Assignment 2 Part 2: Algorithm Description and Results

Implementing Naive Bayes Classifier using Spark MapReduce

Priors for each class:

	sentiment	prior	log_prior
1	positive	0.5023891993022022	-0.6883801622634533
2	negative	0.4976108006977979	-0.6979370322103389

Evaluation: The accuracy is low as the implementation of Naïve Bayes classifier is very simple without any optimizations. For comparison, SKlearn's vanilla NB gives accuracy of 73% with TFIDF vectorization.

Accuracy	*0.66*
Precision	*0.59*
Recall	*0.68*
F1 measure:	*0.64*

Algorithm description:

function TRAIN NAIVE BAYES(D, C) **returns** log $P(c)$ and log $P(w|c)$

for each class $c \in C$ # Calculate $P(c)$ terms
  N_{doc} = number of documents in D
  N_c = number of documents from D in class c
  $logprior[c] \leftarrow \log \frac{N_c}{N_{doc}}$
  $V \leftarrow$ vocabulary of D
  $bigdoc[c] \leftarrow$ **append**(d) **for** d $\in$ D **with** class c
  for each word w in V # Calculate $P(w|c)$ terms
    $count(w,c) \leftarrow$ # of occurrences of w in $bigdoc[c]$
    $loglikelihood[w,c] \leftarrow \log \frac{count(w,c) + 1}{\sum_{w' \text{ in } V} (count(w',c) + 1)}$
return *logprior*, *loglikelihood*, V

function TEST NAIVE BAYES(*testdoc*, *logprior*, *loglikelihood*, C, V) **returns** best c

for each class $c \in C$
  $sum[c] \leftarrow logprior[c]$
  for each position i in *testdoc*
    $word \leftarrow testdoc[i]$
    if $word \in V$
      $sum[c] \leftarrow sum[c] + loglikelihood[word,c]$
return $\text{argmax}_c\ sum[c]$

Figure 4.2 The naive Bayes algorithm, using add-1 smoothing. To use add-α smoothing instead, change the $+1$ to $+\alpha$ for loglikelihood counts in training.