

# DAT565/DIT407 Assignment 3

Sebastian Miles  
miless@chalmers.se

Olle Lapidus  
ollelap@chalmers.se

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## Problem 1

Spam messages usually stand out by using aggressive marketing strategies. These emails will frequently use words such as "free", "win", "urgent", etc. They might also contain suspicious links or inquire about your own personal information. In contrast the ham mails will be conversational and more relevant to the receiver. Easy ham is easy to classify due to the straightforward structure and wording. Hard ham contains words and phrasing that might be classified as spam even though it is ham.

We used 50% of the data as training data. With this training we achieved an accuracy of 95.15%.

88.07

## Problem 2

Firstly, we began with building onto the code from the previous problem. Secondly, we initialized CountVectorizer from the scikit-learn library. Thirdly, we used fit\_transform and transform on the train set and test set respectively.

## Problem 3

Then, we used the BinomialNB function on the transformed train and test set. Thirdly we used the predict function on the

The performance of the Multinomial Naive Bayes classifier was evaluated using accuracy, precision, recall, and a confusion matrix. The classifier was trained on a dataset containing both spam and ham emails, and the results are as follows:

### MultinomialNB

See table 1

**Precision** (ham): 0.95

**Precision** (spam): 0.99

**Recall** (ham): 1.00

**Recall** (spam): 0.70

	Predicted Ham	Predicted Spam	Sum
Actual Ham	1281	1	1282
Actual Spam	73	171	244
Sum	1354	172	1526

Table 1: Confusion Matrix for MultinomialNB

## BernoulliNB

	Predicted Ham	Predicted Spam	Sum
Actual Ham	1280	2	1282
Actual Spam	180	64	244
Sum	1460	68	1528

Table 2: Confusion Matrix for BernoulliNB

See table 2

**Precision** (ham): 0.88

**Precision** (spam): 0.97

**Recall** (ham): 1.00

**Recall** (spam): 0.26

The classifier demonstrates high accuracy, with a precision of 0.99 for spam detection, although the recall for spam is somewhat lower, indicating occasional missed spam emails.

## Problem 4

### Code

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