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DS_GA 1011 HW1
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Analysis of the Results
for Bag of N-Gram Document Classification

The public github repo can be found at:

1. Methods

Under each of the recommended hyper-parameter categories, I have tested

1. Tokenization schemes of the dataset:
   1.1 Convert all words to lower cases and ignore punctuation.
   1.2 Pre-process by deleting line break '< br />' and parentheses.
   1.3 Remove web URLs using regular expression.
2. Model hyper-parameters:
   2.1 Unigram
   2.2 Bigram
   2.3 Trigram
   2.4 Quadrigram
   2.5 Vocabulary size
   2.6 Embedding size
3. Optimization hyper-parameters:
   3.1 SGD optimizer
   3.2 Adam optimizer
   3.3 Change learning rate
   3.4 Use linear annealing of learning rate with original learning rate to be 0.01

2. Result and Analysis

a. Accuracy Table

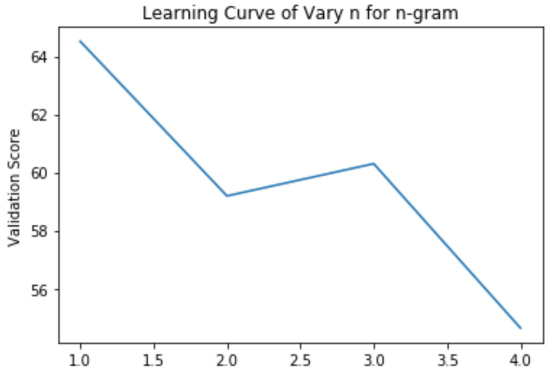
In the ablation study, I set all other variables to constant while allowing one to vary. The values for constant parameters I used are

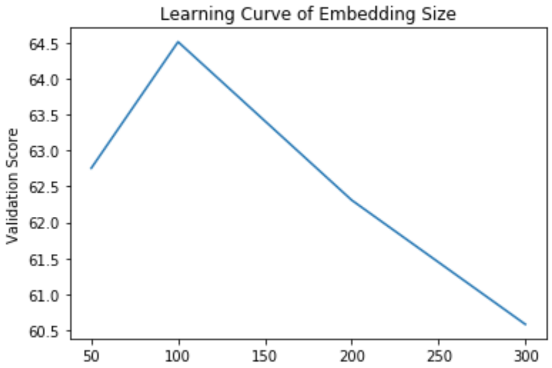
Tokenization schemes = the combination of all three pre-processing methods
n for n-gram = 1
Vocabulary size = 10000
Embedding size = 100
Optimizer = Adam
Learning rate = linear annealing

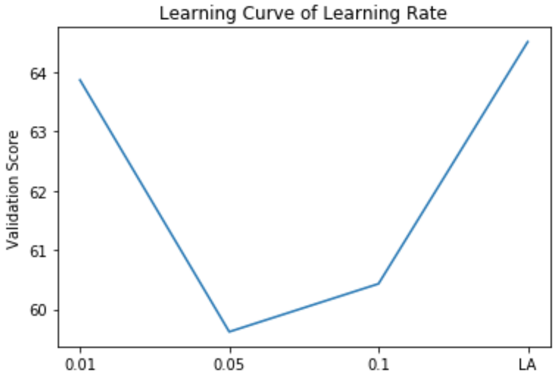
The validation accuracy of each parameters with selected values is shown below:

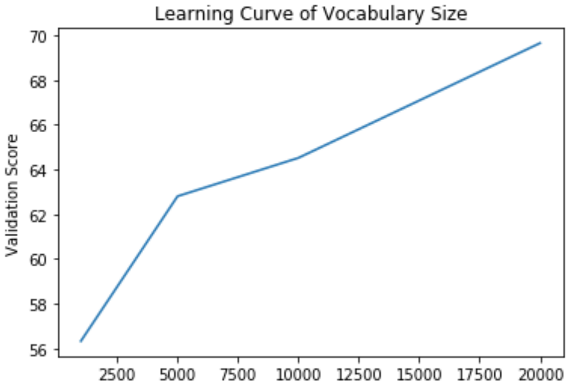
Category	Comparable attribute	Validation Accuracy
Vary n for n-gram	N=1	64.515
	N=2	59.19
	N=3	60.3
	N=4	54.64
Vocabulary size	max_vocab_size = 1000	56.32
	max_vocab_size = 5000	62.8
	max_vocab_size = 10000	64.515
	max_vocab_size = 20000	69.65
Embedding size	emb_dim = 50	62.755
	emb_dim = 100	64.515
	emb_dim = 200	62.31
	emb_dim = 300	60.58
Optimizer	SGD	65.91
	Adam	64.515
Learning rate	learning_rate = 0.01	63.87
	learning_rate = 0.05	59.62
	learning_rate = 0.1	60.43
	Linear annealing	64.515

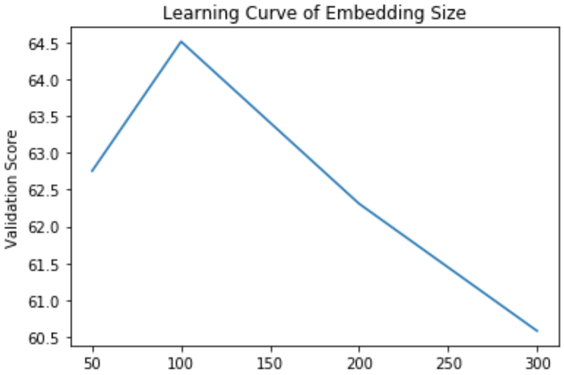
b. Training Curves

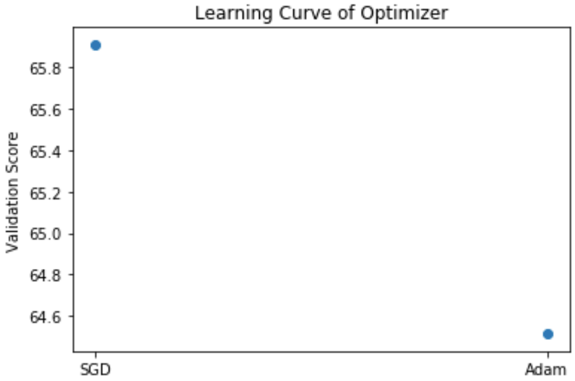

Learning Curve of Vary n for n-gram


Learning Curve of Embedding Size


Learning Curve of Learning Rate


Learning Curve of Vocabulary Size


Learning Curve of Embedding Size


Learning Curve of Optimizer

3. Discussion

Validation set samples:
3 correct: 8367_10.txt, 11778_3.txt, 9006_7.txt
3 incorrect: 42107_0.txt, 2582_2.txt, 12249_8.txt

4. conclusion

The best set of parameters I have found is:
Tokenization schemes: the combination of all three pre-processing methods
n for n-gram: n = 1
learning rate: Linear annealing
Vocabulary Size: 20000
Embedding Size: 100
Optimizer: SGD

The validation accuracy is 69.65
The test accuracy is 67.58