LIN 313 Language and Computers
8/25/2025
Naive Bayes

A. Probability review:

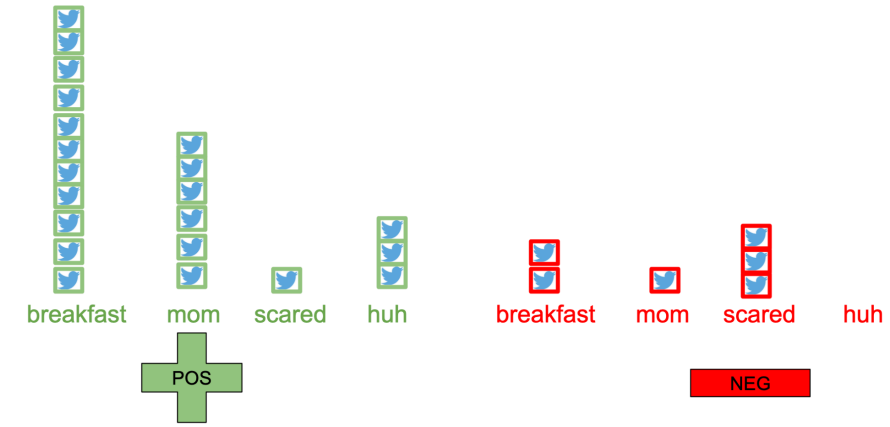
You are rolling a 20-sided die.

1. Q: What is the probability that you roll a 20?

2. Q: What is the probability that you roll two 20s in a row?

3. Q: Given that you have already rolled a 20, what is the probability that you roll another 20? Hint: these are two separate rolling events, and we only care about the second one!

B. Conditional Probabilities:



What is the **likelihood** of rolling "breakfast" **given** that a tweet is positive? I.e., what is P("breakfast" | POS)

P("breakfast" | POS) =
P("mom" | POS) =
P("scared" | POS) =
P("huh" | POS) =

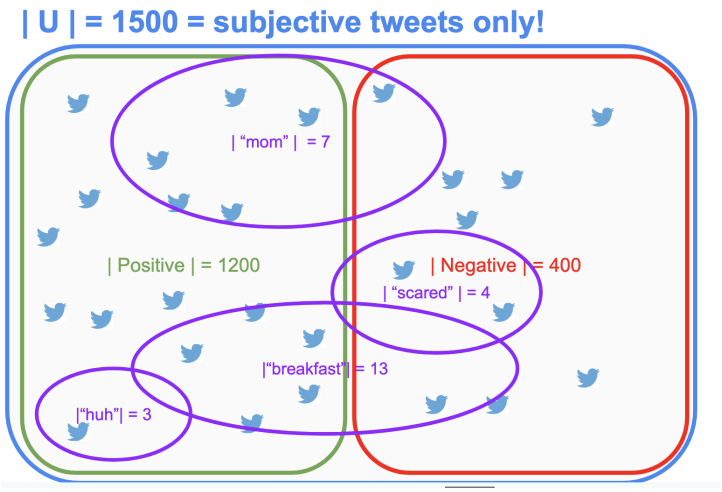
P("breakfast" | NEG) =
P("mom" | NEG) =
P("scared" | NEG) =
P("huh" | NEG) =

C. Joint Probabilities

Given we have a 2-word positive tweet, What's the probability that it contains "breakfast" and "mom"? I.e., what is

P("breakfast", "mom" | POS) =

D. Calculating Priors:



What is the **prior probability** that a tweet in our subjective subset is positive?

P(POS) =
P(NEG) =

E. Putting it all together:

P(POS | "breakfast", "mom") =

P(NEG | "breakfast, "mom") =

Question: How should we classify our tweet?????

F. Bonus: Same same but different

Incoming tweet! We modeled the last tweet as a joint event of "breakfast" and "mom". This tweet is a joint event of "breakfast" and "mom" and "scared".

Question: Is the sentiment the same for this tweet? What is it?

Question: What is our sentiment prediction? Calculate the priors and the joint probabilities for each class just as above, and then plug these values into Bayes' formula.

P(POS) =
P(NEG) =

P("breakfast", "mom", "scared" | POS) =
P("breakfast", "mom", "scared" | NEG) =

P(POS| "breakfast", "mom", "scared") =
P(NEG| "breakfast", "mom", "scared") =

The higher answer is the category that our model predicts.

Question: Why is the model wrong? Where do you think Naive Bayes will have problems with language?