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CS 4980 001

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**Homework 3**

1. How accurate was the classifier? What was the Precision and Recall? The F-measure?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | Actual | | |
| Positive | Neutral | Negative |
| Predicted | Positive | 1 | 0 | 1 |
| Neutral | 1 | 1 | 0 |
| Negative | 0 | 2 | 2 |

* 1. Accuracy:
  2. Precision
     1. Positive:
     2. Neutral:
     3. Negative:
  3. Recall
     1. Positive:
     2. Neutral:
     3. Negative:
  4. F-measure
     1. Positive:
     2. Neutral:
     3. Negative:

1. Choose one incorrectly classified document.
   1. Manually calculate the sentiment probabilities for the document (you can use your classifier to generate the likelihoods and prior probabilities, but do the classifying on paper)
      1. Incorrectly classified document: “The program sucks.”
      2. Logprior[“POS”] = -1.099
      3. Logprior[“NEG”] = -1.099
      4. Logprior[“NEU”] = -1.099
      5. Loglikelihood[“the”] = [-3.076, -3.541, -3.512] # [POS, NEG, NEU]
      6. Loglikelihood[“program”] = [-3.769, -4.234, -4.205] # [POS, NEG, NEU]
      7. Loglikelihood[“sucks”] does not exist
   2. What is the difference of the probability sums of the correct class and the class assigned by the system?
   3. Identify the term or terms that caused the system to misclassify the document.
      1. “Sucks”, which indicates strong negative sentiment, doesn’t exist in the training data. “Program” was also slightly more common in positive reviews, skewing the word to indicate positive even though the word should be neutral.
   4. Build a document (or documents) to add to the training set that would allow the system to correctly classify the document.
      1. Show the mathematical reasoning for your choice of words in the document.
         1. New document: “The thing sucks!”
         2. Adding this new negative document with “sucks” makes loglikelihood[“sucks”] = [-4.883, -4.270, -4.913] with add-1 smoothing. The loglikelihood for negative is noticeably higher than the other two, so adding that value will increase the probability of a document containing the word “sucks” being negative.
      2. Rerun the tests with the additional information.

Text

Description automatically generated

* + 1. Did adding the additional information change any other document classification? If so, how? Did it improve the overall accuracy of your system or make it worse?
       1. No, it didn’t change any other document classification. It improved the overall accuracy of the system to 5/8 = 0.625.
  1. Add the MPQA Subjectivity Cues Lexicon to your system and run the tests again and report the results.
     1. Results

Text

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* + 1. Choose a document that was classified differently after adding the lexicon. Was it correctly or incorrectly classified? Discuss why.
       1. “Great software” is now correctly classified because the word “great” wasn’t in the training set before adding the lexicon, but now with the lexicon saying that “great” is a positive word, it is taken into consideration and greatly contributes to the probability of the document being positive sentiment.
  1. Finally, use the provided collection of Amazon reviews from 2007 to train your classifier. Run the associated tests and report the Precision, Recall, and F-measure.
     1. Output

Text

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* + 1. Confusion Matrix

|  |  |  |
| --- | --- | --- |
|  | Positive | Negative |
| Positive | 166699 | 25402 |
| Negative | 33301 | 174598 |

* + 1. Accuracy: 0.8532425
    2. Precision: 0.8677674764837247
    3. Recall: 0.833495
    4. F-measure: 0.850286023244011
  1. Briefly discuss what you learned from this assignment, what you liked or disliked about the assignment and, optionally, anything you would like to see changed or added to improve the assignment.
     1. I learned how important performing good pre-processing on your dataset before training with it really is. I liked training with a big dataset from a real source, but working with the Amazon reviews dataset took a lot longer than I thought it would. In the future, I suggest using a smaller dataset for the homework.