COMP 6721

Applied Artificial Intelligence

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The below matrices were generated using our program by maintaining following counters,

TruePositive: when actual class is Ham and model predicts as Ham

TrueNegative: when actual class is Ham and model predicts as Spam

FalsePositive: when actual class is Spam and model predicts as Spam

FalseNegative: when actual class is Spam and model predicts as Ham

The above counters are put into the matrices according to their description.

Ham Matrix:

Model predicts	Email is Ham in real	Email is Spam in real
Email is Ham	A = 394	B = 6
Email is Spam	C = 64	D = 336

Spam Matrix:

Model predicts	Email is Spam in real	Email is not Spam in real
Email is Spam	A = 336	B = 64
Email is not Spam	C = 6	D = 394

$$Accuracy = \frac{A+D}{A+B+C+D}, Precision = \frac{A}{A+B}, Recall = \frac{A}{A+c}, F1\ Measure = \frac{2(Precision*Recall)}{Precision+Recall}$$

Table of results:

Measures	While detecting Ham	While detecting Spam
Accuracy	91.25%	91.25%
Precision	98.5%	84%
Recall	86.026%	98.245%
F1-measure	91.84%	90.5657%

The precision for finding Ham is high and recall is low whereas for finding spam the recall is high and precision is less, therefore we require F1-measure which allow us to compare our model to find Ham and Spam. Here we can observe that our model performs better when it comes to detecting Ham emails. Because the F1 score of predicting Ham is better than F1 score of predicting Spam. The overall performance of our model is good. We can improve the performance by filtering the stop words like a, the, from, received, etc. In order to get the actual words which, affect the probability. We can use term frequency and inverse document frequency to remove some of the stop words.

References:

https://towardsdatascience.com/accuracy-precision-recall-or-f1-331fb37c5cb9

https://stackoverflow.com/questions/4880960/how-to-sum-all-the-values-in-a-dictionary

https://en.wikipedia.org/wiki/Confusion_matrix

https://stats.stackexchange.com/questions/49226/how-to-interpret-f-measure-values

Lecture slides on Naïve Bayes and NLP with related worksheets.