The Naive Bayes Algorithm: Takeaways 🖻

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Concepts

• When a new message "w₁, w₂, ..., w_n" comes in, the Naive Bayes algorithm classifies it as spam or non-spam based on the results of these two equations:

$$P(Spam|w_1,w_2,...,w_n) \propto P(Spam) \cdot \prod_{i=1}^n P(w_i|Spam) \ P(Spam^C|w_1,w_2,...,w_n) \propto P(Spam^C) \cdot \prod_{i=1}^n P(w_i|Spam^C)$$

ullet To calculate $P(w_i|Spam)$ and $P(w_i|Spam^C)$, we need to use the additive smoothing technique:

$$egin{aligned} P(w_i|Spam) &= rac{N_{w_i|Spam} + lpha}{N_{Spam} + lpha \cdot N_{Vocabulary}} \ P(w_i|Spam^C) &= rac{N_{w_i|Spam^C} + lpha}{N_{Spam^C} + lpha \cdot N_{Vocabulary}} \end{aligned}$$

• Below, we see what some of the terms in equations above mean:

 $N_{w_i|Spam}=$ the number of times the word w_i occurs in spam messages $N_{w_i|Spam^C}=$ the number of times the word w_i occurs in non-spam messages $N_{Spam}=$ total number of words in spam messages $N_{Spam^C}=$ total number of words in non-spam messages $N_{Vocabulary}=$ total number of words in the vocabulary $\alpha=1$ (α is a smoothing parameter)

Resources

- A technical intro to a few version of the Naive Bayes algorithm
- An intro to conditional independence

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