Naïve Bayes and its explanation

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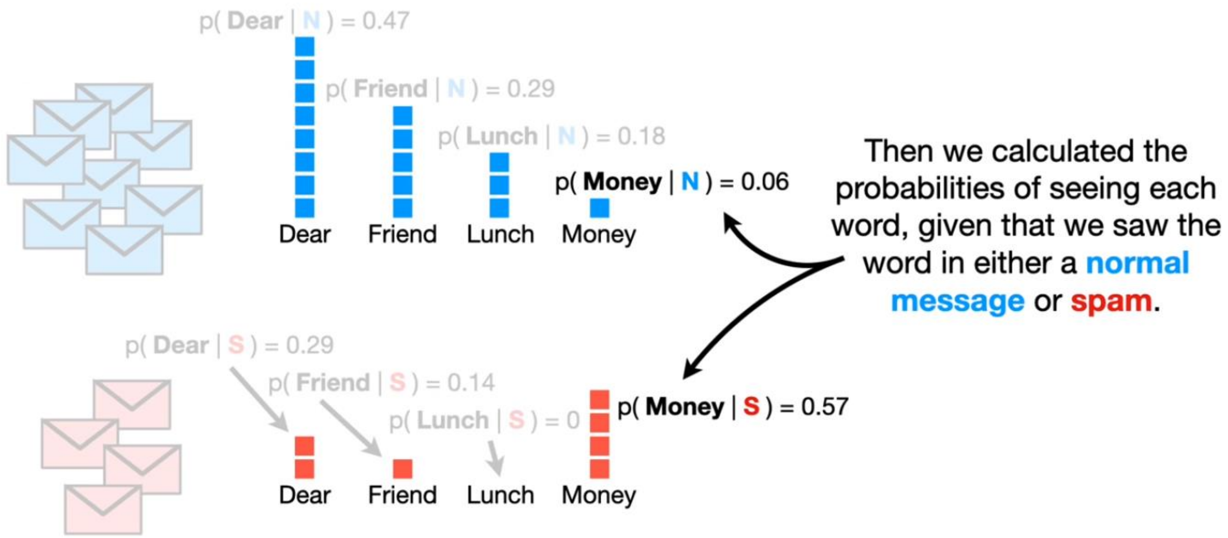
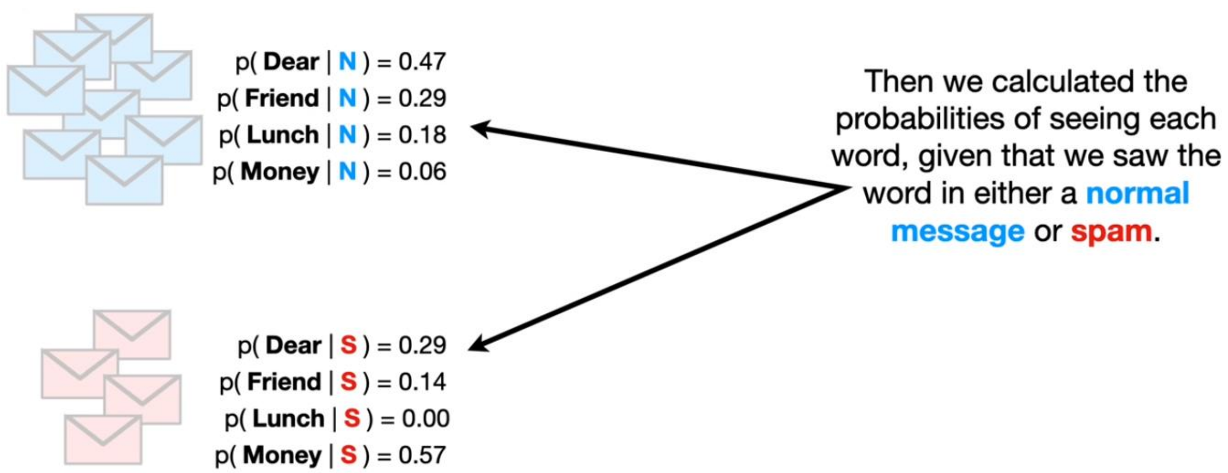
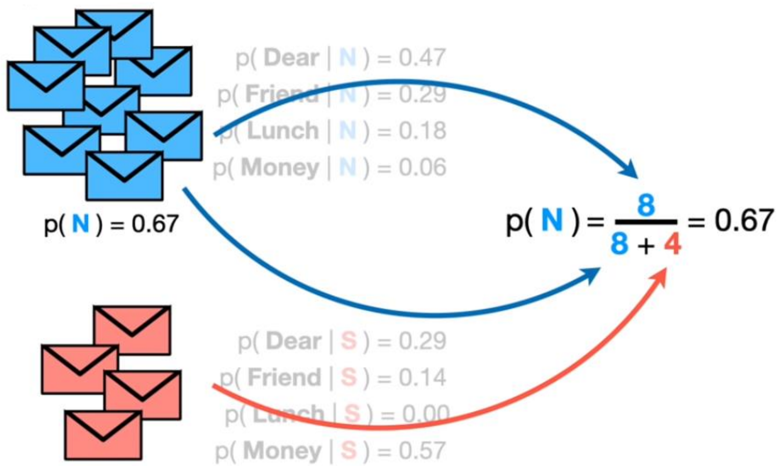
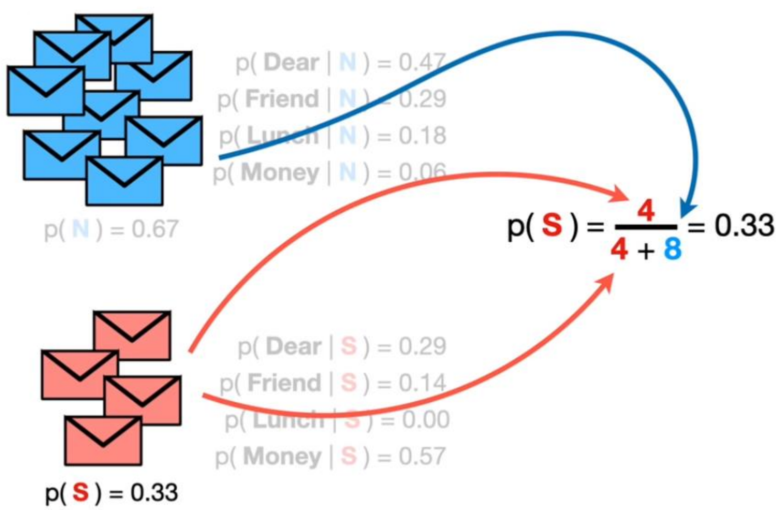


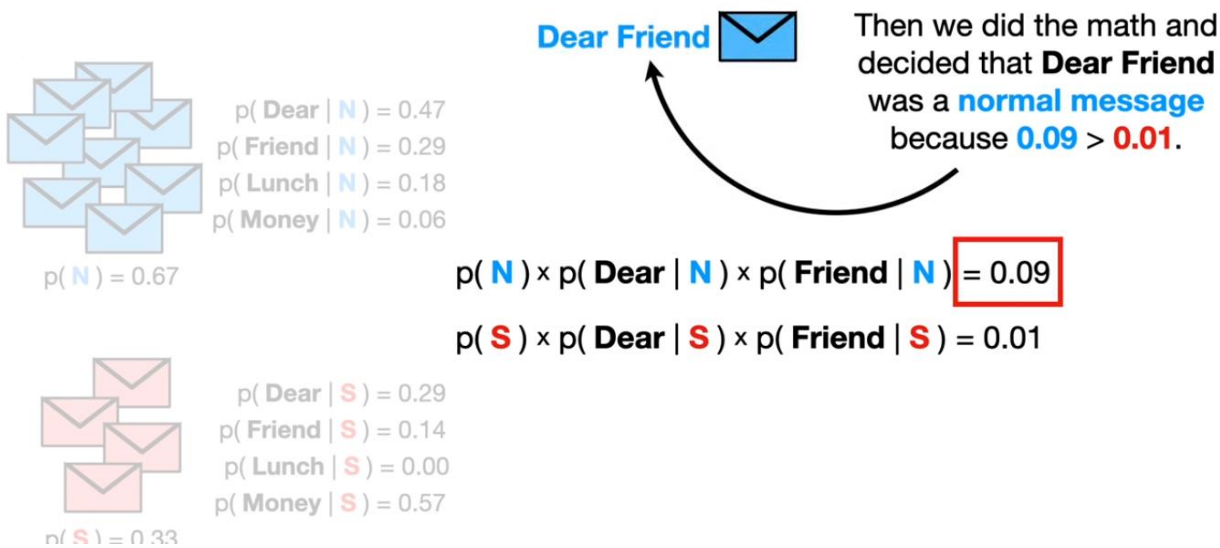




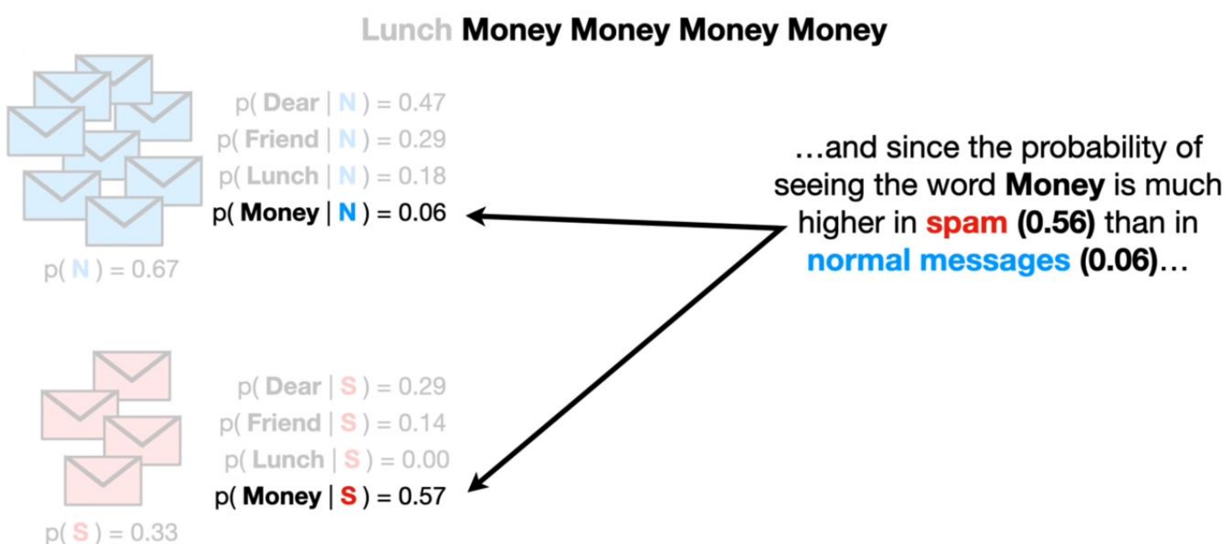
This guess can be anything between **0** and **1**, but we based ours on the classifications in the **Training Dataset**.



Then made the same sort of guess about the probability of seeing **spam**.

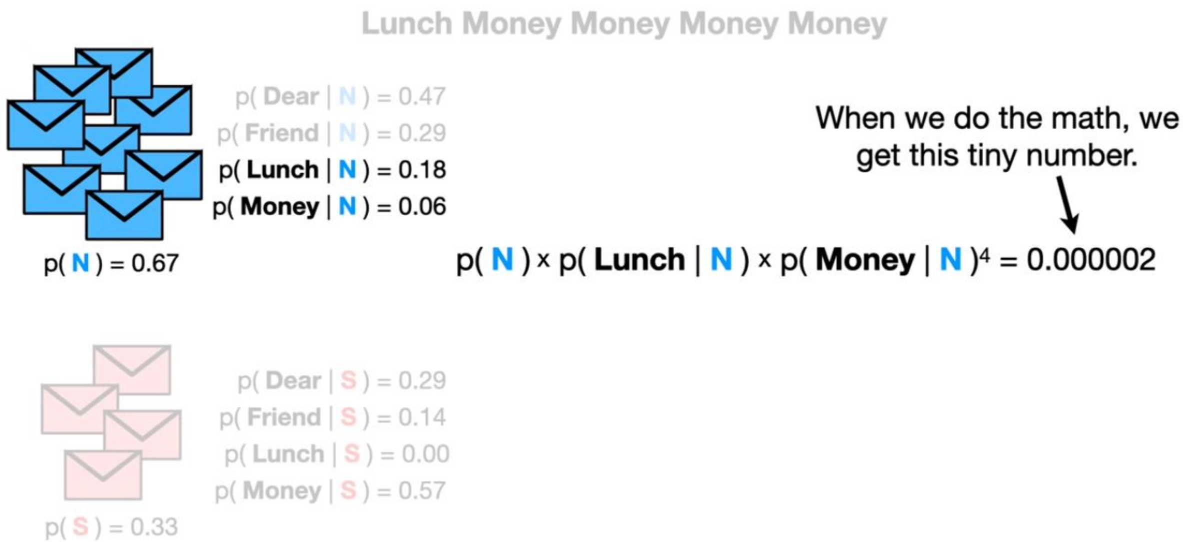


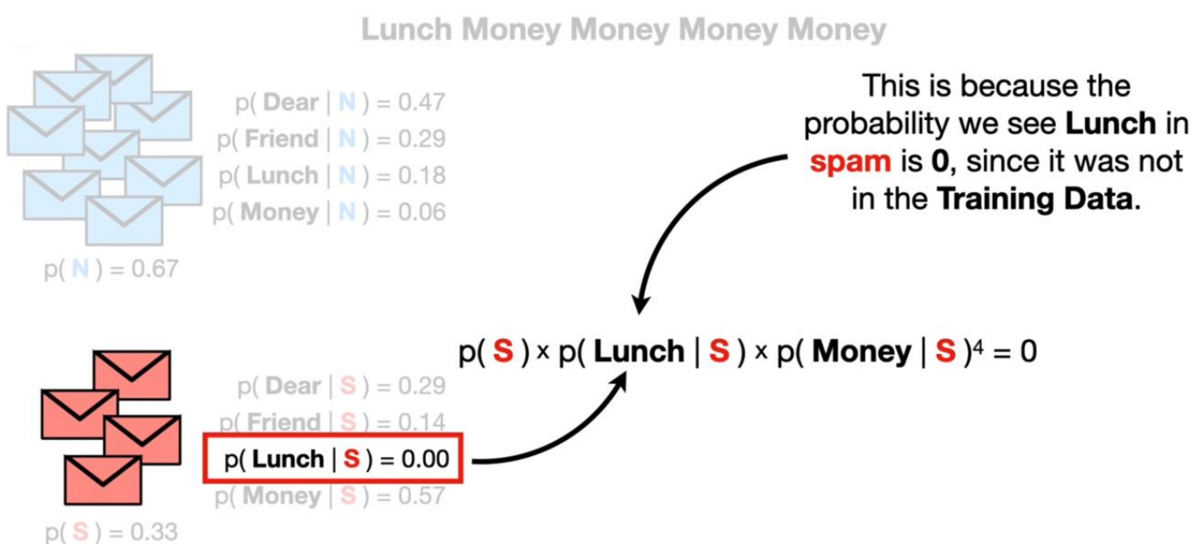
<u>**Let's see a complicated example:**</u>



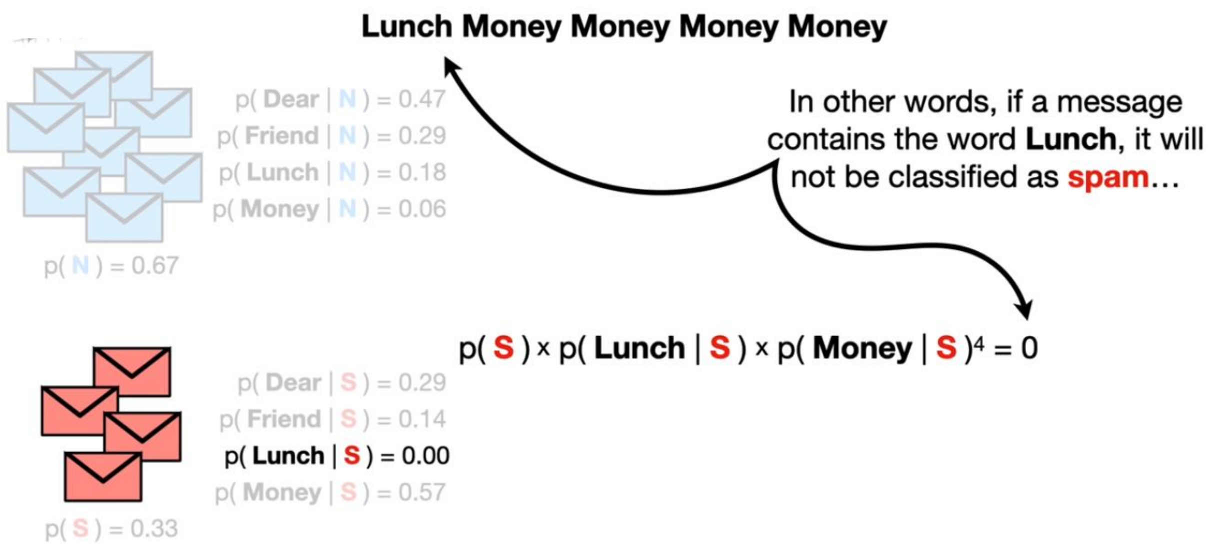
Hence p(Money|S) > p(Money|N), hence we can conclude that, the message is from spam.

Calculations:

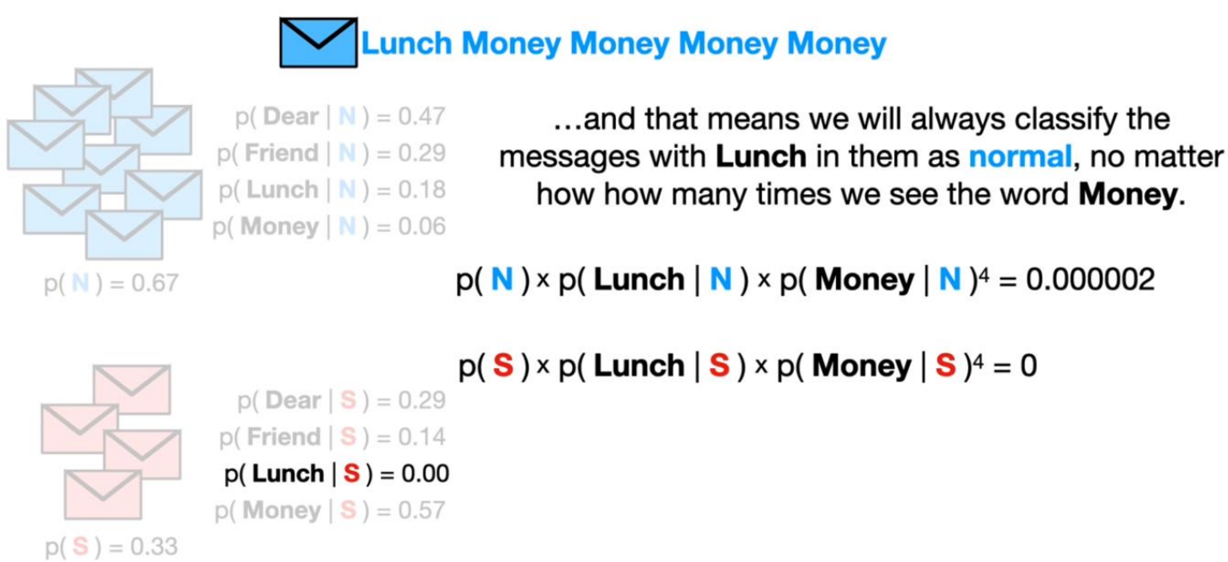




Conclusion:

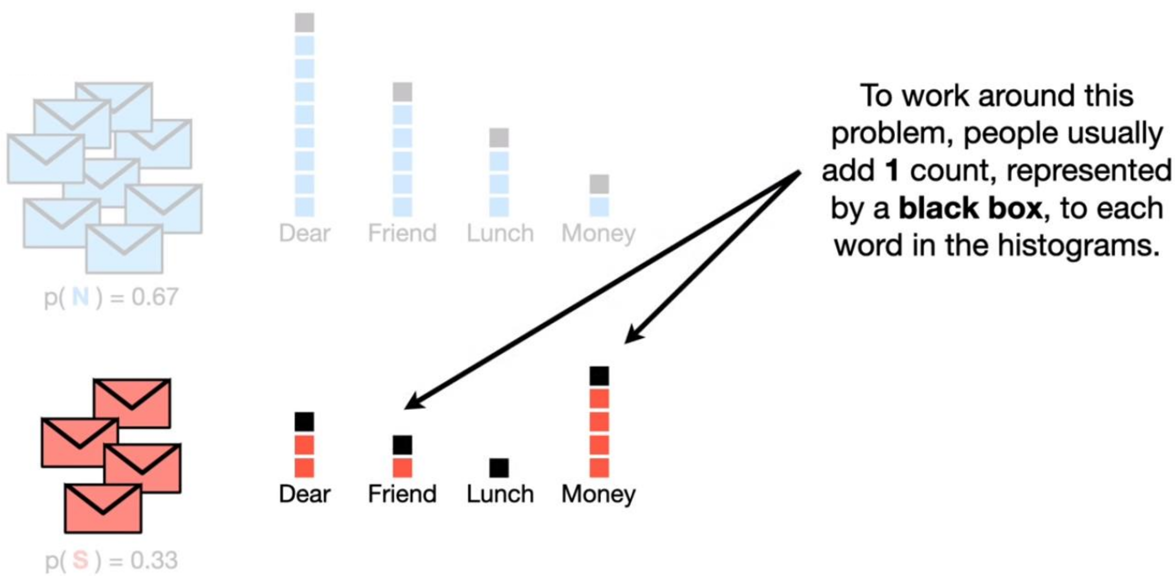


Lunch Money Money Money Money
p(Dear | N) = 0.47
p(Friend | N) = 0.29
p(Lunch | N) = 0.18
p(Money | N) = 0.06
p(N) = 0.67
In other words, if a message contains the word Lunch, it will not be classified as spam…
p(S) x p(Lunch | S) x p(Money | S)4 = 0
p(Dear | S) = 0.29
p(Friend | S) = 0.14
p(Lunch | S) = 0.00
p(Money | S) = 0.57
p(S) = 0.33



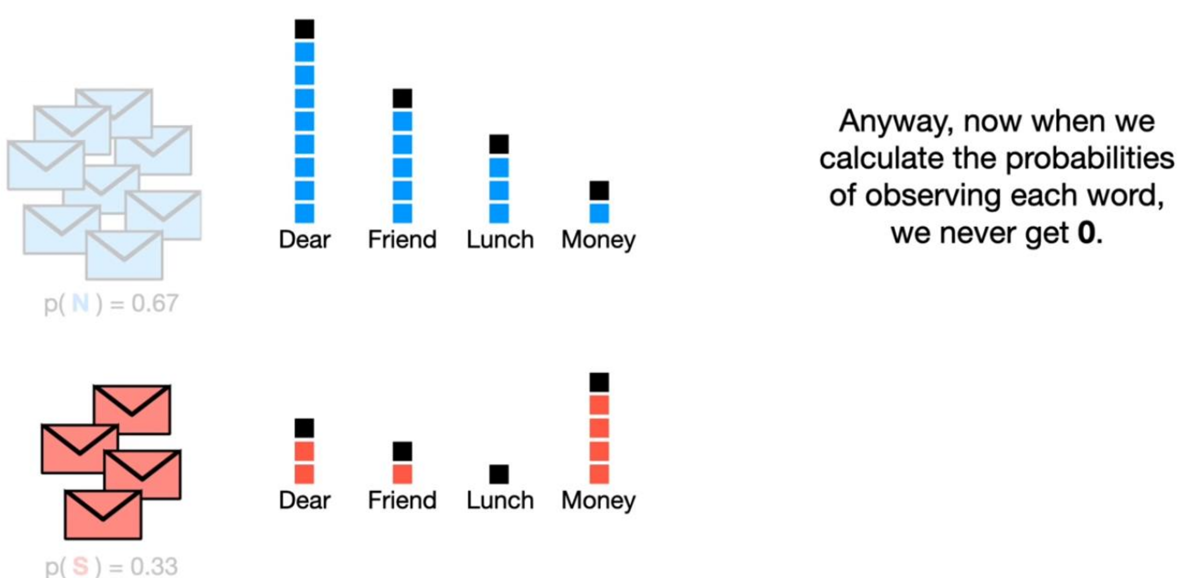
Lunch Money Money Money Money
p(Dear | N) = 0.47
p(Friend | N) = 0.29
p(Lunch | N) = 0.18
p(Money | N) = 0.06
p(N) = 0.67
…and that means we will always classify the messages with Lunch in them as normal, no matter how how many times we see the word Money.
p(N) x p(Lunch | N) x p(Money | N)4 = 0.000002
p(S) x p(Lunch | S) x p(Money | S)4 = 0
p(Dear | S) = 0.29
p(Friend | S) = 0.14
p(Lunch | S) = 0.00
p(Money | S) = 0.57
p(S) = 0.33

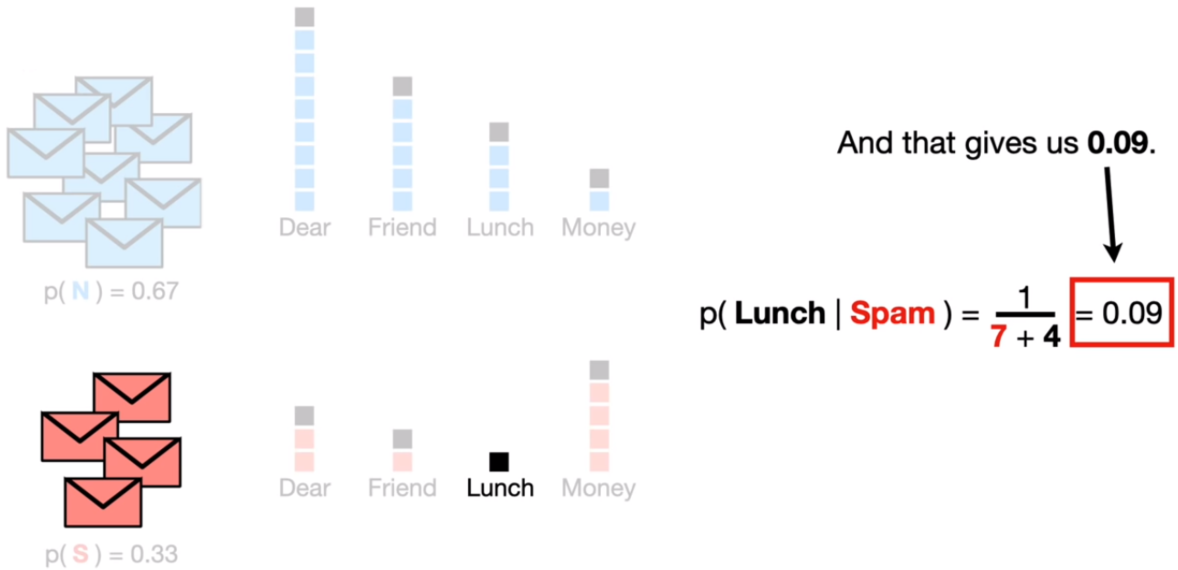
To avoid 'Lunch' is zero; let's add the one more word in each class:



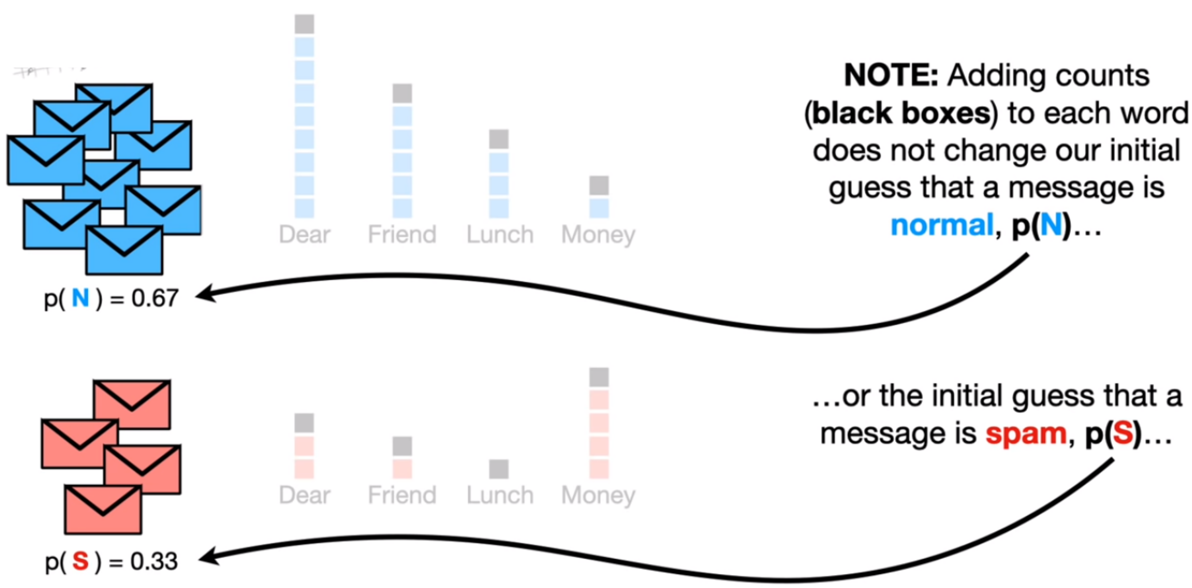
Let suppose the increment is alpha (α):

Let's here α = 1



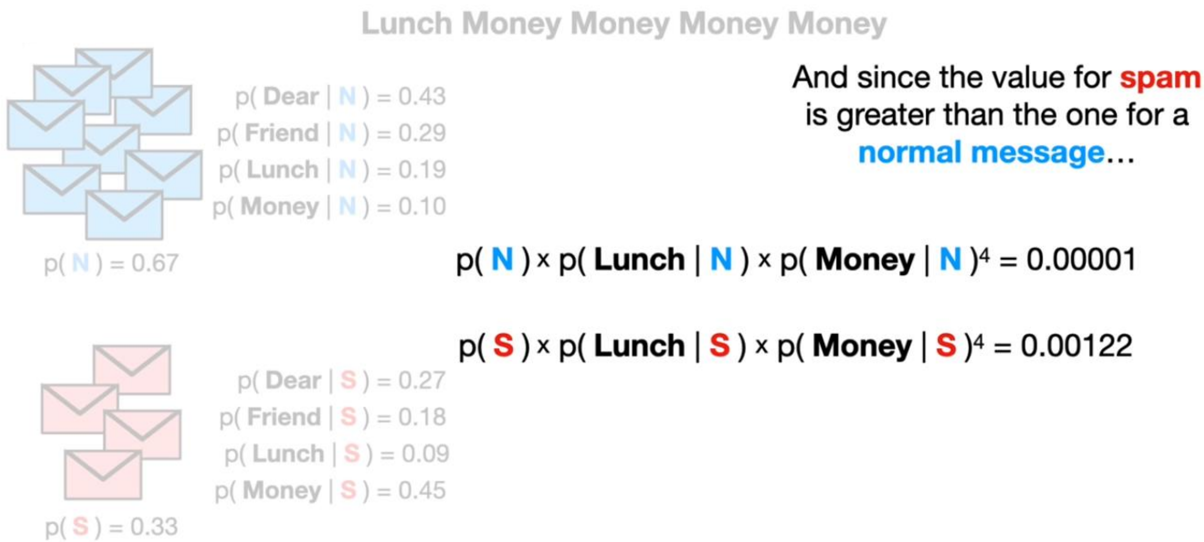


Hence



Moreover the actual count has not changed hence still p(N) and p(S) has not even changed.

After the calculation:



0.00122 > 0.00001, hence we classify the massage as spam.

It is said Naïve Bayes, because it separates the classes very well by scoring each class. It fixes the score for every class by likelihood into the training data, it recognizes by the score only as shown above.

It has high bias (due to high values) and low variance (in practice).