\text{Prob} > F < .0001$ , which is less than 0.05. Each number of clusters was statistically distinct and having two clusters produced the most accurate predictor, as shown in Table 4 and Table 3. Tukey's test was performed on the number of clusters instead of a regression as the number of clusters is discrete, and not continuous.

Table 4: Number Correct by Cluster Size

Number of Clusters	Number Correct
2	1080
3	849
5	645

## Appendix: List of Data

Table 5: Experimental Data

Distance Metric	Number of Clusters	Number Correct
Euclidean	2	180
Euclidean	3	139
Euclidean	5	105
Cosine	2	184
Cosine	3	149
Cosine	5	104
Jaccard	2	176
Jaccard	3	151
Jaccard	5	108
Euclidean	2	180
Euclidean	3	138
Euclidean	5	99
Cosine	2	186
Cosine	3	137
Cosine	5	101
Jaccard	2	174
Jaccard	3	136
Jaccard	5	128

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
63.0	1.0	1.0	145.0	233.0	1.0	2.0	150.0	0.0	2.3	3.0	0.0	6.0	0
67.0	1.0	4.0	160.0	286.0	0.0	2.0	108.0	1.0	1.5	2.0	3.0	3.0	2
67.0	1.0	4.0	120.0	229.0	0.0	2.0	129.0	1.0	2.6	2.0	2.0	7.0	1
37.0	1.0	3.0	130.0	250.0	0.0	0.0	187.0	0.0	3.5	3.0	0.0	3.0	0
41.0	0.0	2.0	130.0	204.0	0.0	2.0	172.0	0.0	1.4	1.0	0.0	3.0	0
56.0	1.0	2.0	120.0	236.0	0.0	0.0	178.0	0.0	0.8	1.0	0.0	3.0	0
62.0	0.0	4.0	140.0	268.0	0.0	2.0	160.0	0.0	3.6	3.0	2.0	3.0	3
57.0	0.0	4.0	120.0	354.0	0.0	0.0	163.0	1.0	0.6	1.0	0.0	3.0	0
63.0	1.0	4.0	130.0	254.0	0.0	2.0	147.0	0.0	1.4	2.0	1.0	7.0	2
53.0	1.0	4.0	140.0	203.0	1.0	2.0	155.0	1.0	3.1	3.0	0.0	7.0	1
57.0	1.0	4.0	140.0	192.0	0.0	0.0	148.0	0.0	0.4	2.0	0.0	6.0	0
56.0	0.0	2.0	140.0	294.0	0.0	2.0	153.0	0.0	1.3	2.0	0.0	3.0	0
56.0	1.0	3.0	130.0	256.0	1.0	2.0	142.0	1.0	0.6	2.0	1.0	6.0	2
44.0	1.0	2.0	120.0	263.0	0.0	0.0	173.0	0.0	0.0	1.0	0.0	7.0	0
52.0	1.0	3.0	172.0	199.0	1.0	0.0	162.0	0.0	0.5	1.0	0.0	7.0	0
57.0	1.0	3.0	150.0	168.0	0.0	0.0	174.0	0.0	1.6	1.0	0.0	3.0	0
48.0	1.0	2.0	110.0	229.0	0.0	0.0	168.0	0.0	1.0	3.0	0.0	7.0	1
54.0	1.0	4.0	140.0	239.0	0.0	0.0	160.0	0.0	1.2	1.0	0.0	3.0	0
48.0	0.0	3.0	130.0	275.0	0.0	0.0	139.0	0.0	0.2	1.0	0.0	3.0	0
49.0	1.0	2.0	130.0	266.0	0.0	0.0	171.0	0.0	0.6	1.0	0.0	3.0	0
64.0	1.0	1.0	110.0	211.0	0.0	2.0	211.0	1.0	1.8	2.0	0.0	3.0	0
58.0	0.0	1.0	150.0	283.0	1.0	2.0	162.0	0.0	1.0	1.0	0.0	3.0	0
58.0	1.0	2.0	120.0	284.0	0.0	2.0	160.0	0.0	1.8	2.0	0.0	3.0	1
58.0	1.0	3.0	132.0	224.0	0.0	2.0	173.0	0.0	3.2	1.0	2.0	7.0	3
60.0	1.0	4.0	130.0	206.0	0.0	2.0	132.0	1.0	2.4	2.0	2.0	7.0	4
50.0	0.0	3.0	120.0	219.0	0.0	0.0	158.0	0.0	1.6	2.0	0.0	3.0	0
58.0	0.0	3.0	120.0	340.0	0.0	0.0	172.0	0.0	0.0	1.0	0.0	3.0	0
66.0	0.0	1.0	150.0	226.0	0.0	0.0	114.0	0.0	2.6	3.0	0.0	3.0	0
43.0	1.0	4.0	150.0	247.0	0.0	0.0	171.0	0.0	1.5	1.0	0.0	3.0	0
40.0	1.0	4.0	110.0	167.0	0.0	2.0	114.0	1.0	2.0	2.0	0.0	7.0	3
69.0	0.0	1.0	140.0	239.0	0.0	0.0	151.0	0.0	1.8	1.0	2.0	3.0	0
60.0	1.0	4.0	117.0	230.0	1.0	0.0	160.0	1.0	1.4	1.0	2.0	7.0	2
64.0	1.0	3.0	140.0	335.0	0.0	0.0	138.0	0.0	0.0	1.0	0.0	3.0	1
59.0	1.0	4.0	135.0	234.0	0.0	0.0	161.0	0.0	0.5	2.0	0.0	7.0	0
44.0	1.0	3.0	130.0	233.0	0.0	0.0	179.0	1.0	0.4	1.0	0.0	3.0	0
42.0	1.0	4.0	140.0	226.0	0.0	0.0	178.0	0.0	0.0	1.0	0.0	3.0	0
43.0	1.0	4.0	120.0	177.0	0.0	2.0	120.0	1.0	2.5	2.0	0.0	7.0	3
57.0	1.0	4.0	150.0	276.0	0.0	2.0	112.0	1.0	0.6	2.0	1.0	6.0	1
55.0	1.0	4.0	132.0	353.0	0.0	0.0	132.0	1.0	1.2	2.0	1.0	7.0	3
61.0	1.0	3.0	150.0	243.0	1.0	0.0	137.0	1.0	1.0	2.0	0.0	3.0	0
65.0	0.0	4.0	150.0	225.0	0.0	2.0	114.0	0.0	1.0	2.0	3.0	7.0	4
40.0	1.0	1.0	140.0	199.0	0.0	0.0	178.0	1.0	1.4	1.0	0.0	7.0	0
71.0	0.0	2.0	160.0	302.0	0.0	0.0	162.0	0.0	0.4	1.0	2.0	3.0	0
59.0	1.0	3.0	150.0	212.0	1.0	0.0	157.0	0.0	1.6	1.0	0.0	3.0	0
61.0	0.0	4.0	130.0	330.0	0.0	2.0	169.0	0.0	0.0	1.0	0.0	3.0	1
58.0	1.0	3.0	112.0	230.0	0.0	2.0	165.0	0.0	2.5	2.0	1.0	7.0	4
51.0	1.0	3.0	110.0	175.0	0.0	0.0	123.0	0.0	0.6	1.0	0.0	3.0	0
50.0	1.0	4.0	150.0	243.0	0.0	2.0	128.0	0.0	2.6	2.0	0.0	7.0	4
65.0	0.0	3.0	140.0	417.0	1.0	2.0	157.0	0.0	0.8	1.0	1.0	3.0	0
53.0	1.0	3.0	130.0	197.0	1.0	2.0	152.0	0.0	1.2	3.0	0.0	3.0	0
41.0	0.0	2.0	105.0	198.0	0.0	0.0	168.0	0.0	0.0	1.0	1.0	3.0	0
65.0	1.0	4.0	120.0	177.0	0.0	0.0	140.0	0.0	0.4	1.0	0.0	7.0	0

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
44.0	1.0	4.0	112.0	290.0	0.0	2.0	153.0	0.0	0.0	1.0	1.0	3.0	2
44.0	1.0	2.0	130.0	219.0	0.0	2.0	188.0	0.0	0.0	1.0	0.0	3.0	0
60.0	1.0	4.0	130.0	253.0	0.0	2.0	144.0	1.0	1.4	1.0	1.0	7.0	1
54.0	1.0	4.0	124.0	266.0	0.0	2.0	109.0	1.0	2.2	2.0	1.0	7.0	1
50.0	1.0	3.0	140.0	233.0	0.0	0.0	163.0	0.0	0.6	2.0	1.0	7.0	1
41.0	1.0	4.0	110.0	172.0	0.0	2.0	172.0	0.0	0.0	1.0	0.0	7.0	1
54.0	1.0	3.0	125.0	273.0	0.0	2.0	152.0	0.0	0.5	3.0	1.0	3.0	0
51.0	1.0	1.0	125.0	213.0	0.0	2.0	125.0	1.0	1.4	1.0	1.0	3.0	0
51.0	0.0	4.0	130.0	305.0	0.0	0.0	142.0	1.0	1.2	2.0	0.0	7.0	2
46.0	0.0	3.0	142.0	177.0	0.0	2.0	160.0	1.0	1.4	3.0	0.0	3.0	0
58.0	1.0	4.0	128.0	216.0	0.0	2.0	216.0	1.0	2.2	2.0	3.0	7.0	1
54.0	0.0	3.0	135.0	304.0	1.0	0.0	170.0	0.0	0.0	1.0	0.0	3.0	0
54.0	1.0	4.0	120.0	188.0	0.0	0.0	113.0	0.0	1.4	2.0	1.0	7.0	2
60.0	1.0	4.0	145.0	282.0	0.0	2.0	142.0	1.0	2.8	2.0	2.0	7.0	2
60.0	1.0	3.0	140.0	185.0	0.0	2.0	155.0	0.0	3.0	2.0	0.0	3.0	1
54.0	1.0	3.0	150.0	232.0	0.0	2.0	232.0	0.0	1.6	1.0	0.0	7.0	0
59.0	1.0	4.0	170.0	326.0	0.0	2.0	140.0	1.0	3.4	3.0	0.0	7.0	2
46.0	1.0	3.0	150.0	231.0	0.0	0.0	147.0	0.0	3.6	2.0	0.0	3.0	1
65.0	0.0	3.0	155.0	269.0	0.0	0.0	148.0	0.0	0.8	1.0	0.0	3.0	0
67.0	1.0	4.0	125.0	254.0	1.0	0.0	163.0	0.0	0.2	2.0	2.0	7.0	3
62.0	1.0	4.0	120.0	267.0	0.0	0.0	99.0	1.0	1.8	2.0	2.0	7.0	1
65.0	1.0	4.0	110.0	248.0	0.0	2.0	158.0	0.0	0.6	1.0	2.0	6.0	1
44.0	1.0	4.0	110.0	197.0	0.0	2.0	177.0	0.0	0.0	1.0	1.0	3.0	1
65.0	0.0	3.0	160.0	360.0	0.0	2.0	151.0	0.0	0.8	1.0	0.0	3.0	0
60.0	1.0	4.0	125.0	258.0	0.0	2.0	141.0	1.0	2.8	2.0	1.0	7.0	1
51.0	0.0	3.0	140.0	308.0	0.0	2.0	142.0	0.0	1.5	1.0	1.0	3.0	0
48.0	1.0	2.0	130.0	245.0	0.0	2.0	180.0	0.0	0.2	2.0	0.0	3.0	0
58.0	1.0	4.0	150.0	270.0	0.0	2.0	111.0	1.0	0.8	1.0	0.0	7.0	3
45.0	1.0	4.0	104.0	208.0	0.0	2.0	148.0	1.0	3.0	2.0	0.0	3.0	0
53.0	0.0	4.0	130.0	264.0	0.0	2.0	143.0	0.0	0.4	2.0	0.0	3.0	0
39.0	1.0	3.0	140.0	321.0	0.0	2.0	182.0	0.0	0.0	1.0	0.0	3.0	0
68.0	1.0	3.0	180.0	274.0	1.0	2.0	150.0	1.0	1.6	2.0	0.0	7.0	3
52.0	1.0	2.0	120.0	325.0	0.0	0.0	172.0	0.0	0.2	1.0	0.0	3.0	0
44.0	1.0	3.0	140.0	235.0	0.0	2.0	180.0	0.0	0.0	1.0	0.0	3.0	0
47.0	1.0	3.0	138.0	257.0	0.0	2.0	156.0	0.0	0.0	1.0	0.0	3.0	0
53.0	0.0	3.0	128.0	216.0	0.0	2.0	115.0	0.0	0.0	1.0	0.0	?	0
53.0	0.0	4.0	138.0	234.0	0.0	2.0	160.0	0.0	0.0	1.0	0.0	3.0	0
51.0	0.0	3.0	130.0	256.0	0.0	2.0	149.0	0.0	0.5	1.0	0.0	3.0	0
66.0	1.0	4.0	120.0	302.0	0.0	2.0	151.0	0.0	0.4	2.0	0.0	3.0	0
62.0	0.0	4.0	160.0	164.0	0.0	2.0	145.0	0.0	6.2	3.0	3.0	7.0	3
62.0	1.0	3.0	130.0	231.0	0.0	0.0	146.0	0.0	1.8	2.0	3.0	7.0	0
44.0	0.0	3.0	108.0	141.0	0.0	0.0	175.0	0.0	0.6	2.0	0.0	3.0	0
63.0	0.0	3.0	135.0	252.0	0.0	2.0	172.0	0.0	0.0	1.0	0.0	3.0	0
52.0	1.0	4.0	128.0	255.0	0.0	0.0	161.0	1.0	0.0	1.0	1.0	7.0	1
59.0	1.0	4.0	110.0	239.0	0.0	2.0	142.0	1.0	1.2	2.0	1.0	7.0	2
60.0	0.0	4.0	150.0	258.0	0.0	2.0	157.0	0.0	2.6	2.0	2.0	7.0	3
52.0	1.0	2.0	134.0	201.0	0.0	0.0	158.0	0.0	0.8	1.0	1.0	3.0	0
48.0	1.0	4.0	122.0	222.0	0.0	2.0	186.0	0.0	0.0	1.0	0.0	3.0	0
45.0	1.0	4.0	115.0	260.0	0.0	2.0	185.0	0.0	0.0	1.0	0.0	3.0	0
34.0	1.0	1.0	118.0	182.0	0.0	2.0	174.0	0.0	0.0	1.0	0.0	3.0	0
57.0	0.0	4.0	128.0	303.0	0.0	2.0	159.0	0.0	0.0	1.0	1.0	3.0	0
71.0	0.0	3.0	110.0	265.0	1.0	2.0	130.0	0.0	0.0	1.0	1.0	3.0	0

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
49.0	1.0	3.0	120.0	188.0	0.0	0.0	139.0	0.0	2.0	2.0	3.0	7.0	3
54.0	1.0	2.0	108.0	309.0	0.0	0.0	156.0	0.0	0.0	1.0	0.0	7.0	0
59.0	1.0	4.0	140.0	177.0	0.0	0.0	162.0	1.0	0.0	1.0	1.0	7.0	2
57.0	1.0	3.0	128.0	229.0	0.0	2.0	150.0	0.0	0.4	2.0	1.0	7.0	1
61.0	1.0	4.0	120.0	260.0	0.0	0.0	140.0	1.0	3.6	2.0	1.0	7.0	2
39.0	1.0	4.0	118.0	219.0	0.0	0.0	219.0	0.0	1.2	2.0	0.0	7.0	3
61.0	0.0	4.0	145.0	307.0	0.0	2.0	146.0	1.0	1.0	2.0	0.0	7.0	1
56.0	1.0	4.0	125.0	249.0	1.0	2.0	144.0	1.0	1.2	2.0	1.0	3.0	1
52.0	1.0	1.0	118.0	186.0	0.0	2.0	190.0	0.0	0.0	2.0	0.0	6.0	0
43.0	0.0	4.0	132.0	341.0	1.0	2.0	136.0	1.0	3.0	2.0	0.0	7.0	2
62.0	0.0	3.0	130.0	263.0	0.0	0.0	97.0	0.0	1.2	2.0	1.0	7.0	2
41.0	1.0	2.0	135.0	203.0	0.0	0.0	132.0	0.0	0.0	2.0	0.0	6.0	0
58.0	1.0	3.0	140.0	211.0	1.0	2.0	165.0	0.0	0.0	1.0	0.0	3.0	0
35.0	0.0	4.0	138.0	183.0	0.0	0.0	182.0	0.0	1.4	1.0	0.0	3.0	0
63.0	1.0	4.0	130.0	330.0	1.0	2.0	132.0	1.0	1.8	1.0	3.0	7.0	3
65.0	1.0	4.0	135.0	254.0	0.0	2.0	254.0	0.0	2.8	2.0	1.0	7.0	2
48.0	1.0	4.0	130.0	256.0	1.0	2.0	150.0	1.0	0.0	1.0	2.0	7.0	3
63.0	0.0	4.0	150.0	407.0	0.0	2.0	154.0	0.0	4.0	2.0	3.0	7.0	4
51.0	1.0	3.0	100.0	222.0	0.0	0.0	143.0	1.0	1.2	2.0	0.0	3.0	0
55.0	1.0	4.0	140.0	217.0	0.0	0.0	111.0	1.0	5.6	3.0	0.0	7.0	3
65.0	1.0	1.0	138.0	282.0	1.0	2.0	282.0	0.0	1.4	2.0	1.0	3.0	1
45.0	0.0	2.0	130.0	234.0	0.0	2.0	175.0	0.0	0.6	2.0	0.0	3.0	0
56.0	0.0	4.0	200.0	288.0	1.0	2.0	288.0	1.0	4.0	3.0	2.0	7.0	3
54.0	1.0	4.0	110.0	239.0	0.0	0.0	126.0	1.0	2.8	2.0	1.0	7.0	3
44.0	1.0	2.0	120.0	220.0	0.0	0.0	170.0	0.0	0.0	1.0	0.0	3.0	0
62.0	0.0	4.0	124.0	209.0	0.0	0.0	209.0	0.0	0.0	1.0	0.0	3.0	0
54.0	1.0	3.0	120.0	258.0	0.0	2.0	147.0	0.0	0.4	2.0	0.0	7.0	0
51.0	1.0	3.0	94.0	227.0	0.0	0.0	154.0	1.0	0.0	1.0	1.0	7.0	0
29.0	1.0	2.0	130.0	204.0	0.0	2.0	202.0	0.0	0.0	1.0	0.0	3.0	0
51.0	1.0	4.0	140.0	261.0	0.0	2.0	186.0	1.0	0.0	1.0	0.0	3.0	0
43.0	0.0	3.0	122.0	213.0	0.0	0.0	165.0	0.0	0.2	2.0	0.0	3.0	0
55.0	0.0	2.0	135.0	250.0	0.0	2.0	161.0	0.0	1.4	2.0	0.0	3.0	0
70.0	1.0	4.0	145.0	174.0	0.0	0.0	125.0	1.0	2.6	3.0	0.0	7.0	4
62.0	1.0	2.0	120.0	281.0	0.0	2.0	103.0	0.0	1.4	2.0	1.0	7.0	3
35.0	1.0	4.0	120.0	198.0	0.0	0.0	130.0	1.0	1.6	2.0	0.0	7.0	1
51.0	1.0	3.0	125.0	245.0	1.0	2.0	166.0	0.0	2.4	2.0	0.0	3.0	0
59.0	1.0	2.0	140.0	221.0	0.0	0.0	164.0	1.0	0.0	1.0	0.0	3.0	0
59.0	1.0	1.0	170.0	288.0	0.0	2.0	159.0	0.0	0.2	2.0	0.0	7.0	1
52.0	1.0	2.0	128.0	205.0	1.0	0.0	184.0	0.0	0.0	1.0	0.0	3.0	0
64.0	1.0	3.0	125.0	309.0	0.0	0.0	131.0	1.0	1.8	2.0	0.0	7.0	1
58.0	1.0	3.0	105.0	240.0	0.0	2.0	154.0	1.0	0.6	2.0	0.0	7.0	0
47.0	1.0	3.0	108.0	243.0	0.0	0.0	152.0	0.0	0.0	1.0	0.0	3.0	1
57.0	1.0	4.0	165.0	289.0	1.0	2.0	124.0	0.0	1.0	2.0	3.0	7.0	4
41.0	1.0	3.0	112.0	250.0	0.0	0.0	179.0	0.0	0.0	1.0	0.0	3.0	0
45.0	1.0	2.0	128.0	308.0	0.0	2.0	170.0	0.0	0.0	1.0	0.0	3.0	0
60.0	0.0	3.0	102.0	318.0	0.0	0.0	160.0	0.0	0.0	1.0	1.0	3.0	0
52.0	1.0	1.0	152.0	298.0	1.0	0.0	178.0	0.0	1.2	2.0	0.0	7.0	0
42.0	0.0	4.0	102.0	265.0	0.0	2.0	122.0	0.0	0.6	2.0	0.0	3.0	0
67.0	0.0	3.0	115.0	564.0	0.0	2.0	564.0	0.0	1.6	2.0	0.0	7.0	0
55.0	1.0	4.0	160.0	289.0	0.0	2.0	145.0	1.0	0.8	2.0	1.0	7.0	4
64.0	1.0	4.0	120.0	246.0	0.0	2.0	96.0	1.0	2.2	3.0	1.0	3.0	3
70.0	1.0	4.0	130.0	322.0	0.0	2.0	109.0	0.0	2.4	2.0	3.0	3.0	1

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
51.0	1.0	4.0	140.0	299.0	0.0	0.0	173.0	1.0	1.6	1.0	0.0	7.0	1
58.0	1.0	4.0	125.0	300.0	0.0	2.0	171.0	0.0	0.0	1.0	2.0	7.0	1
60.0	1.0	4.0	140.0	293.0	0.0	2.0	170.0	0.0	1.2	2.0	2.0	7.0	2
68.0	1.0	3.0	118.0	277.0	0.0	0.0	151.0	0.0	1.0	1.0	1.0	7.0	0
46.0	1.0	2.0	101.0	197.0	1.0	0.0	156.0	0.0	0.0	1.0	0.0	7.0	0
77.0	1.0	4.0	125.0	304.0	0.0	2.0	162.0	1.0	0.0	1.0	3.0	3.0	4
54.0	0.0	3.0	110.0	214.0	0.0	0.0	158.0	0.0	1.6	2.0	0.0	3.0	0
58.0	0.0	4.0	100.0	248.0	0.0	2.0	122.0	0.0	1.0	2.0	0.0	3.0	0
48.0	1.0	3.0	124.0	255.0	1.0	0.0	175.0	0.0	0.0	1.0	2.0	3.0	0
57.0	1.0	4.0	132.0	207.0	0.0	0.0	168.0	1.0	0.0	1.0	0.0	7.0	0
52.0	1.0	3.0	138.0	223.0	0.0	0.0	169.0	0.0	0.0	1.0	?	3.0	0
54.0	0.0	2.0	132.0	288.0	1.0	2.0	159.0	1.0	0.0	1.0	1.0	3.0	0
35.0	1.0	4.0	126.0	282.0	0.0	2.0	156.0	1.0	0.0	1.0	0.0	7.0	1
45.0	0.0	2.0	112.0	160.0	0.0	0.0	138.0	0.0	0.0	2.0	0.0	3.0	0
70.0	1.0	3.0	160.0	269.0	0.0	0.0	112.0	1.0	2.9	2.0	1.0	7.0	3
53.0	1.0	4.0	142.0	226.0	0.0	2.0	111.0	1.0	0.0	1.0	0.0	7.0	0
59.0	0.0	4.0	174.0	249.0	0.0	0.0	143.0	1.0	0.0	2.0	0.0	3.0	1
62.0	0.0	4.0	140.0	394.0	0.0	2.0	157.0	0.0	1.2	2.0	0.0	3.0	0
64.0	1.0	4.0	145.0	212.0	0.0	2.0	132.0	0.0	2.0	2.0	2.0	6.0	4
57.0	1.0	4.0	152.0	274.0	0.0	0.0	88.0	1.0	1.2	2.0	1.0	7.0	1
52.0	1.0	4.0	108.0	233.0	1.0	0.0	147.0	0.0	0.1	1.0	3.0	7.0	0
56.0	1.0	4.0	132.0	184.0	0.0	2.0	105.0	1.0	2.1	2.0	1.0	6.0	1
43.0	1.0	3.0	130.0	315.0	0.0	0.0	162.0	0.0	1.9	1.0	1.0	3.0	0
53.0	1.0	3.0	130.0	246.0	1.0	2.0	173.0	0.0	0.0	1.0	3.0	3.0	0
48.0	1.0	4.0	124.0	274.0	0.0	2.0	166.0	0.0	0.5	2.0	0.0	7.0	3
56.0	0.0	4.0	134.0	409.0	0.0	2.0	150.0	1.0	1.9	2.0	2.0	7.0	2
42.0	1.0	1.0	148.0	244.0	0.0	2.0	178.0	0.0	0.8	1.0	2.0	3.0	0
59.0	1.0	1.0	178.0	270.0	0.0	2.0	145.0	0.0	4.2	3.0	0.0	7.0	0
60.0	0.0	4.0	158.0	305.0	0.0	2.0	161.0	0.0	0.0	1.0	0.0	3.0	1
63.0	0.0	2.0	140.0	195.0	0.0	0.0	179.0	0.0	0.0	1.0	2.0	3.0	0
42.0	1.0	3.0	120.0	240.0	1.0	0.0	194.0	0.0	0.8	3.0	0.0	7.0	0
66.0	1.0	2.0	160.0	246.0	0.0	0.0	120.0	1.0	0.0	2.0	3.0	6.0	2
54.0	1.0	2.0	192.0	283.0	0.0	2.0	195.0	0.0	0.0	1.0	1.0	7.0	1
69.0	1.0	3.0	140.0	254.0	0.0	2.0	146.0	0.0	2.0	2.0	3.0	7.0	2
50.0	1.0	3.0	129.0	196.0	0.0	0.0	163.0	0.0	0.0	1.0	0.0	3.0	0
51.0	1.0	4.0	140.0	298.0	0.0	0.0	122.0	1.0	4.2	2.0	3.0	7.0	3
43.0	1.0	4.0	132.0	247.0	1.0	2.0	143.0	1.0	0.1	2.0	?	7.0	1
62.0	0.0	4.0	138.0	294.0	1.0	0.0	106.0	0.0	1.9	2.0	3.0	3.0	2
68.0	0.0	3.0	120.0	211.0	0.0	2.0	115.0	0.0	1.5	2.0	0.0	3.0	0
67.0	1.0	4.0	100.0	299.0	0.0	2.0	125.0	1.0	0.9	2.0	2.0	3.0	3
69.0	1.0	1.0	160.0	234.0	1.0	2.0	131.0	0.0	0.1	2.0	1.0	3.0	0
45.0	0.0	4.0	138.0	236.0	0.0	2.0	152.0	1.0	0.2	2.0	0.0	3.0	0
50.0	0.0	2.0	120.0	244.0	0.0	0.0	162.0	0.0	1.1	1.0	0.0	3.0	0
59.0	1.0	1.0	160.0	273.0	0.0	2.0	125.0	0.0	0.0	1.0	0.0	3.0	1
50.0	0.0	4.0	110.0	254.0	0.0	2.0	159.0	0.0	0.0	1.0	0.0	3.0	0
64.0	0.0	4.0	180.0	325.0	0.0	0.0	154.0	1.0	0.0	1.0	0.0	3.0	0
57.0	1.0	3.0	150.0	126.0	1.0	0.0	173.0	0.0	0.2	1.0	1.0	7.0	0
64.0	0.0	3.0	140.0	313.0	0.0	0.0	133.0	0.0	0.2	1.0	0.0	7.0	0
43.0	1.0	4.0	110.0	211.0	0.0	0.0	161.0	0.0	0.0	1.0	0.0	7.0	0
45.0	1.0	4.0	142.0	309.0	0.0	2.0	147.0	1.0	0.0	2.0	3.0	7.0	3
58.0	1.0	4.0	128.0	259.0	0.0	2.0	130.0	1.0	3.0	2.0	2.0	7.0	3
50.0	1.0	4.0	144.0	200.0	0.0	2.0	126.0	1.0	0.9	2.0	0.0	7.0	3

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
55.0	1.0	2.0	130.0	262.0	0.0	0.0	155.0	0.0	0.0	1.0	0.0	3.0	0
62.0	0.0	4.0	150.0	244.0	0.0	0.0	154.0	1.0	1.4	2.0	0.0	3.0	1
37.0	0.0	3.0	120.0	215.0	0.0	0.0	170.0	0.0	0.0	1.0	0.0	3.0	0
38.0	1.0	1.0	120.0	231.0	0.0	0.0	182.0	1.0	3.8	2.0	0.0	7.0	4
41.0	1.0	3.0	130.0	214.0	0.0	2.0	168.0	0.0	2.0	2.0	0.0	3.0	0
66.0	0.0	4.0	178.0	228.0	1.0	0.0	225.0	1.0	1.0	2.0	2.0	7.0	3
52.0	1.0	4.0	112.0	230.0	0.0	0.0	160.0	0.0	0.0	1.0	1.0	3.0	1
56.0	1.0	1.0	120.0	193.0	0.0	2.0	162.0	0.0	1.9	2.0	0.0	7.0	0
46.0	0.0	2.0	105.0	204.0	0.0	0.0	172.0	0.0	0.0	1.0	0.0	3.0	0
46.0	0.0	4.0	138.0	243.0	0.0	2.0	152.0	1.0	0.0	2.0	0.0	3.0	0
64.0	0.0	4.0	130.0	303.0	0.0	0.0	303.0	0.0	2.0	2.0	2.0	3.0	0
59.0	1.0	4.0	138.0	271.0	0.0	2.0	182.0	0.0	0.0	1.0	0.0	3.0	0
41.0	0.0	3.0	112.0	268.0	0.0	2.0	172.0	1.0	0.0	1.0	0.0	3.0	0
54.0	0.0	3.0	108.0	267.0	0.0	2.0	167.0	0.0	0.0	1.0	0.0	3.0	0
39.0	0.0	3.0	94.0	199.0	0.0	0.0	179.0	0.0	0.0	1.0	0.0	3.0	0
53.0	1.0	4.0	123.0	282.0	0.0	0.0	95.0	1.0	2.0	2.0	2.0	7.0	3
63.0	0.0	4.0	108.0	269.0	0.0	0.0	169.0	1.0	1.8	2.0	2.0	3.0	1
34.0	0.0	2.0	118.0	210.0	0.0	0.0	192.0	0.0	0.7	1.0	0.0	3.0	0
47.0	1.0	4.0	112.0	204.0	0.0	0.0	143.0	0.0	0.1	1.0	0.0	3.0	0
67.0	0.0	3.0	152.0	277.0	0.0	0.0	172.0	0.0	0.0	1.0	1.0	3.0	0
54.0	1.0	4.0	110.0	206.0	0.0	2.0	208.0	1.0	0.0	2.0	1.0	3.0	3
66.0	1.0	4.0	112.0	212.0	0.0	2.0	132.0	1.0	0.1	1.0	1.0	3.0	2
52.0	0.0	3.0	136.0	196.0	0.0	2.0	169.0	0.0	0.1	2.0	0.0	3.0	0
55.0	0.0	4.0	180.0	327.0	0.0	1.0	117.0	1.0	3.4	2.0	0.0	3.0	2
49.0	1.0	3.0	118.0	149.0	0.0	2.0	126.0	0.0	0.8	1.0	3.0	3.0	1
74.0	0.0	2.0	120.0	269.0	0.0	2.0	121.0	1.0	0.2	1.0	1.0	3.0	0
54.0	0.0	3.0	160.0	201.0	0.0	0.0	163.0	0.0	0.0	1.0	1.0	3.0	0
54.0	1.0	4.0	122.0	286.0	0.0	2.0	116.0	1.0	3.2	2.0	2.0	3.0	3
56.0	1.0	4.0	130.0	283.0	1.0	2.0	103.0	1.0	1.6	3.0	0.0	7.0	2
46.0	1.0	4.0	120.0	249.0	0.0	2.0	144.0	0.0	0.8	1.0	0.0	7.0	1
49.0	0.0	2.0	134.0	271.0	0.0	0.0	162.0	0.0	0.0	2.0	0.0	3.0	0
42.0	1.0	2.0	120.0	295.0	0.0	0.0	162.0	0.0	0.0	1.0	0.0	3.0	0
41.0	1.0	2.0	110.0	235.0	0.0	0.0	153.0	0.0	0.0	1.0	0.0	3.0	0
41.0	0.0	2.0	126.0	306.0	0.0	0.0	163.0	0.0	0.0	1.0	0.0	3.0	0
49.0	0.0	4.0	130.0	269.0	0.0	0.0	163.0	0.0	0.0	1.0	0.0	3.0	0
61.0	1.0	1.0	134.0	234.0	0.0	0.0	145.0	0.0	2.6	2.0	2.0	3.0	2
60.0	0.0	3.0	120.0	178.0	1.0	0.0	96.0	0.0	0.0	1.0	0.0	3.0	0
67.0	1.0	4.0	120.0	237.0	0.0	0.0	71.0	0.0	1.0	2.0	0.0	3.0	2
58.0	1.0	4.0	100.0	234.0	0.0	0.0	156.0	0.0	0.1	1.0	1.0	7.0	2
47.0	1.0	4.0	110.0	275.0	0.0	2.0	118.0	1.0	1.0	2.0	1.0	3.0	1
52.0	1.0	4.0	125.0	212.0	0.0	0.0	168.0	0.0	1.0	1.0	2.0	7.0	3
62.0	1.0	2.0	128.0	208.0	1.0	2.0	140.0	0.0	0.0	1.0	0.0	3.0	0
57.0	1.0	4.0	110.0	201.0	0.0	0.0	126.0	1.0	1.5	2.0	0.0	6.0	0
58.0	1.0	4.0	146.0	218.0	0.0	0.0	105.0	0.0	2.0	2.0	1.0	7.0	1
64.0	1.0	4.0	128.0	263.0	0.0	0.0	105.0	1.0	0.2	2.0	1.0	7.0	0
51.0	0.0	3.0	120.0	295.0	0.0	2.0	157.0	0.0	0.6	1.0	0.0	3.0	0
43.0	1.0	4.0	115.0	303.0	0.0	0.0	181.0	0.0	1.2	2.0	0.0	3.0	0
42.0	0.0	3.0	120.0	209.0	0.0	0.0	173.0	0.0	0.0	2.0	0.0	3.0	0
67.0	0.0	4.0	106.0	223.0	0.0	0.0	142.0	0.0	0.3	1.0	2.0	3.0	0
76.0	0.0	3.0	140.0	197.0	0.0	1.0	116.0	0.0	1.1	2.0	0.0	3.0	0
70.0	1.0	2.0	156.0	245.0	0.0	2.0	143.0	0.0	0.0	1.0	0.0	3.0	0
57.0	1.0	2.0	124.0	261.0	0.0	0.0	141.0	0.0	0.3	1.0	0.0	7.0	1



Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
44.0	0.0	3.0	118.0	242.0	0.0	0.0	149.0	0.0	0.3	2.0	1.0	3.0	0
58.0	0.0	2.0	136.0	319.0	1.0	2.0	152.0	0.0	0.0	1.0	2.0	3.0	3
60.0	0.0	1.0	150.0	240.0	0.0	0.0	171.0	0.0	0.9	1.0	0.0	3.0	0
44.0	1.0	3.0	120.0	226.0	0.0	0.0	169.0	0.0	0.0	1.0	0.0	3.0	0
61.0	1.0	4.0	138.0	166.0	0.0	2.0	125.0	1.0	3.6	2.0	1.0	3.0	4
42.0	1.0	4.0	136.0	315.0	0.0	0.0	315.0	1.0	1.8	2.0	0.0	6.0	2
52.0	1.0	4.0	128.0	204.0	1.0	0.0	156.0	1.0	1.0	2.0	0.0	?	2
59.0	1.0	3.0	126.0	218.0	1.0	0.0	134.0	0.0	2.2	2.0	1.0	6.0	2
40.0	1.0	4.0	152.0	223.0	0.0	0.0	181.0	0.0	0.0	1.0	0.0	7.0	1
42.0	1.0	3.0	130.0	180.0	0.0	0.0	150.0	0.0	0.0	1.0	0.0	3.0	0
61.0	1.0	4.0	140.0	207.0	0.0	2.0	138.0	1.0	1.9	1.0	1.0	7.0	1
66.0	1.0	4.0	160.0	228.0	0.0	2.0	138.0	0.0	2.3	1.0	0.0	6.0	0
46.0	1.0	4.0	140.0	311.0	0.0	0.0	120.0	1.0	1.8	2.0	2.0	7.0	2
71.0	0.0	4.0	112.0	149.0	0.0	0.0	125.0	0.0	1.6	2.0	0.0	3.0	0
59.0	1.0	1.0	134.0	204.0	0.0	0.0	162.0	0.0	0.8	1.0	2.0	3.0	1
64.0	1.0	1.0	170.0	227.0	0.0	2.0	155.0	0.0	0.6	2.0	0.0	7.0	0
66.0	0.0	3.0	146.0	278.0	0.0	2.0	152.0	0.0	0.0	2.0	1.0	3.0	0
39.0	0.0	3.0	138.0	220.0	0.0	0.0	152.0	0.0	0.0	2.0	0.0	3.0	0
57.0	1.0	2.0	154.0	232.0	0.0	2.0	164.0	0.0	0.0	1.0	1.0	3.0	1
58.0	0.0	4.0	130.0	197.0	0.0	0.0	131.0	0.0	0.6	2.0	0.0	3.0	0
57.0	1.0	4.0	110.0	335.0	0.0	0.0	335.0	1.0	3.0	2.0	1.0	7.0	2
47.0	1.0	3.0	130.0	253.0	0.0	0.0	179.0	0.0	0.0	1.0	0.0	3.0	0
55.0	0.0	4.0	128.0	205.0	0.0	1.0	130.0	1.0	2.0	2.0	1.0	7.0	3
35.0	1.0	2.0	122.0	192.0	0.0	0.0	174.0	0.0	0.0	1.0	0.0	3.0	0
61.0	1.0	4.0	148.0	203.0	0.0	0.0	161.0	0.0	0.0	1.0	1.0	7.0	2
58.0	1.0	4.0	114.0	318.0	0.0	1.0	140.0	0.0	4.4	3.0	3.0	6.0	4
58.0	0.0	4.0	170.0	225.0	1.0	2.0	146.0	1.0	2.8	2.0	2.0	6.0	2
58.0	1.0	2.0	125.0	220.0	0.0	0.0	144.0	0.0	0.4	2.0	?	7.0	0
56.0	1.0	2.0	130.0	221.0	0.0	2.0	163.0	0.0	0.0	1.0	0.0	7.0	0
56.0	1.0	2.0	120.0	240.0	0.0	0.0	169.0	0.0	0.0	3.0	0.0	3.0	0
67.0	1.0	3.0	152.0	212.0	0.0	2.0	150.0	0.0	0.8	2.0	0.0	7.0	1
55.0	0.0	2.0	132.0	342.0	0.0	0.0	166.0	0.0	1.2	1.0	0.0	3.0	0
44.0	1.0	4.0	120.0	169.0	0.0	0.0	144.0	1.0	2.8	3.0	0.0	6.0	2
63.0	1.0	4.0	140.0	187.0	0.0	2.0	144.0	1.0	4.0	1.0	2.0	7.0	2
63.0	0.0	4.0	124.0	197.0	0.0	0.0	136.0	1.0	0.0	2.0	0.0	3.0	1
41.0	1.0	2.0	120.0	157.0	0.0	0.0	182.0	0.0	0.0	1.0	0.0	3.0	0
59.0	1.0	4.0	164.0	176.0	1.0	2.0	90.0	0.0	1.0	2.0	2.0	6.0	3
57.0	0.0	4.0	140.0	241.0	0.0	0.0	123.0	1.0	0.2	2.0	0.0	7.0	1
45.0	1.0	1.0	110.0	264.0	0.0	0.0	132.0	0.0	1.2	2.0	0.0	7.0	1
68.0	1.0	4.0	144.0	193.0	1.0	0.0	141.0	0.0	3.4	2.0	2.0	7.0	2
57.0	1.0	4.0	130.0	131.0	0.0	0.0	115.0	1.0	1.2	2.0	1.0	7.0	3
57.0	0.0	2.0	130.0	236.0	0.0	2.0	174.0	0.0	0.0	2.0	1.0	3.0	1
38.0	1.0	3.0	138.0	175.0	0.0	0.0	173.0	0.0	0.0	1.0	?	3.0	0
28	1	2	130	132	0	2	185	0	0	?	?	?	0
29	1	2	120	243	0	0	160	0	0	?	?	?	0
29	1	2	140	?	0	0	170	0	0	?	?	?	0
30	0	1	170	237	?	1	170	0	0	?	?	6	0
31	0	2	100	219	0	1	150	0	0	?	?	?	0
32	0	2	105	198	0	0	165	0	0	?	?	?	0
32	1	2	110	225	0	0	184	0	0	?	?	?	0
32	1	2	125	254	0	0	155	0	0	?	?	?	0
33	1	3	120	298	0	0	185	0	0	?	?	?	0

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
34	0	2	130	161	0	0	190	0	0	?	?	?	0
34	1	2	150	214	0	1	168	0	0	?	?	?	0
34	1	2	98	220	0	0	220	0	0	?	?	?	0
35	0	1	120	160	0	1	185	0	0	?	?	?	0
35	0	4	140	167	0	0	150	0	0	?	?	?	0
35	1	2	120	308	0	2	308	0	0	?	?	?	0
35	1	2	150	264	0	0	168	0	0	?	?	?	0
36	1	2	120	166	0	0	180	0	0	?	?	?	0
36	1	3	112	340	0	0	184	0	1	2	?	3	0
36	1	3	130	209	0	0	178	0	0	?	?	?	0
36	1	3	150	160	0	0	160	0	0	?	?	?	0
37	0	2	120	260	0	0	130	0	0	?	?	?	0
37	0	3	130	211	0	0	142	0	0	?	?	?	0
37	0	4	130	173	0	1	184	0	0	?	?	?	0
37	1	2	130	283	0	1	98	0	0	?	?	?	0
37	1	3	130	194	0	0	190	0	0	?	?	?	0
37	1	4	120	223	0	0	168	0	0	?	?	3	0
37	1	4	130	315	0	0	158	0	0	?	?	?	0
38	0	2	120	275	?	0	129	0	0	?	?	?	0
38	1	2	140	297	0	0	150	0	0	?	?	?	0
38	1	3	145	292	0	0	292	0	0	?	?	?	0
39	0	3	110	182	0	1	180	0	0	?	?	?	0
39	1	2	120	?	0	1	146	0	2	1	?	?	0
39	1	2	120	200	0	0	160	1	1	2	?	?	0
39	1	2	120	204	0	0	145	0	0	?	?	?	0
39	1	2	130	?	0	0	120	0	0	?	?	?	0
39	1	2	190	241	0	0	106	0	0	?	?	?	0
39	1	3	120	339	0	0	170	0	0	?	?	?	0
39	1	3	160	147	1	0	160	0	0	?	?	?	0
39	1	4	110	273	0	0	132	0	0	?	?	?	0
39	1	4	130	307	0	0	307	0	0	?	?	?	0
40	1	2	130	275	0	0	150	0	0	?	?	?	0
40	1	2	140	289	0	0	172	0	0	?	?	?	0
40	1	3	130	215	0	0	138	0	0	?	?	?	0
40	1	3	130	281	0	0	167	0	0	?	?	?	0
40	1	3	140	?	0	0	188	0	0	?	?	?	0
41	0	2	110	250	0	1	142	0	0	?	?	?	0
41	0	2	125	184	0	0	180	0	0	?	?	?	0
41	0	2	130	245	0	0	245	0	0	?	?	?	0
41	1	2	120	291	0	1	160	0	0	?	?	?	0
41	1	2	120	295	0	0	295	0	0	?	?	?	0
41	1	2	125	269	0	0	144	0	0	?	?	?	0
41	1	4	112	250	0	0	142	0	0	?	?	?	0
42	0	3	115	211	0	1	137	0	0	?	?	?	0
42	1	2	120	196	0	0	150	0	0	?	?	?	0
42	1	2	120	198	0	0	195	0	0	?	?	?	0
42	1	2	150	268	0	0	136	0	0	?	?	?	0
42	1	3	120	228	0	0	152	1	1.5	2	?	?	0
42	1	3	160	147	0	0	146	0	0	?	?	?	0
42	1	4	140	358	0	0	170	0	0	?	?	?	0
43	0	1	100	223	0	0	223	0	0	?	?	?	0
43	0	2	120	201	0	0	165	0	0	?	?	?	0

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
43	0	2	120	215	0	1	175	0	0	?	?	?	0
43	0	2	120	249	0	1	176	0	0	?	?	?	0
43	0	2	120	266	0	0	266	0	0	118	?	?	0
43	0	2	150	186	0	0	154	0	0	?	?	?	0
43	0	3	150	?	0	0	175	0	0	?	?	3	0
43	1	2	142	207	0	0	207	0	0	138	?	?	0
44	0	4	120	218	0	1	115	0	0	?	?	?	0
44	1	2	120	184	0	0	184	0	1	142	?	?	0
44	1	2	130	215	0	0	135	0	0	?	?	?	0
44	1	4	150	412	0	0	170	0	0	?	?	?	0
45	0	2	130	237	0	0	237	0	0	170	?	?	0
45	0	2	180	?	0	0	180	0	0	?	?	?	0
45	0	4	132	297	0	0	297	0	0	144	?	?	0
45	1	2	140	224	1	0	122	0	0	?	?	?	0
45	1	3	135	?	0	0	110	0	0	?	?	?	0
45	1	4	120	225	0	0	225	0	0	140	?	?	0
45	1	4	140	224	0	0	144	0	0	?	?	?	0
46	0	4	130	238	0	0	238	0	0	90	?	?	0
46	1	2	140	275	0	0	165	1	0	?	?	?	0
46	1	3	120	230	0	0	150	0	0	?	?	?	0
46	1	3	150	163	?	0	163	0	0	116	?	?	0
46	1	4	110	238	0	1	140	1	1	2	?	3	0
46	1	4	110	240	0	1	140	0	0	?	?	3	0
46	1	4	180	280	0	1	120	0	0	?	?	?	0
47	0	2	140	257	0	0	135	0	1	1	?	?	0
47	0	3	130	?	0	0	145	0	2	2	?	?	0
47	1	1	110	249	0	0	150	0	0	?	?	?	0
47	1	2	160	263	0	0	174	0	0	?	?	?	0
47	1	4	140	276	1	0	125	1	0	?	?	?	0
48	0	2	?	308	0	1	?	?	2	1	?	?	0
48	0	2	120	?	1	1	148	0	0	?	?	?	0
48	0	2	120	284	0	0	120	0	0	?	?	?	0
48	0	3	120	195	0	0	125	0	0	?	?	?	0
48	0	4	108	163	0	0	175	?	2	1	?	?	0
48	0	4	120	254	0	1	110	0	0	?	?	?	0
48	0	4	150	227	0	0	130	1	1	2	?	?	0
48	1	2	100	?	0	0	100	?	0	?	?	?	0
48	1	2	130	245	0	0	160	0	0	?	?	?	0
48	1	2	140	238	0	0	238	0	0	?	?	?	0
48	1	3	110	211	0	0	138	0	0	?	?	6	0
49	0	2	110	?	0	0	160	0	0	?	?	?	0
49	0	2	110	?	0	0	160	0	0	?	?	?	0
49	0	2	124	201	0	0	164	0	0	?	?	?	0
49	0	3	130	207	0	1	135	0	0	?	?	?	0
49	1	2	100	253	0	0	174	0	0	?	?	?	0
49	1	3	140	187	0	0	182	0	0	?	?	?	0
49	1	4	120	297	?	0	132	0	1	2	?	?	0
49	1	4	140	?	0	0	130	0	0	?	?	?	0
50	0	2	110	202	0	0	202	0	0	145	?	?	0
50	0	4	120	328	0	0	110	1	1	2	?	?	0
50	1	2	120	168	0	0	160	0	0	?	?	?	0
50	1	2	140	216	0	0	170	0	0	?	?	3	0

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
50	1	2	170	209	0	1	116	0	0	?	?	?	0
50	1	4	140	129	0	0	135	0	0	?	?	?	0
50	1	4	150	215	0	0	215	1	0	?	?	?	0
51	0	2	160	194	0	0	170	0	0	?	?	?	0
51	0	3	110	190	0	0	120	0	0	?	?	?	0
51	0	3	130	220	0	0	160	1	2	?	?	?	0
51	0	3	150	200	0	0	120	0	0.5	1	?	?	0
51	1	2	125	188	0	0	185	0	0	?	?	?	0
51	1	2	130	224	0	0	150	0	0	?	?	?	0
51	1	4	130	179	0	0	100	0	0	?	?	?	0
52	0	2	120	210	0	0	210	0	0	?	?	?	0
52	0	2	140	?	0	0	140	0	0	?	?	?	0
52	0	3	125	272	0	0	139	0	0	?	?	?	0
52	0	4	130	180	0	0	140	1	1.5	2	?	?	0
52	1	2	120	284	0	0	118	0	0	?	?	?	0
52	1	2	140	100	0	0	138	1	0	?	?	?	0
52	1	2	160	196	0	0	165	0	0	?	?	?	0
52	1	3	140	259	0	1	170	0	0	?	?	?	0
53	0	2	113	468	?	0	127	0	0	?	?	?	0
53	0	2	140	216	0	0	142	1	2	?	?	?	0
53	0	3	120	274	0	0	130	0	0	?	?	?	0
53	1	2	120	?	0	0	132	0	0	?	?	?	0
53	1	2	140	320	0	0	162	0	0	?	?	?	0
53	1	3	120	195	0	0	140	0	0	?	?	?	0
53	1	4	124	260	0	1	112	1	3	?	?	?	0
53	1	4	130	182	0	0	182	0	0	?	?	?	0
53	1	4	140	243	0	0	155	0	0	?	?	?	0
54	0	2	120	221	0	0	138	0	1	?	?	?	0
54	0	2	120	230	1	0	140	0	0	?	?	?	0
54	0	2	120	273	0	0	150	0	1.5	?	?	?	0
54	0	2	130	253	0	1	155	0	0	?	?	?	0
54	0	2	140	309	?	1	140	0	0	?	?	?	0
54	0	2	150	230	0	0	130	0	0	?	?	?	0
54	0	2	160	312	0	0	130	0	0	?	?	?	0
54	1	1	120	171	0	0	137	0	2	?	?	?	0
54	1	2	110	208	0	0	142	0	0	?	?	?	0
54	1	2	120	238	0	0	154	0	0	?	?	?	0
54	1	2	120	246	0	0	110	0	0	?	?	?	0
54	1	2	160	195	0	1	130	0	1	?	?	?	0
54	1	2	160	305	0	0	175	0	0	?	?	?	0
54	1	3	120	217	0	0	137	0	0	?	?	?	0
54	1	3	150	?	0	0	122	0	0	?	?	?	0
54	1	4	150	365	0	1	134	0	1	?	?	?	0
55	0	2	110	344	0	1	160	0	0	?	?	?	0
55	0	2	122	320	0	0	155	0	0	?	?	?	0
55	0	2	130	394	0	2	150	0	0	?	?	?	0
55	1	2	120	256	1	0	137	0	0	?	?	?	0
55	1	2	140	196	0	0	150	0	0	?	?	?	0
55	1	2	145	326	0	0	155	0	0	?	?	?	0
55	1	3	110	277	0	0	160	0	0	?	?	?	0
55	1	3	120	220	0	2	134	0	0	?	?	?	0
55	1	4	120	270	0	0	140	0	0	?	?	?	0

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
55	1	4	140	229	0	0	110	1	0.5	2	?	?	0
56	0	3	130	219	?	1	164	0	0	?	?	?	0
56	1	2	130	184	0	0	100	0	0	?	?	?	0
56	1	3	130	?	0	0	114	0	0	?	?	?	0
56	1	3	130	276	0	0	128	1	1	1	?	6	0
56	1	4	120	85	0	0	85	0	0	140	?	?	0
57	0	1	130	308	0	0	98	0	1	2	?	?	0
57	0	4	180	347	0	1	126	1	0.8	2	?	?	0
57	1	2	140	260	1	0	140	0	0	?	?	6	0
58	1	2	130	230	0	0	150	0	0	?	?	?	0
58	1	2	130	251	0	0	110	0	0	?	?	?	0
58	1	3	140	179	0	0	160	0	0	?	?	?	0
58	1	4	135	222	0	0	100	0	0	?	?	?	0
59	0	2	130	188	0	0	124	0	1	2	?	?	0
59	1	2	140	287	0	0	150	0	0	?	?	?	0
59	1	3	130	318	0	0	120	1	1	2	?	3	0
59	1	3	180	213	0	0	100	0	0	?	?	?	0
59	1	4	140	?	0	0	140	0	0	?	0	?	0
60	1	3	120	246	0	2	135	0	0	?	?	?	0
61	0	4	130	294	0	1	120	1	1	2	?	?	0
61	1	4	125	292	0	1	292	1	1	?	?	?	0
62	0	1	160	193	0	0	116	0	0	?	?	?	0
62	1	2	140	271	0	0	152	0	1	1	?	?	0
31	1	4	120	270	0	0	153	1	1.5	2	?	?	1
33	0	4	100	246	0	0	150	1	1	2	?	?	1
34	1	1	140	156	0	0	180	?	0	?	?	?	1
35	1	2	110	257	0	0	140	0	0	?	?	?	1
36	1	2	120	267	0	0	160	0	3	2	?	?	1
37	1	4	140	207	0	0	130	1	1.5	2	?	?	1
38	1	4	110	196	0	0	166	0	0	?	?	?	1
38	1	4	120	282	0	0	170	0	?	?	?	?	1
38	1	4	92	117	0	0	134	1	2.5	2	?	?	1
40	1	4	120	466	?	0	152	1	1	2	?	6	1
41	1	4	110	289	0	0	170	0	0	?	?	6	1
41	1	4	120	237	?	0	138	1	1	2	?	?	1
43	1	4	150	247	0	0	130	1	2	2	?	?	1
46	1	4	110	202	0	0	150	1	0	?	?	?	1
46	1	4	118	186	0	0	124	0	0	?	?	7	1
46	1	4	120	277	0	0	125	1	1	2	?	?	1
47	1	3	140	193	0	0	145	1	1	2	?	?	1
47	1	4	150	226	0	0	98	1	1.5	2	0	7	1
48	1	4	106	263	1	0	110	0	?	?	?	?	1
48	1	4	120	260	0	0	115	0	2	2	?	?	1
48	1	4	160	268	0	0	103	1	1	2	?	?	1
49	0	3	160	180	0	0	156	0	1	2	?	?	1
49	1	3	115	265	0	0	265	0	0	?	?	?	1
49	1	4	130	206	0	0	170	0	0	?	?	?	1
50	0	3	140	288	0	0	140	1	0	?	?	7	1
50	1	4	145	264	0	0	150	?	0	?	?	?	1
51	0	4	160	303	0	0	150	1	1	2	?	?	1
52	1	4	130	225	0	0	120	1	2	2	?	?	1
54	1	4	125	216	0	0	140	0	0	?	?	?	1

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
54	1	4	125	224	0	0	122	0	2	2	?	?	1
55	1	4	140	201	0	0	130	1	3	2	?	?	1
57	1	2	140	265	0	1	265	1	1	2	?	?	1
58	1	3	130	213	0	1	140	0	0	?	?	?	6
59	0	4	130	338	1	1	130	1	1.5	2	?	?	1
60	1	4	100	248	0	0	245	0	1	2	?	?	1
63	1	4	150	223	0	0	115	0	0	?	?	?	1
65	1	4	140	306	1	0	87	1	1.5	2	?	?	1
32	1	4	118	529	0	0	130	0	0	?	?	?	1
38	1	4	110	?	0	0	150	1	1	2	?	?	1
39	1	4	110	280	0	0	280	0	0	?	?	6	1
40	0	4	150	392	0	0	130	0	2	2	?	6	1
43	1	1	120	291	0	1	155	0	0	?	?	?	1
45	1	4	130	219	0	1	130	1	1	2	?	?	1
46	1	4	120	231	0	0	115	1	0	?	?	?	1
46	1	4	130	222	0	0	222	0	0	112	?	?	1
48	1	4	122	275	1	1	150	1	2	3	?	?	1
48	1	4	160	193	0	0	192	1	3	2	?	?	1
48	1	4	160	329	0	0	92	1	1.5	2	?	?	1
48	1	4	160	355	0	0	355	1	2	2	?	?	1
50	1	4	130	233	0	0	121	1	2	2	?	7	1
52	1	4	120	182	0	0	150	0	0	?	?	?	1
52	1	4	170	?	0	0	126	1	1.5	2	?	?	1
53	1	4	120	246	0	0	116	1	0	?	?	?	1
54	1	3	120	237	0	0	150	1	1.5	?	?	7	1
54	1	4	130	242	0	0	242	1	1	2	?	?	1
54	1	4	130	603	1	0	125	1	1	2	?	?	1
54	1	4	140	?	0	0	118	1	0	?	?	?	1
54	1	4	200	198	0	0	142	1	2	2	?	?	1
55	1	4	140	268	0	0	128	1	1.5	2	?	?	1
56	1	4	150	213	1	0	213	1	1	2	?	?	1
57	1	4	150	255	0	0	92	1	3	2	?	?	1
58	1	3	160	211	1	1	92	0	0	?	?	?	1
58	1	4	130	263	0	0	263	1	2	2	?	?	1
41	1	4	130	172	0	1	130	0	2	2	?	?	1
43	1	4	120	175	0	0	175	1	1	2	?	7	1
44	1	2	150	288	0	0	150	1	3	2	?	?	1
44	1	4	130	290	0	0	100	1	2	2	?	?	1
46	1	1	140	272	1	0	275	0	2	2	?	?	1
47	0	3	135	248	1	0	170	0	0	?	?	?	1
48	0	4	138	214	0	0	108	1	1.5	2	?	?	1
49	1	4	130	341	0	0	120	1	1	2	?	?	1
49	1	4	140	234	0	0	140	1	1	2	?	?	1
51	1	3	135	160	0	0	150	0	2	2	?	?	1
52	1	4	112	342	0	1	96	1	1	2	?	?	1
52	1	4	130	298	0	0	110	1	1	2	?	?	1
52	1	4	140	404	0	0	124	1	2	2	?	?	1
52	1	4	160	246	0	1	82	1	4	2	?	?	1
53	1	3	145	518	0	0	130	0	0	?	?	?	1
53	1	4	180	285	0	1	120	1	1.5	2	?	?	1
54	1	4	140	216	0	0	105	0	1.5	2	?	?	1
55	1	1	140	295	0	?	136	0	0	?	?	?	1

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
55	1	2	160	292	1	0	143	1	2	2	?	?	1
55	1	4	145	248	0	0	96	1	2	2	?	?	1
56	0	2	120	279	0	0	279	0	1	2	?	?	1
56	1	4	150	230	0	1	124	1	1.5	2	?	?	1
56	1	4	170	388	0	1	122	1	2	2	?	?	1
58	1	2	136	164	0	1	99	1	2	2	?	?	1
59	1	4	130	?	0	0	125	0	0	?	?	?	1
59	1	4	140	264	1	2	119	1	0	?	?	?	1
65	1	4	170	263	1	0	112	1	2	2	?	?	1
66	1	4	140	?	0	0	94	1	1	2	?	?	1
41	1	4	120	336	0	0	118	1	3	2	?	?	1
43	1	4	140	288	0	0	135	1	2	2	?	?	1
44	1	4	135	491	0	0	491	0	0	?	?	?	1
47	0	4	120	205	0	0	98	1	2	2	?	?	1
47	1	4	160	291	0	1	158	1	3	2	?	?	1
49	1	4	128	212	0	0	96	1	0	?	?	?	1
49	1	4	150	222	0	0	122	0	2	2	?	?	1
50	1	4	140	231	0	1	140	1	5	2	?	?	1
50	1	4	140	341	0	1	125	1	2.5	2	?	?	1
52	1	4	140	266	0	0	134	1	2	2	?	?	1
52	1	4	160	331	0	0	94	1	2.5	?	?	?	1
54	0	3	130	294	0	1	100	1	0	2	?	?	1
56	1	4	155	342	1	0	150	1	3	2	?	?	1
58	0	2	180	393	0	0	110	1	1	2	?	?	1
65	1	4	130	275	0	1	115	1	1	2	?	?	1
32	1	1	95	0	?	?	127	0	.7	1	?	?	1
34	1	4	115	0	?	?	154	0	.2	1	?	?	1
35	1	4	?	0	?	0	130	1	?	?	?	?	3
36	1	4	110	0	?	0	125	1	1	2	?	?	1
38	0	4	105	0	?	0	166	0	2.8	1	?	?	2
38	0	4	110	0	0	0	156	0	0	2	?	?	1
38	1	3	100	0	?	0	179	0	-1.1	1	?	?	0
38	1	3	115	0	0	0	128	1	0	2	?	?	1
38	1	4	135	0	?	0	150	0	0	?	?	?	2
38	1	4	150	0	?	0	120	1	?	?	?	?	1
40	1	4	95	0	?	1	144	0	0	1	?	?	2
41	1	4	125	0	?	0	176	0	1.6	1	?	?	2
42	1	4	105	0	?	0	128	1	-1.5	3	?	?	1
42	1	4	145	0	0	0	99	1	0	2	?	?	2
43	1	4	100	0	?	0	122	0	1.5	3	?	?	3
43	1	4	115	0	0	0	145	1	2	2	?	?	4
43	1	4	140	0	0	1	140	1	.5	1	?	?	2
45	1	3	110	0	?	0	138	0	-1	1	?	?	0
46	1	4	100	0	?	1	133	0	-2.6	2	?	?	1
46	1	4	115	0	0	0	113	1	1.5	2	?	?	1
47	1	3	110	0	?	0	120	1	0	?	?	?	1
47	1	3	155	0	0	0	118	1	1	2	?	?	3
47	1	4	110	0	?	1	149	0	2.1	1	?	?	2
47	1	4	160	0	0	0	124	1	0	2	?	?	1
48	1	4	115	0	?	0	128	0	0	2	?	?	2
50	0	4	160	0	?	0	110	0	0	?	?	?	1
50	1	4	115	0	0	0	120	1	.5	2	?	?	3

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
50	1	4	120	0	0	1	156	1	0	1	?	6	3
50	1	4	145	0	?	0	139	1	.7	2	?	?	1
51	0	4	120	0	?	0	127	1	1.5	1	?	?	2
51	1	4	110	0	?	0	92	0	0	2	?	?	4
51	1	4	120	0	1	0	104	0	0	2	?	3	3
51	1	4	130	0	?	0	170	0	-.7	1	?	?	2
51	1	4	130	0	?	1	163	0	0	?	?	7	1
51	1	4	140	0	0	0	60	0	0	2	?	3	2
51	1	4	95	0	?	0	126	0	2.2	2	?	?	2
52	1	4	130	0	?	0	120	0	0	2	?	7	2
52	1	4	135	0	?	0	128	1	2	2	?	7	2
52	1	4	165	0	?	0	122	1	1	1	?	7	2
52	1	4	95	0	?	0	82	1	?	?	?	?	2
53	1	2	120	0	0	0	95	0	0	2	?	3	3
53	1	2	130	0	?	1	120	0	.7	3	?	?	0
53	1	3	105	0	0	0	115	0	0	2	?	7	1
53	1	3	160	0	?	2	122	1	0	?	?	7	1
53	1	4	120	0	?	0	120	0	0	2	?	7	1
53	1	4	125	0	?	0	120	0	1.5	1	?	?	4
53	1	4	130	0	0	2	135	1	1	2	?	7	2
53	1	4	80	0	?	0	141	1	2	3	?	?	0
54	1	4	120	0	0	0	155	0	0	2	?	7	2
54	1	4	130	0	?	0	110	1	3	2	?	7	3
54	1	4	180	0	?	0	150	0	1.5	2	?	7	1
55	1	2	140	0	?	1	150	0	.2	1	?	?	0
55	1	4	115	0	?	0	155	0	.1	2	?	?	1
55	1	4	120	0	0	1	92	0	.3	1	?	7	4
55	1	4	140	0	0	0	83	0	0	2	?	7	2
56	1	3	120	0	0	0	97	0	0	2	?	0	0
56	1	3	125	0	?	0	98	0	-2	2	?	7	2
56	1	3	155	0	0	1	99	0	0	2	?	3	2
56	1	4	115	0	?	1	82	0	-1	1	?	?	1
56	1	4	120	0	0	1	100	1	-1	3	?	7	2
56	1	4	120	0	0	1	148	0	0	2	?	?	2
56	1	4	125	0	1	0	103	1	1	2	?	7	3
56	1	4	140	0	?	0	121	1	1.8	1	?	?	1
57	1	3	105	0	?	0	148	0	.3	2	?	?	1
57	1	4	110	0	?	1	131	1	1.4	1	1	?	3
57	1	4	140	0	0	0	120	1	2	2	?	6	2
57	1	4	140	0	?	0	100	1	0	?	?	6	3
57	1	4	160	0	?	0	98	1	2	2	?	7	2
57	1	4	95	0	?	0	182	0	.7	3	?	?	1
58	1	4	115	0	?	0	138	0	.5	1	?	?	1
58	1	4	130	0	0	1	100	1	1	2	?	6	4
58	1	4	170	0	?	1	105	1	0	?	?	3	1
59	1	3	125	0	?	0	175	0	2.6	2	?	?	1
59	1	4	110	0	?	0	94	0	0	?	?	6	3
59	1	4	120	0	0	0	115	0	0	2	?	3	2
59	1	4	125	0	?	0	119	1	.9	1	?	?	1
59	1	4	135	0	0	0	115	1	1	2	?	7	1
60	1	3	115	0	?	0	143	0	2.4	1	?	?	1
60	1	4	125	0	?	0	110	0	.1	1	2	?	3



Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
60	1	4	130	0	?	1	130	1	1.1	3	1	?	1
60	1	4	135	0	0	0	63	1	.5	1	?	?	3
60	1	4	160	0	0	1	99	1	.5	2	?	?	3
60	1	4	160	0	?	0	149	0	.4	2	?	?	1
61	1	3	200	0	?	1	70	0	0	?	?	?	3
61	1	4	105	?	?	0	110	1	1.5	1	?	?	1
61	1	4	110	0	?	0	113	0	1.4	2	?	?	1
61	1	4	125	0	0	0	105	1	0	3	?	?	3
61	1	4	130	0	0	2	115	0	0	2	?	?	3
61	1	4	130	0	?	0	77	0	2.5	2	?	?	3
61	1	4	150	0	0	0	105	1	0	2	?	?	1
61	1	4	150	0	0	0	117	1	2	2	?	?	2
61	1	4	160	0	1	1	145	0	1	2	?	?	2
62	0	1	140	0	?	0	143	0	0	?	?	?	2
62	0	4	120	0	?	1	123	1	1.7	3	?	?	1
62	1	1	120	0	?	2	134	0	-8	2	2	?	1
62	1	3	160	0	0	0	72	1	0	2	?	?	3
62	1	4	115	0	?	0	128	1	2.5	3	?	?	2
62	1	4	115	0	?	0	72	1	-5	2	?	?	1
62	1	4	150	0	?	1	78	0	2	2	?	?	3
63	1	4	100	0	?	0	109	0	-9	2	?	?	1
63	1	4	140	0	?	2	149	0	2	1	?	?	2
63	1	4	150	0	0	0	86	1	2	2	?	?	3
63	1	4	150	0	?	1	154	0	3.7	1	?	?	3
63	1	4	185	0	0	0	98	1	0	1	?	?	1
64	0	4	200	0	0	0	140	1	1	2	?	?	3
64	0	4	95	0	?	0	145	0	1.1	3	?	?	1
64	1	4	110	0	?	0	114	1	1.3	3	?	?	1
65	1	4	115	0	0	0	93	1	0	2	?	?	1
65	1	4	145	0	?	1	67	0	?	?	?	?	3
65	1	4	155	0	?	0	154	0	1	1	?	?	0
65	1	4	160	0	1	1	122	0	?	?	?	?	3
66	0	4	155	0	?	0	90	0	0	?	?	?	1
66	1	4	150	0	0	0	108	1	2	2	?	?	3
67	1	1	145	0	0	2	125	0	0	2	?	?	2
68	1	4	135	0	0	1	120	1	0	1	?	?	3
68	1	4	145	0	?	0	136	0	1.8	1	?	?	1
69	1	4	135	0	0	0	130	0	0	2	?	?	1
69	1	4	?	0	0	1	?	?	?	?	?	?	3
70	1	4	115	0	0	1	92	1	0	2	?	?	1
70	1	4	140	0	1	0	157	1	2	2	?	?	3
72	1	3	160	0	?	2	114	0	1.6	2	2	?	0
73	0	3	160	0	0	1	121	0	0	1	?	?	1
74	1	2	145	0	?	1	123	0	1.3	1	?	?	1
63	1	4	140	260	0	1	112	1	3	2	?	?	2
44	1	4	130	209	0	1	127	0	0	?	?	?	0
60	1	4	132	218	0	1	140	1	1.5	3	?	?	2
55	1	4	142	228	0	1	149	1	2.5	1	?	?	1
66	1	3	110	213	1	2	99	1	1.3	2	?	?	0
66	1	3	120	0	0	1	120	0	-0.5	1	?	?	0
65	1	4	150	236	1	1	105	1	0	?	?	?	3
60	1	3	180	0	0	1	140	1	1.5	2	?	?	0

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
60	1	3	120	0	?	0	141	1	2	1	?	?	3
60	1	2	160	267	1	1	157	0	0.5	2	?	?	1
56	1	2	126	166	0	1	140	0	?	?	?	?	0
59	1	4	140	0	0	1	117	1	1	2	?	?	1
62	1	4	110	0	0	0	120	1	0.5	2	?	3	1
63	1	3	?	0	0	2	?	?	?	?	?	?	1
57	1	4	128	0	1	1	148	1	1	2	?	?	1
62	1	4	120	220	0	1	86	0	?	?	?	?	0
63	1	4	170	177	0	0	84	1	2.5	3	?	?	4
46	1	4	110	236	0	0	125	1	2	2	?	?	1
63	1	4	126	0	0	1	120	0	1.5	3	?	?	0
60	1	4	152	0	0	1	118	1	?	?	?	?	0
58	1	4	116	0	0	0	124	0	1	1	?	?	2
64	1	4	120	0	1	1	106	0	2	2	?	?	1
63	1	3	130	0	0	1	111	1	0	?	?	?	3
74	1	3	?	0	0	0	?	?	?	?	?	?	0
52	1	3	128	0	0	1	180	0	3	1	?	?	2
69	1	4	130	0	1	1	129	0	1	2	?	6	2
51	1	4	?	0	1	1	?	?	?	?	?	?	2
60	1	4	130	186	1	1	140	1	0.5	2	?	?	1
56	1	4	120	100	0	0	120	1	1.5	2	0	7	1
55	1	3	?	228	0	1	?	?	?	?	?	?	3
54	1	4	?	0	0	1	?	?	?	?	?	?	3
77	1	4	124	171	0	1	110	1	2	1	?	?	3
63	1	4	160	230	1	0	105	1	1	2	?	?	3
55	1	3	0	0	0	0	155	0	1.5	2	?	?	3
52	1	3	122	0	0	0	110	1	2	3	?	?	2
64	1	4	144	0	0	1	122	1	1	2	?	?	3
60	1	4	?	281	0	1	?	?	?	?	?	?	2
60	1	4	120	0	0	0	133	1	2	1	?	7	0
58	1	4	?	203	1	0	?	?	?	?	?	?	1
59	1	4	154	0	0	1	131	1	1.5	?	0	?	0
61	1	3	120	0	0	0	80	1	0	2	?	?	3
40	1	4	125	0	1	0	165	0	0	?	?	?	1
61	1	4	?	0	1	1	86	0	1.5	2	?	7	3
41	1	4	104	0	0	1	111	0	0	?	?	?	0
57	1	4	?	277	1	1	?	?	?	?	?	?	4
63	1	4	136	0	0	0	84	1	0	?	?	?	2
59	1	4	122	233	0	0	117	1	1.3	3	?	?	1
51	1	4	128	0	0	0	107	0	0	?	?	?	0
59	1	3	?	0	0	0	128	1	2	3	?	?	2
42	1	3	134	240	?	0	160	0	0	?	?	?	0
55	1	3	120	0	0	1	125	1	2.5	2	?	?	1
63	0	2	?	0	0	0	?	?	?	?	?	?	0
62	1	4	152	153	0	1	97	1	1.6	1	?	?	2
56	1	2	124	224	1	0	161	0	2	2	?	?	0
53	1	4	126	0	0	0	106	0	0	?	?	?	1
68	1	4	138	0	0	0	130	1	3	2	?	?	2
53	1	4	154	0	?	1	140	1	1.5	2	?	?	2
60	1	3	?	316	1	1	?	?	?	?	?	?	3
62	1	2	?	0	0	0	?	?	?	?	?	?	0
59	1	4	178	0	1	2	120	1	0	?	?	?	1

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
51	1	4	?	218	1	2	?	?	?	?	?	?	0
61	1	4	110	0	?	0	108	1	2	3	?	?	2
57	1	4	130	311	?	1	148	1	2	2	?	?	1
56	1	3	170	0	0	2	123	1	2.5	?	?	?	4
58	1	2	126	0	1	0	110	1	2	2	?	?	2
69	1	3	140	0	?	1	118	0	2.5	3	?	?	2
67	1	1	142	270	1	0	125	0	2.5	1	?	?	3
58	1	4	120	0	0	2	106	1	1.5	3	?	7	1
65	1	4	?	0	0	0	?	?	?	?	?	?	1
63	1	2	?	217	1	1	?	?	?	?	?	?	1
55	1	2	110	214	1	1	180	0	?	?	?	?	0
57	1	4	140	214	0	1	144	1	2	2	?	6	2
65	1	1	?	252	0	0	?	?	?	?	?	?	0
54	1	4	136	220	0	0	140	1	3	2	?	?	3
72	1	3	120	214	0	0	102	1	1	2	?	?	3
75	1	4	170	203	1	1	108	0	0	?	?	7	1
49	1	1	130	0	0	1	145	0	3	2	?	?	2
51	1	3	?	339	0	0	?	?	?	?	?	?	3
60	1	4	142	216	0	0	110	1	2.5	2	?	?	2
64	0	4	142	276	0	0	140	1	1	2	?	7	1
58	1	4	132	458	1	0	69	0	1	3	?	?	0
61	1	4	146	241	0	0	148	1	3	3	?	?	2
67	1	4	160	384	1	1	130	1	0	2	?	?	2
62	1	4	135	297	0	0	130	1	1	2	?	?	2
65	1	4	136	248	0	0	140	1	4	3	?	?	4
63	1	4	130	308	0	0	138	1	2	2	?	?	2
69	1	4	140	208	0	1	140	1	2	?	?	?	3
51	1	4	?	227	1	1	?	?	?	?	?	?	0
62	1	4	158	210	1	0	112	1	3	3	?	?	1
55	1	3	?	245	1	1	?	?	?	?	?	?	1
75	1	4	136	225	0	0	112	1	3	2	?	?	3
40	1	3	106	240	0	0	80	1	0	?	?	7	0
67	1	4	120	0	1	0	150	0	1.5	3	?	?	3
58	1	4	110	198	0	0	110	0	0	?	?	?	1
60	1	4	?	195	0	0	?	?	?	?	?	?	0
63	1	4	160	267	1	1	88	1	2	?	?	?	3
35	1	3	?	161	0	1	?	?	?	?	?	?	0
62	1	1	112	258	0	1	150	1	?	?	?	?	1
43	1	4	122	0	0	0	120	0	0.5	1	?	?	1
63	1	3	130	0	1	1	160	0	3	2	?	?	0
68	1	3	150	195	1	0	132	0	0	?	?	6	1
65	1	4	150	235	0	0	120	1	1.5	2	?	?	3
48	1	3	102	0	?	1	110	1	1	3	?	?	1
63	1	4	96	305	0	1	121	1	1	1	?	?	1
64	1	4	130	223	0	1	128	0	0.5	2	?	?	0
61	1	4	120	282	0	1	135	1	4	3	?	6	3
50	1	4	144	349	0	2	120	1	1	1	?	7	1
59	1	4	124	?	0	0	117	1	1	2	?	?	1
55	1	4	150	160	0	1	150	0	0	?	?	?	0
45	1	3	?	236	0	0	?	?	?	?	?	?	0
65	1	4	?	312	0	2	?	?	?	?	?	?	3
61	1	2	?	283	0	0	?	?	?	?	?	?	0

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
49	1	3	?	142	0	0	?	?	?	?	?	?	3
72	1	4	?	211	0	0	?	?	?	?	?	?	1
50	1	4	?	218	0	0	?	?	?	?	?	?	1
64	1	4	?	306	1	1	?	?	?	?	?	?	3
55	1	4	116	186	1	1	102	0	0	?	?	?	2
63	1	4	110	252	0	1	140	1	2	2	2	?	2
59	1	4	125	222	0	0	135	1	2.5	3	?	?	3
56	1	4	?	0	0	2	?	?	?	?	?	?	1
62	1	3	?	0	1	1	?	?	?	?	?	?	2
74	1	4	150	258	1	1	130	1	4	3	?	?	3
54	1	4	130	202	1	0	112	1	2	2	?	?	1
57	1	4	110	197	0	2	100	0	0	?	?	?	0
62	1	3	?	204	0	1	?	?	?	?	?	?	1
76	1	3	104	?	0	2	120	0	3.5	3	?	?	4
54	0	4	138	274	0	0	105	1	1.5	2	?	?	1
70	1	4	170	192	0	1	129	1	3	3	?	?	2
61	0	2	140	298	1	0	120	1	0	?	?	?	0
48	1	4	?	272	0	1	?	?	?	?	?	?	0
48	1	3	132	220	1	1	162	0	0	?	?	?	1
61	1	1	142	200	1	1	100	0	1.5	3	?	?	3
66	1	4	112	261	0	0	140	0	1.5	1	?	?	1
68	1	1	?	181	1	1	?	?	?	?	?	?	0
55	1	4	172	260	0	0	73	0	2	?	?	?	3
62	1	3	120	220	0	2	86	0	0	?	?	?	0
71	1	3	?	221	0	0	?	?	?	?	?	?	3
74	1	1	?	216	1	0	?	?	?	?	?	?	3
53	1	3	155	175	1	1	160	0	?	?	?	?	0
58	1	3	150	219	0	1	118	1	0	?	?	?	2
75	1	4	160	310	1	0	112	1	2	3	?	?	0
56	1	3	?	208	1	1	?	?	?	?	?	?	4
58	1	3	?	232	0	1	?	?	?	?	?	?	2
64	1	4	134	273	0	0	102	1	4	3	?	?	4
54	1	3	?	203	0	1	?	?	?	?	?	?	0
54	1	2	?	182	0	1	?	?	?	?	?	?	0
59	1	4	140	274	0	0	154	1	2	2	?	?	0
55	1	4	?	204	1	1	?	?	?	?	?	?	1
57	1	4	144	270	1	1	160	1	2	2	?	?	3
61	1	4	?	292	0	1	?	?	?	?	?	?	3
41	1	4	150	171	0	0	128	1	1.5	2	?	?	0
71	1	4	130	221	0	1	115	1	0	?	?	?	3
38	1	4	110	289	0	0	105	1	1.5	3	?	?	1
55	1	4	158	217	0	0	110	1	2.5	2	?	?	1
56	1	4	128	223	0	1	119	1	2	3	?	?	2
69	1	4	?	?	1	0	?	?	?	?	?	?	2
64	1	4	150	193	0	1	135	1	0.5	2	?	?	2
72	1	4	160	?	1	2	130	0	1.5	?	?	?	2
69	1	4	?	210	1	1	?	?	?	?	?	?	2
56	1	4	?	282	1	0	?	?	?	?	?	?	1
62	1	4	?	170	0	1	120	1	3	?	?	?	4
67	1	4	?	369	0	0	?	?	?	?	?	?	3
57	1	4	156	173	0	2	119	1	3	3	?	?	3
69	1	4	?	289	1	1	?	?	?	?	?	?	3

Table 6: Heart Disease Data

Age	Sex	Chest Pain	Blood Pressure	Cholesterol	Blood Sugar	ECG	Heart rate	Angina	ST Depression	ST Slope	Major Vessels	Thalassemia	Diagnosis
51	1	4	?	?	1	2	?	?	?	?	?	?	1
48	1	4	140	?	0	0	159	1	1.5	1	?	?	3
69	1	4	122	216	1	2	84	1	0	?	?	?	2
69	1	3	?	271	0	2	?	?	?	?	?	?	0
64	1	4	?	244	1	1	?	?	?	?	?	?	2
57	1	2	180	285	1	1	120	0	0.8	?	?	?	1
53	1	4	124	243	0	0	122	1	2	2	?	?	1
37	1	3	118	240	0	2	165	0	1	2	?	?	0
67	1	4	140	219	0	1	122	1	2	2	?	?	3
74	1	3	140	237	1	0	94	0	0	?	?	?	1
63	1	2	?	165	0	1	165	?	?	?	?	?	0
58	1	4	100	213	0	1	110	0	0	?	?	?	0
61	1	4	190	287	1	2	150	1	2	3	?	?	4
64	1	4	130	258	1	2	130	0	0	?	?	?	2
58	1	4	160	256	1	2	113	1	1	1	?	?	3
60	1	4	130	186	1	2	140	?	0.5	2	?	?	1
57	1	4	122	264	0	2	100	0	0	?	?	?	1
55	1	3	?	?	0	1	?	?	?	?	?	?	0
55	1	4	120	226	0	2	127	1	1.7	3	?	?	1
56	1	4	130	203	1	0	98	0	1.5	2	?	?	1
57	1	4	130	207	0	1	96	1	1	2	?	?	0
61	1	3	?	284	0	0	?	?	?	?	?	?	1
61	1	3	120	337	0	0	98	1	0	?	?	?	3
58	1	3	150	219	0	1	118	1	0	?	?	?	2
74	1	4	155	310	0	0	112	1	1.5	3	?	?	2
68	1	3	134	254	1	0	151	1	0	?	?	?	0
51	0	4	114	258	1	2	96	0	1	1	?	?	0
62	1	4	160	254	1	1	108	1	3	2	?	?	4
53	1	4	144	300	1	1	128	1	1.5	2	?	?	3
62	1	4	158	170	0	1	138	1	0	?	?	?	1
46	1	4	134	310	0	0	126	0	0	?	?	?	2
54	0	4	127	333	1	1	154	0	0	?	?	?	1
62	1	1	?	139	0	1	?	?	?	?	?	?	0
55	1	4	122	223	1	1	100	0	0	?	?	?	2
58	1	4	?	385	1	2	?	?	?	?	?	?	0
62	1	2	120	254	0	2	93	1	0	?	?	?	1