

Natural Language Processing

Lab 3.1

February 1, 2024

This lab sheet is to practice the concepts taught this week so far: Naive Bayes classification and Sentiment Analysis.

1. Train two models, multinomial naive Bayes and binarized naive Bayes, both with add-1 smoothing, on the following document counts for key sentiment words, with positive or negative class assigned as noted.

doc	"good"	"poor"	"great"	(class)
d1.	3	0	3	pos
d2.	0	1	2	pos
d3.	1	3	0	neg
d4.	1	5	2	neg
d5.	0	2	0	neg

Use both naive Bayes models to assign a class (pos or neg) to this sentence:

A good, good plot and great characters, but poor acting.

Do the two models agree or disagree?

2. Consider an NLP classification task where a model is trained to classify text documents into two categories: pos and neg. After testing the model on a validation set, the following confusion matrix was obtained:

Actual / Predicted	pos	neg
pos	80	20
neg	30	70

Based on the confusion matrix provided above, calculate the accuracy, and the precision, recall and F1 for the pos class. Provide your answers in decimal form rounded to two decimal places

3. In another NLP task, a model is developed to classify text documents into three categories: Positive (pos), Neutral (neut), and Negative (neg). After deploying the model on a test dataset, the following confusion matrix was recorded:

Using the confusion matrix above, calculate the following metrics: accuracy, and precision, recall, F1 for each class. Then calculate the micro-average precision, recall

Actual / Predicted	pos	neut	neg
pos	100	20	10
neut	330	120	20
neg	15	25	95

and F1. Finally calculate the macro-average precision, recall and F1 for the classifier. Provide your answers in decimal form rounded to two decimal places.

4. Briefly explain what the bootstrap method is and why it is appropriate for comparing two classifiers.
5. Describe the steps you would take to apply the bootstrap method to compare Model A and Model B.