Dylan Brown
Perceptron Lab

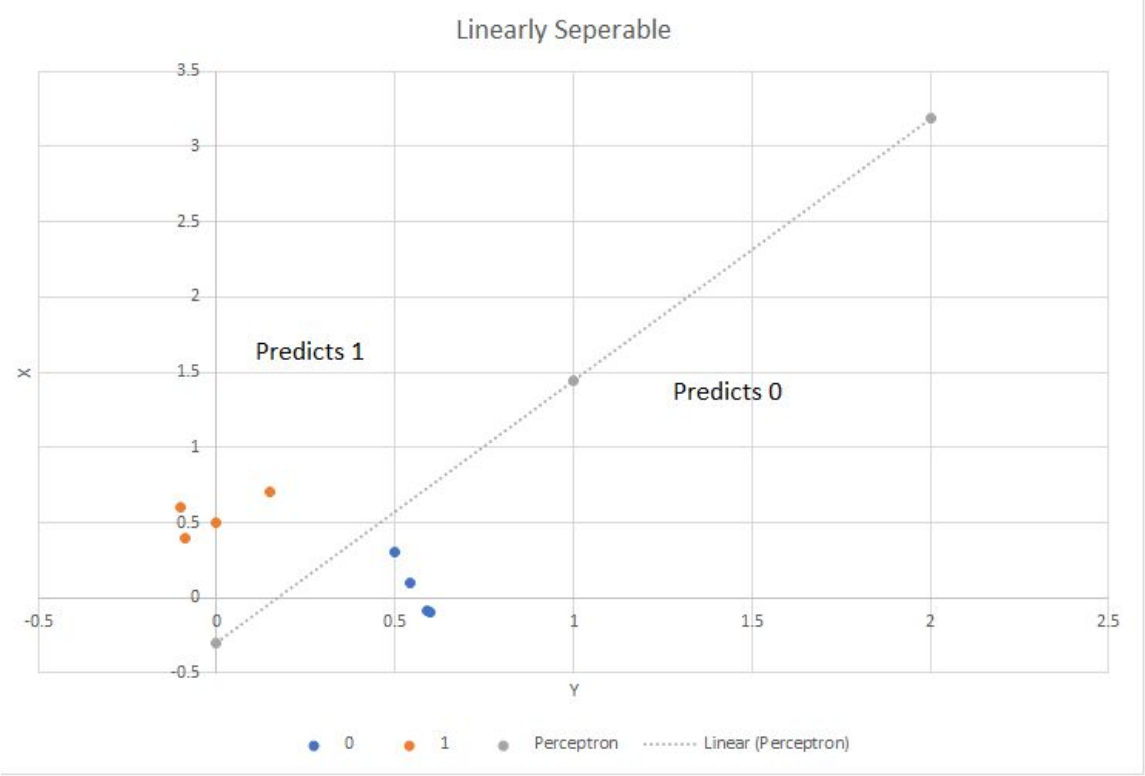
Stopping criteria: It will always do at least two epochs, and compare the accuracy of the last one to the current one. If the new accuracy is less than 0.005, then it stops. The accuracy measurement uses the measurePredictiveAccuracy method provided by the machine learning toolkit.

Learning Rate results:

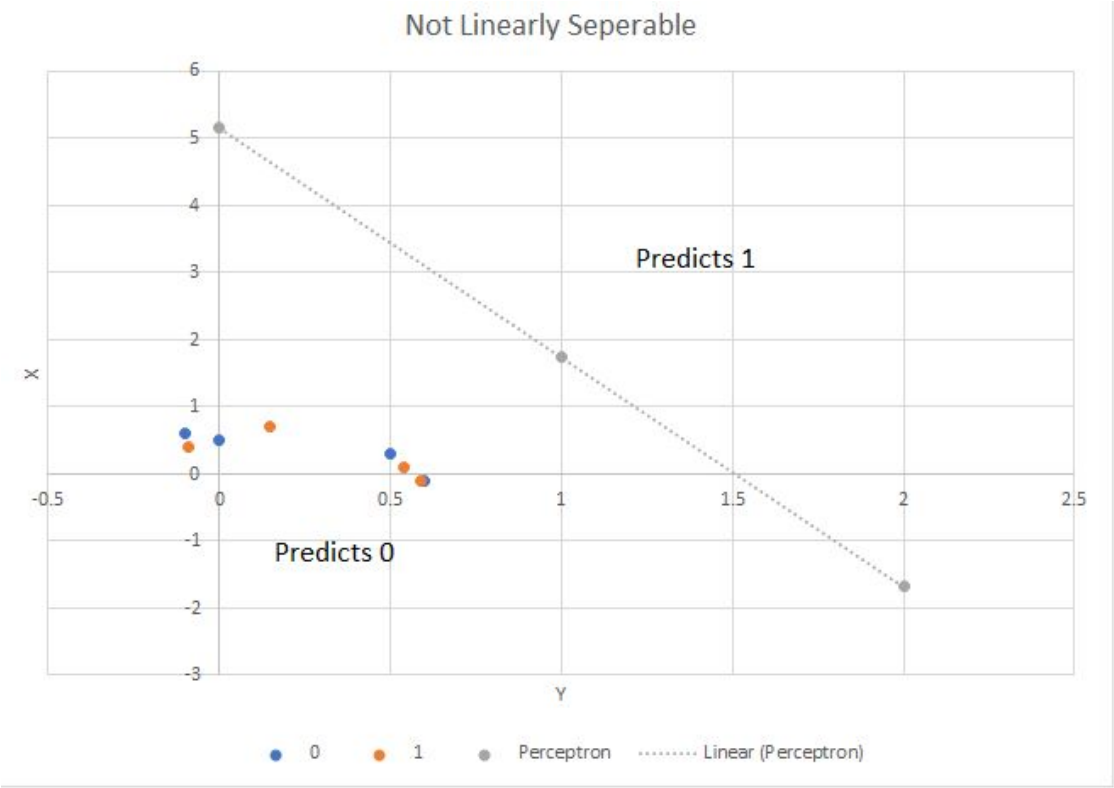
DataSet	Learning Rate	Epochs to Train	Final Accuracy %
Linearly separable	0	3	60
Linearly separable	0.19	3	100
Linearly separable	0.38	6	100
Linearly separable	0.57	3	80
Linearly separable	0.76	5	100
Linearly separable	0.95	3	100
Not Linearly separable	0	3	20
Not Linearly separable	0.19	4	80
Not Linearly separable	0.38	3	80
Not Linearly separable	0.57	3	80
Not Linearly separable	0.76	3	80
Not Linearly separable	0.95	3	80

Work for the equations for the following graphs show in appendix.

Data set 1 linearly separable:



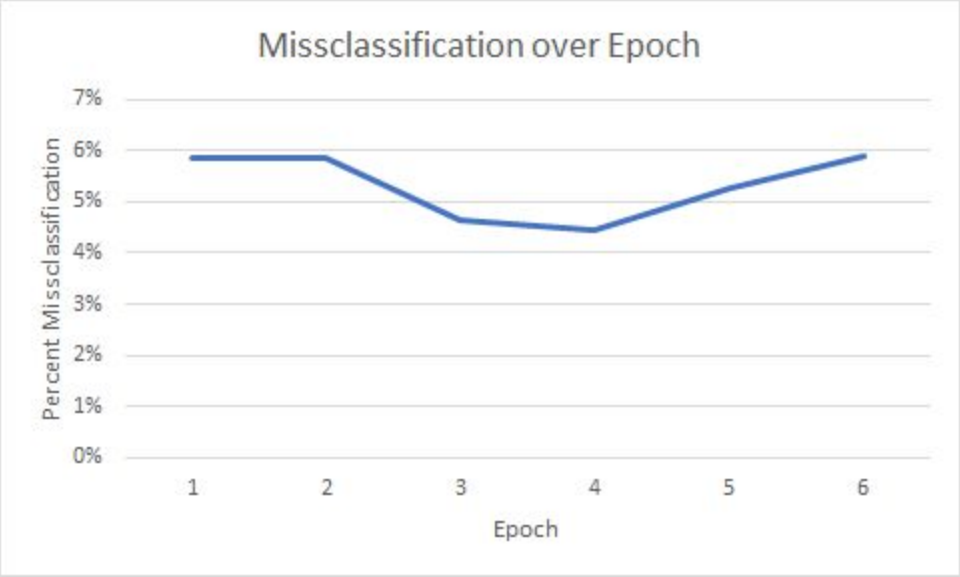
Data set 2 not linearly separable:



The Voting Problem

Train Accuracy	Test Accuracy	Epochs
86.96	94.96	3
94.41	95.68	6
95.66	92.81	3
93.79	94.96	5
95.96	96.4	4
93.36	94.96	4

It looks like the model learned that there are pretty direct correlations between the attributes and the result. The top three attributes that affected the outcome were, in order from highest to lowest effect: physician-fee-freeze, immigration, anti-satellite-test-ban.
The lowest were, in the same order: duty-free-exports, synfuels-corporation-cutback, adoption-of-the-budget-resolution.



It is odd that the rate went back up again, but that is because most of the trials ran in under 5 epochs, so after that the data made the chart sway back up.

Appendix
Data set 1 linearly seperable:

```
% First arff data file created by Dylan Brown
% fake meaningless data with correlations for training and testing a perceptron

@RELATION fakeData

@ATTRIBUTE Thing CONTINUOUS
@ATTRIBUTE Waeee CONTINUOUS
@ATTRIBUTE Class {0,1}

@DATA

0.6, -0.1, 0
0.59, -0.09, 0
0.5, 0.3, 0
0.54, 0.1, 0
-0.1, 0.6, 1
-0.09, 0.4, 1
0, 0.5, 1
0.15, 0.7, 1
```

Data set 2 not linearly separable:

```
% second arff data file created by Dylan Brown
% fake meaningless data with correlations for training and testing a perceptron

@relation fakeData

@attribute x numeric
@attribute y numeric
@attribute class {0,1}

@data

0.6, -0.1, 0
0.59, -0.09, 1
0.5, 0.3, 0
0.54, 0.1, 1
-0.1, 0.6, 0
-0.09, 0.4, 1
0, 0.5, 0
0.15, 0.7, 1
```

Equation Derivation

w_x * x + w_y * y + w_b * 1 = 0

$$xw_x + yw_y + w_b = 0$$

$$yw_y + w_b = -xw_x$$

$$yw_y = -xw_x - w_b$$

$$y = -(xw_x)/w_y - w_b/w_y$$