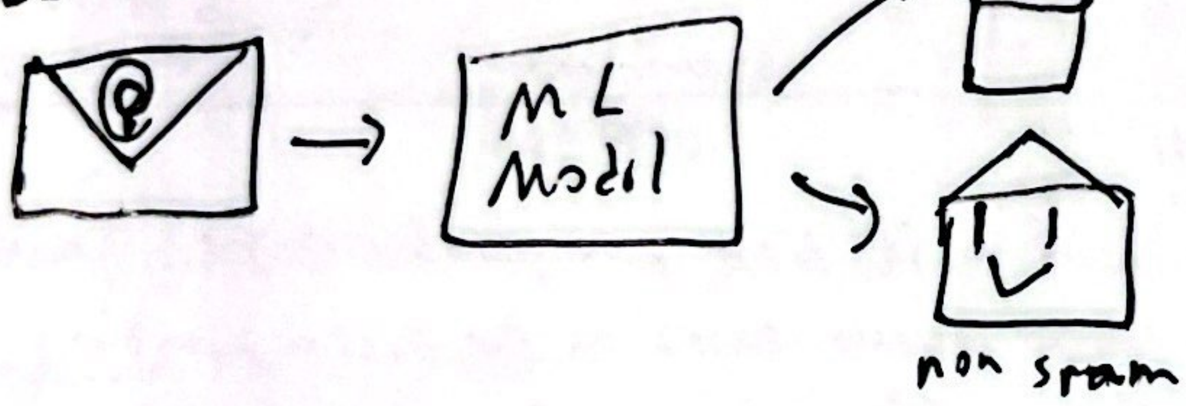
Naive Bayes Classifier (- supervised - classification)

1 - is a classification algorithm based on bayes theorem it learns probabilities from training to then classify new data based on its probability of falling in some class

2 ✱ Ex spam filters: we can train our algo with many spam and non spam emails and count the occurances of different words in each class (spam / non spam etc) then calculate the probabilities of certain words appearing in spam emails and non spam emails. we then classify a new email into spam or non spam based on the words it contains by using bayes theorem

2.1 · Ex



2.2 · train using emails

	label	SMS
0	spam	Party Drugs Prize
1	non spam	Ali how are you
2	spam	Winner Prize!

	label	Party	Ali	Prize	...
0	spam	1	0	2	...
1	non spam	0	1	0	...
2	spam	0	0	1	...

· count occurances and find probabilities of words in spam vs non spam

2.3 · Bayes Theorem

$$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$$

⇓

P(A|B): P of A Given B occurred

P(B|A): P of B Given A occured

P(A): P of A occuring

P(B): P of B occuring

2.4 · Non email

$P(\text{spam} \mid \text{Party}, \text{Drugs})$ → probability of email being spam based on words "party" and "Drugs"

$$= \frac{P(\text{Party}|\text{spam}) \cdot P(\text{Drugs}|\text{spam}) \cdot P(\text{spam})}{P(\text{Party}) \cdot P(\text{Drugs})}$$

2.5 ⇒ Calculate. Like P(spam) = 66% ... = X%

probability that this email is spam ex 99%

3 ✱ This algo makes the false assumption that the probabilities of different words appearing are independent (Feature independence) so its "Naive". So its good for text based classifications "computationally efficient"

$P(\text{Party} \mid \text{spam}) = P(\text{Party} \mid \text{spam \& Drugs})$