CS 440: Introduction to Artificial Intelligence

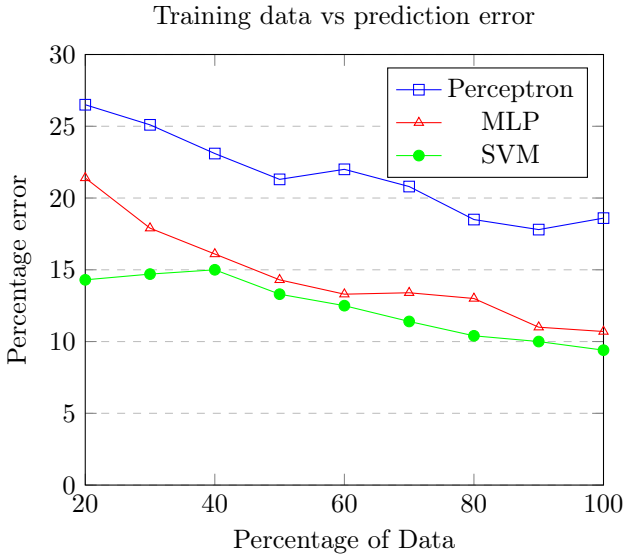
Brandon Smith & Nicholas Grieco

October 23, 2017

Question 1: Optical Character Recognition

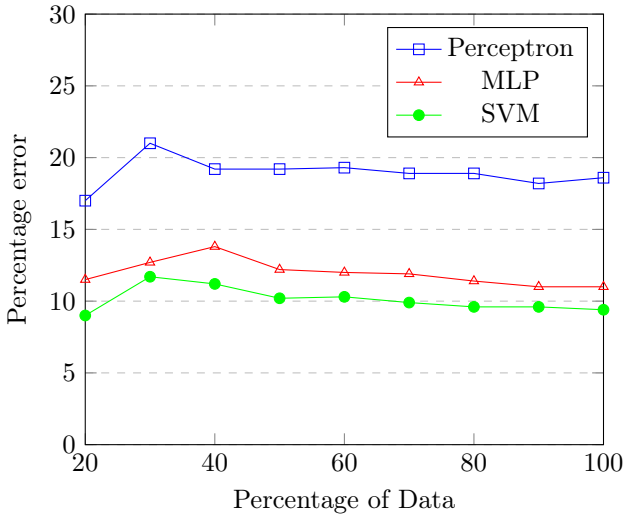
0.1 Partial Training Results

Results when using 20% to 100% of the training data, when validating and testing on 1000 images.



0.2 Partial Testing Results

Results when using 20% to 100% of the testing data, when training with 5000 images.



0.3 Qualitative Evaluation

Hello

Question 2: University of Excellence

a)

The provided tree is classified correctly.

b)

GPA: ≥ 3.9, $3.2 <$ GPA < 3.9 , ≤ 3.2
Research: Yes, No
Rank: 1, 2, 3

Level 1

GPA		
	Positive	Negative
≥ 3.9	3	0
$3.2 <$ GPA < 3.9	3	2
≤ 3.2	0	4

Remainder = $\frac{3}{12}$ B(1) + $\frac{5}{12}$ B($\frac{3}{5}$) + $\frac{1}{3}$ B(0)= 0.4046

Research		
	Positive	Negative
Yes	3	2
No	3	4

Remainder = $\frac{5}{12}$ B($\frac{3}{5}$) + $\frac{7}{12}$ B($\frac{3}{7}$) = 0.9792

Rank		
	Positive	Negative
Rank 1	3	2
Rank 2	2	1
Rank 3	1	3

Remainder = $\frac{5}{12}$ B($\frac{3}{5}$) + $\frac{1}{4}$ B($\frac{2}{3}$) + $\frac{1}{3}$ B($\frac{1}{4}$)= 0.9046

Reccomendation		
	Positive	Negative
Good	5	3
Normal	1	3

Remainder = $\frac{8}{12}$ B($\frac{5}{8}$) + $\frac{4}{12}$ B($\frac{1}{4}$) = 0.9067

GPA has the lowest remainder so we choose that option for the first level.

Level 2

Research		
	Positive	Negative
Yes	2	0
No	1	2

Remainder = $\frac{2}{5}$ B(1) + $\frac{3}{5}$ B($\frac{1}{3}$) = 0.5510

Rank		
	Positive	Negative
Rank 1	1	1
Rank 2	1	0
Rank 3	1	1

Remainder = $\frac{2}{5}$ B(1) + B(1) + $\frac{2}{5}$ B($\frac{1}{2}$) = 0.80

Reccomendation		
	Positive	Negative
Good	3	2
Normal	0	0

Remainder = B($\frac{3}{5}$) + B(1) + B(1) = 0.9710

Research has the lowest remainder so we choose that option for the second level.
Level 3

Rank		
	Positive	Negative
Rank 1	0	1
Rank 2	1	0
Rank 3	0	1

Remainder = B(1) + B(1) + B(1) = 0

Reccomendation		
	Positive	Negative
Good	1	2
Normal	0	0

Remainder =B(1) + B($\frac{1}{3}$) = 0.9183

University ranking has the lowest remainder so we choose that option for the last level.

c)

Yes they classify the same way because it's the same tree. It is not a coincidence. At each state the best attribute was chosen. The only time you can have different trees from the same data is at any given 2 attributes have the same remainder and you can choose.

Question 3: SVM

Question 3 goes here

Question 4: Perceptrons

Question 4 goes here

Question 5: Classification

Question 5 goes here