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Applied Artificial Intelligence

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Project Assignment 2 Report

**Analysis**

### How we generated this table using our program:

We calculated the FP (False positive) and FN (False Negative), TP (True Positive) and TN (True Negative) values for each class namely: **spam (Positive Class)** and **ham (Negative Class)**. Then using the formulas in the **Table 1**, we calculated the metrics for each class. For **Table 2**, we used the values that we calculated to generated the Confusion Matrix for 800 test files in which 400 were labelled as spam and the rest were ham.

### Discussion of the results

**For individual classes- Spam and Ham:**

As per the results, for Ham class it was 98.75% accurate and for Spam class, the accuracy was 83%. For both the classes, precision was 100% as expected which means all of the predicted positives were correctly classified. The recall was 83% for Spam class which means that 17% of the spam emails find a way into the inbox and are not filtered whereas

**For the Model:**

The model has 90.87% accuracy and the precision is 98.51% which means that out of 100 emails classified as spam, the classifier incorrectly classifies around only 2 ham emails as spam emails which looks good. However, the recall for the model is 83% which means that 17% emails still find a way to the inbox, which is not a good score for a spam detector. The F1 score is 90.09 for the classifier which is a harmonic mean of precision and recall.

**Table 1** Results for each class- Spam and Ham

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Ham (%) | Spam (%) | MODEL (%) | Formula |
| Accuracy | **98.75** | **83** | **90.87** | (TP+TN) / (TP+FP+TN+FN) |
| Precision | **100** | **100** | **98.51** | TP / (TP+FP) |
| Recall | **98.75** | **83** | **83** | TP / (TP+FN) |
| F1-  measure | 99.37 | 90.71 | 90.09 | 2PR / (P+R) |

**Table 2** Confusion Matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Predicted | |  |
| **N = 800** | **SPAM** | **HAM** | TOTAL |
| Actual | **SPAM** | **TP = 332** | **FN = 68** | 400 |
| **HAM** | **FP = 5** | **TN = 395** | 400 |
|  | TOTAL | 337 | 463 | 800 |

# Bibliography

|  |  |
| --- | --- |
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| [3] | "Evaluating a Spam filter Classifier," 2020. [Online]. Available: https://freecontent.manning.com/evaluating-a-classification-model-with-a-spam-filter/. |