Andrew Tran

CS 1675

Homework 1 Report

Due: 1/24/19

2a/b)

Attribute	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Range	[0,17]	[0,199]	[0,122]	[0,99]	[0,846]	[0,67.1]	[0.08,2.42]	[21,81]
Mean	3.85	120.89	69.11	20.54	79.79	31.99	0.47	33.24
Variance	3.37	31.97	19.35	15.95	115.24	7.88	0.33	11.76

2c)

Class 0: 500 instances

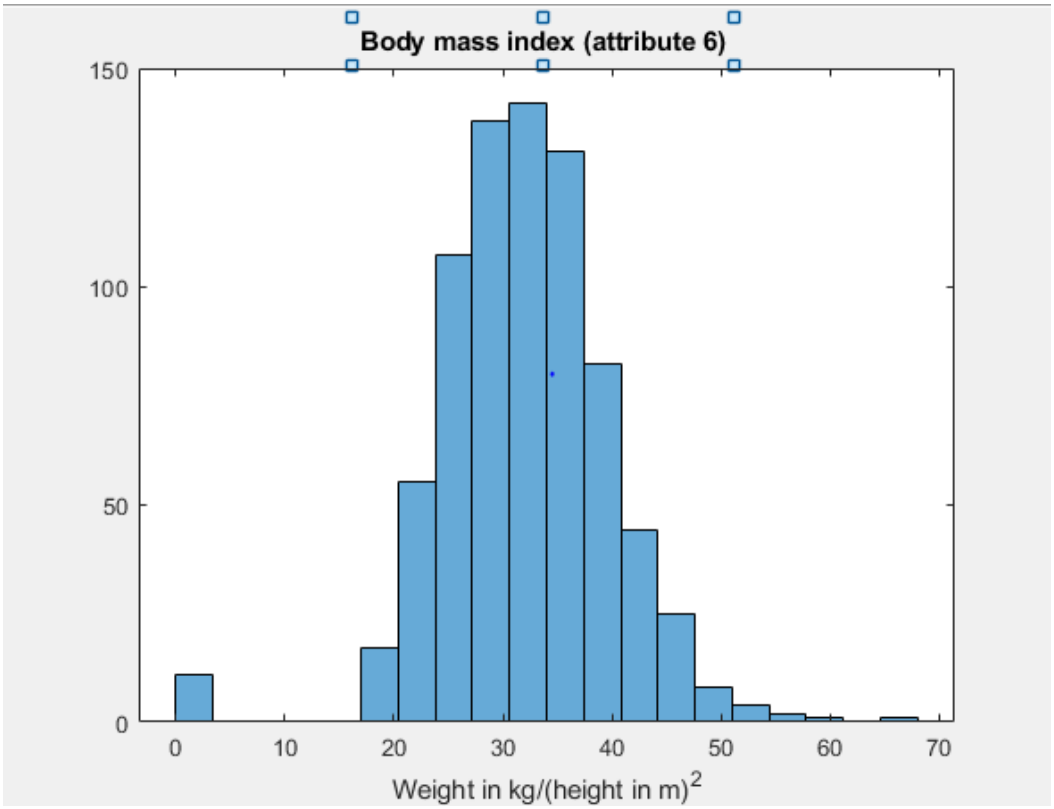
Attribute	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mean	3.30	109.98	68.18	19.18	68.79	30.30	0.43	31.19
Variance	3.02	26.14	18.06	14.89	98.87	7.69	0.30	11.67

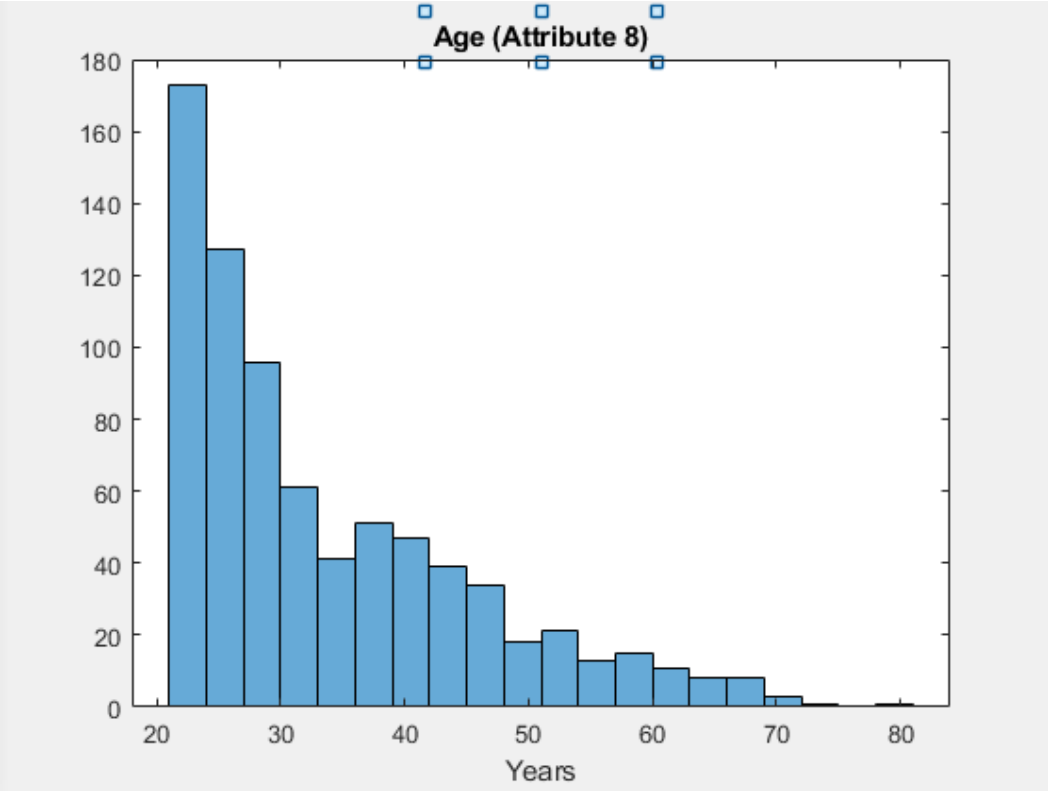
Class 1: 268 instances

Attribute	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mean	4.87	141.26	70.82	22.16	100.34	35.14	0.55	37.07
Variance	3.74	31.94	21.49	17.68	138.69	7.26	0.37	10.97

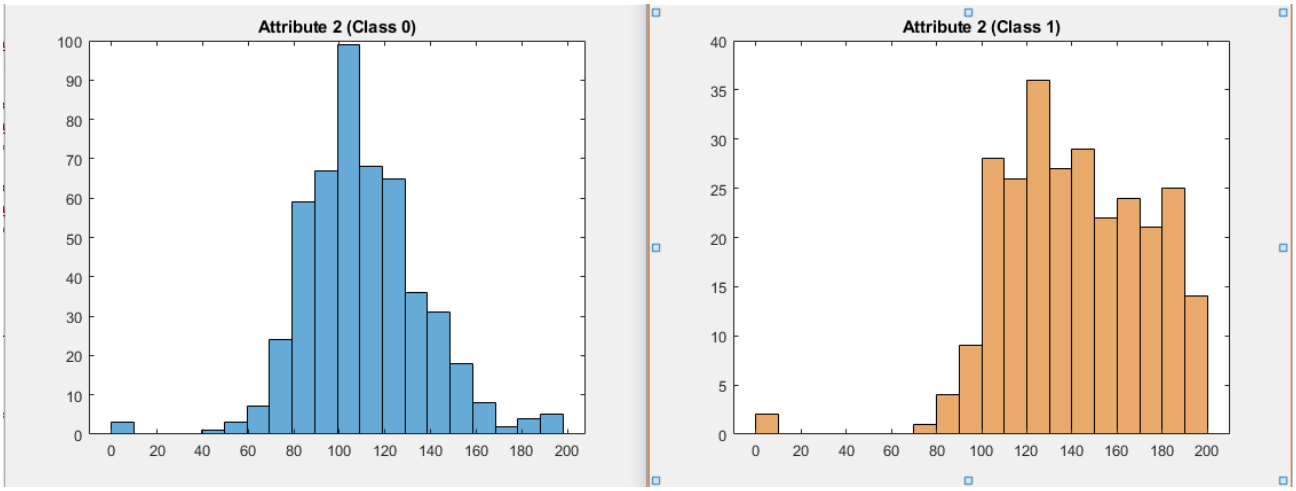
Attribute 2 (Plasma glucose concentration) seems to be the best attribute to discriminate the 2 classes. The means of this attribute have a 24.9% difference between classes which is the highest percent difference besides attribute 5. The reason attribute 5 is not as good at discriminating the 2 classes is the variances for this attribute are significantly larger than the variances for attribute 2 showing the measurement for attribute 2 is more precise.

2e) Attribute 6 (Body mass index) seems to most resemble a normal distribution.





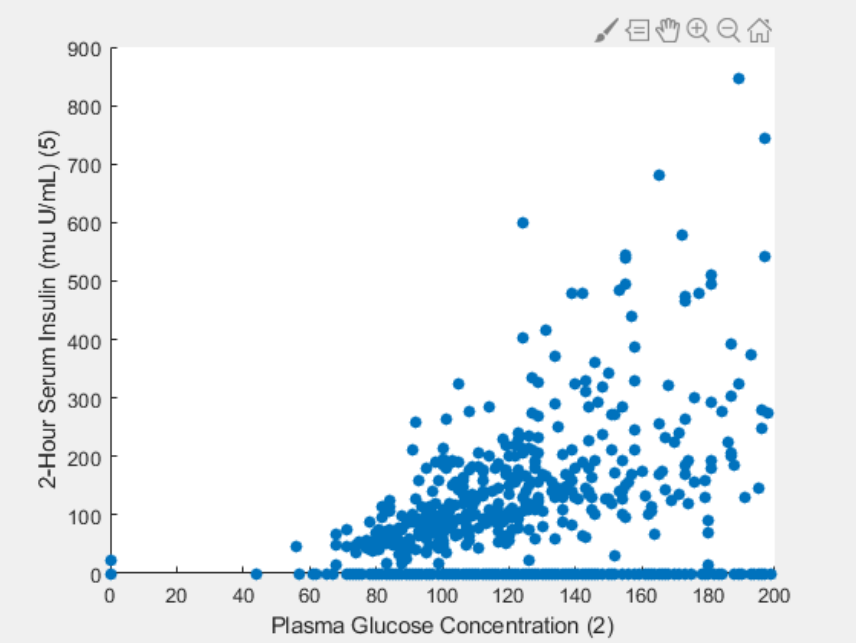
2f) Attribute 2 (Plasma glucose concentration) seems to be the best attribute the most helpful when discriminating the 2 classes:



The distribution for class 0 resembles a normal distribution while class 1's distribution is more uniform. The distributions between the other attributes were very similar to each other between the 2 classes.

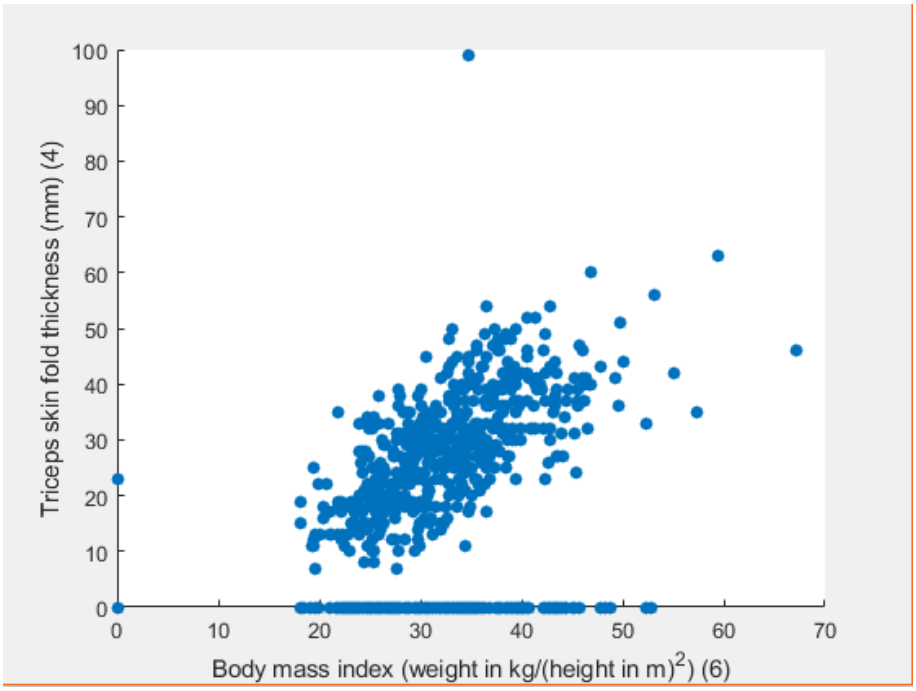
2g) If 2 attributes are independent from each other and are random, the scatter plot produced should show no obvious positive or negative trend.

An interesting pattern forms when comparing attributes 2 (plasma glucose concentration) and 5 (2-hour serum insulin):



There seems to be a positive correlation between the concentration of glucose and the amount of insulin in the bloodstream. I find this plot interesting mostly because it just makes sense. Insulin makes the body absorb glucose, so if there is a high concentration of glucose (meaning the body is not absorbing it) there should be a large amount of insulin 2 hours after taking an insulin serum (because the body is not using it to absorb the glucose).

Another non-random relationship found was between attributes 4 (triceps skin fold thickness) and 6 (BMI):



This relationship in interesting because of how compact the data points are as compared to the previous example. There is a clear positive correlation between these 2 attributes.

3a) A way to encode colors is to use a vector of 3 values (each can be either 1 or 0). This is similar to the way colors are encoded using RGB values. Since there are only 8 colors, 3 bits is enough to uniquely encode all the colors. Example:

	Black	Blue	Green	Yellow	Red	Brown	Orange	White
Code	[0,0,0]	[0,0,1]	[0,1,0]	[0,1,1]	[1,0,0]	[1,0,1]	[1,1,0]	[1,1,1]

3b) First 5 normalized values for attribute 3: [0.15, -0.16, -0.26, -0.16, -1.5]

3c)

Original Value (attribute 3)	Discretized value (bin number)
72	6
66	6
64	6
66	6
40	4

5a) A^T =

$$\begin{matrix} 1 & 3 \\ 2 & 4 \\ 5 & 6 \end{matrix}$$

5b) B^{-1} =

$$\begin{matrix} 1 & -5.5 & 1.25 \\ 0 & -0.5 & 0.25 \\ -0.67 & 4.33 & -1 \end{matrix}$$

5c) B+C =

$$\begin{matrix} 15 & 7 & 14 \\ 3 & -1 & 7 \\ 3 & 6 & 10 \end{matrix}$$

5d) B-C =

$$\begin{matrix} -1 & -5 & 4 \\ 1 & 5 & -1 \\ 5 & 10 & 2 \end{matrix}$$

5e) A*B =

$$\begin{matrix} 31 & 45 & 45 \\ 53 & 59 & 75 \end{matrix}$$

5f) B*C =

$$\begin{matrix} 48 & 21 & 75 \\ 15 & 0 & 30 \\ 34 & -12 & 76 \end{matrix}$$

5g) B*A = cannot multiply 3x3 and 2x3