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CMSC 409 - Project 1 Report
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A) Create, understand, explore a data set

Scenario A: For this scenario, only the height of males and females were considered. A normal distribution scatter plot was created using Python. The male heights were centered around the average male height (5.9), with a standard deviation of 0.1. The female heights were centered around the average female height (5.4), with a standard deviation of 0.1. The resulting graph is shown below (Figure 1).

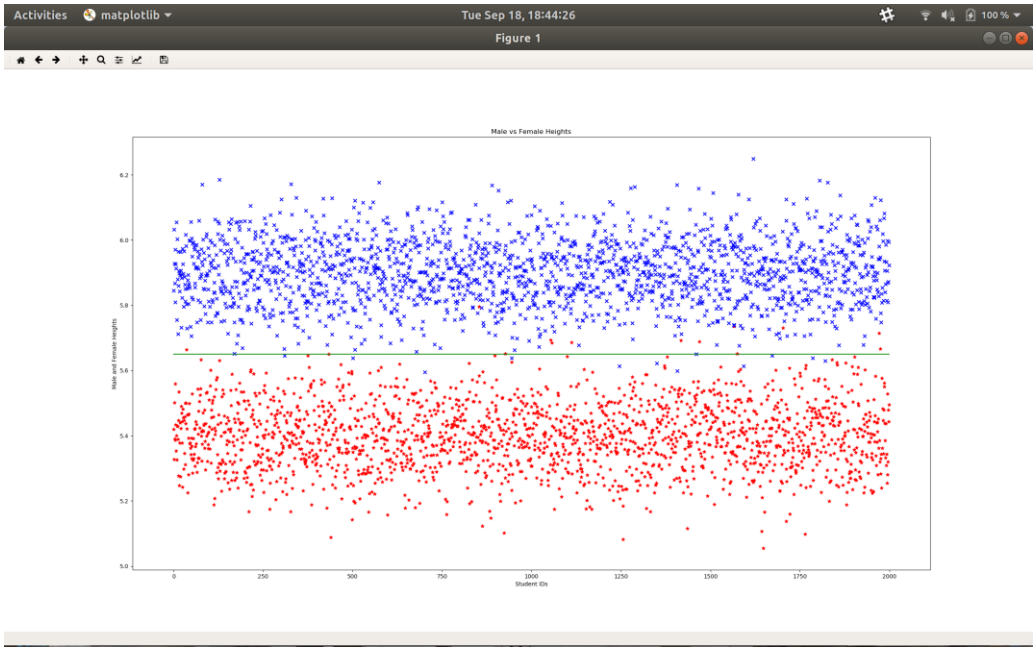

Figure 1. shows a normal distribution of male and female heights. The blue color represents a male student while the red color represents a female student. The green line represents the line of separation, which is defined as y = 2000(0) + 5.65 or y = 5.65. The neuron will fire if the sample is above or below the line. The accuracy and error rate of this sample is discussed below.

	Predicted Male	**Predicted Female**
Actual Male	1985	15
Actual Female	1990	10

Table 1 – Heights of Males and Females

Accuracy = 99.4%
Error = 0.6%

Scenario B: For this scenario, both the weights and heights of males and females were considered. A normal distribution scatter plot was created using Python. The male weights are centered around the average male weight (195.7) with a standard deviation of 20. The male heights are centered around the average male height (5.9) with a standard deviation of 0.1. The female weights were centered around the average female weight (168.5) with a standard deviation of 20. The female heights are centered around the average female height (5.4) with a standard deviation of 0.1. The resulting graph is shown below (Figure 2).

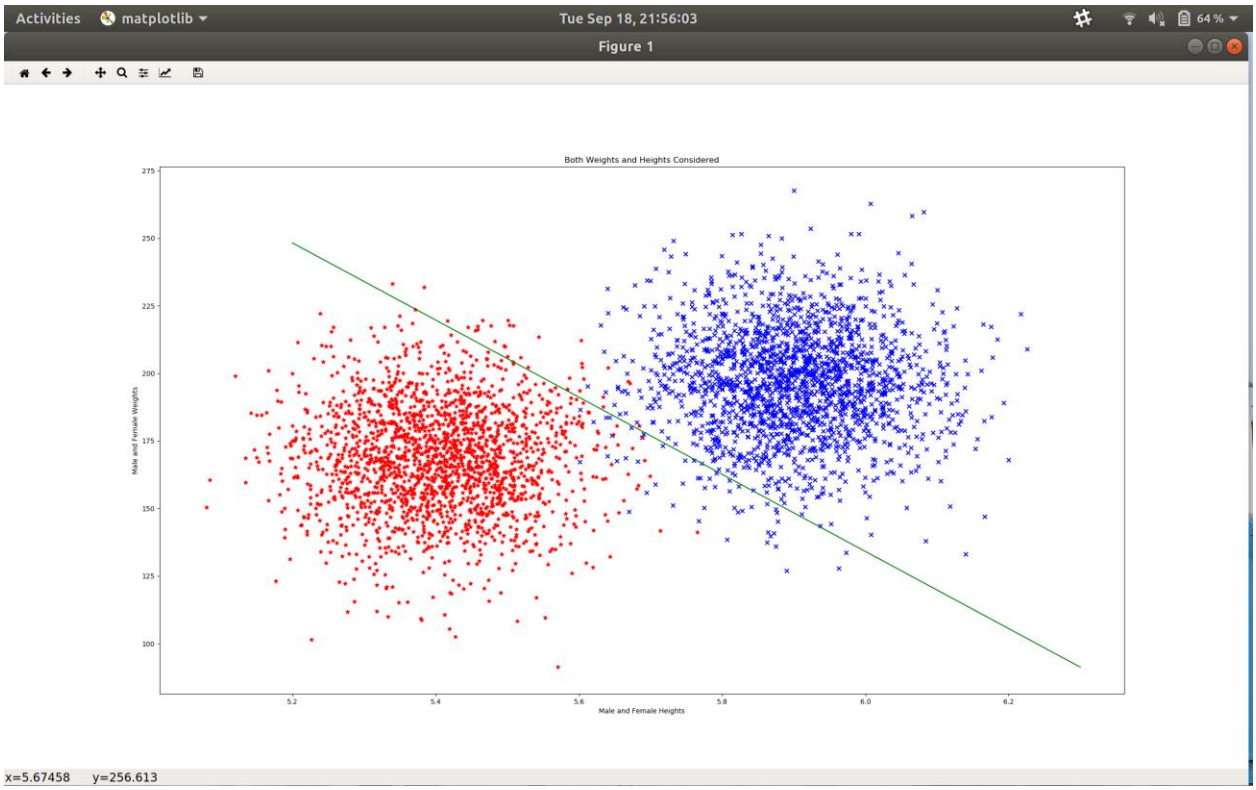

Figure 2. shows the normal distribution of male and female heights and weights. The blue color represents male students, while the red color represents female students. The green line represents the line of separation which is defined as y = -142.65x + 990. The accuracy and error rate is discussed below

	Predicted Male	**Predicted Female**
Actual Male	1943	57
Actual Female	1972	28

Table 2 – Height and Weight of Males and Females

Accuracy = 97.9%
Error = 2.1%

B) McCulloch-Pitts Neurons

1)

x	y	Memory	Inequality	Out
0	0	0	$0 < T = 0.5$	$0 < 0.5$
0	1	0	$yw < T$	$-1 < 0.5$
1	0	0	$xw \geq T$	$1 \geq 0.5$
1	1	0	$xw + yw < T$	$-1 < 0.5$
0	0	1	$0 < T$	$0 < 0.5$
0	1	1	$yw < T$	$-1 < 0.5$
1	0	1	$xw \geq T$	$1 \geq 0.5$
1	1	1	$xw + yw < T$	$-1 < 0.5$

2) The range of possible values for threshold $-1 < 0 < 1$

3) We cannot consider the case when the x and y values are both 1 and memory is 0 and also the case when the x and y values are both 1 and memory is 1.