

Naive Bayes

Agenda

- **Why Naive Bayes?**
- Classification --
 - Naive Bayes classifier
- Independent Features
- Prior Probability
- Likelihood
- Posterior Probability
- Relationship between Posterior, prior and likelihood
- Applications --
 1. Face Recognition
 2. Spam Filtering
 3. Weather Prediction
 4. Text Classification
- Advantages
- Limitations

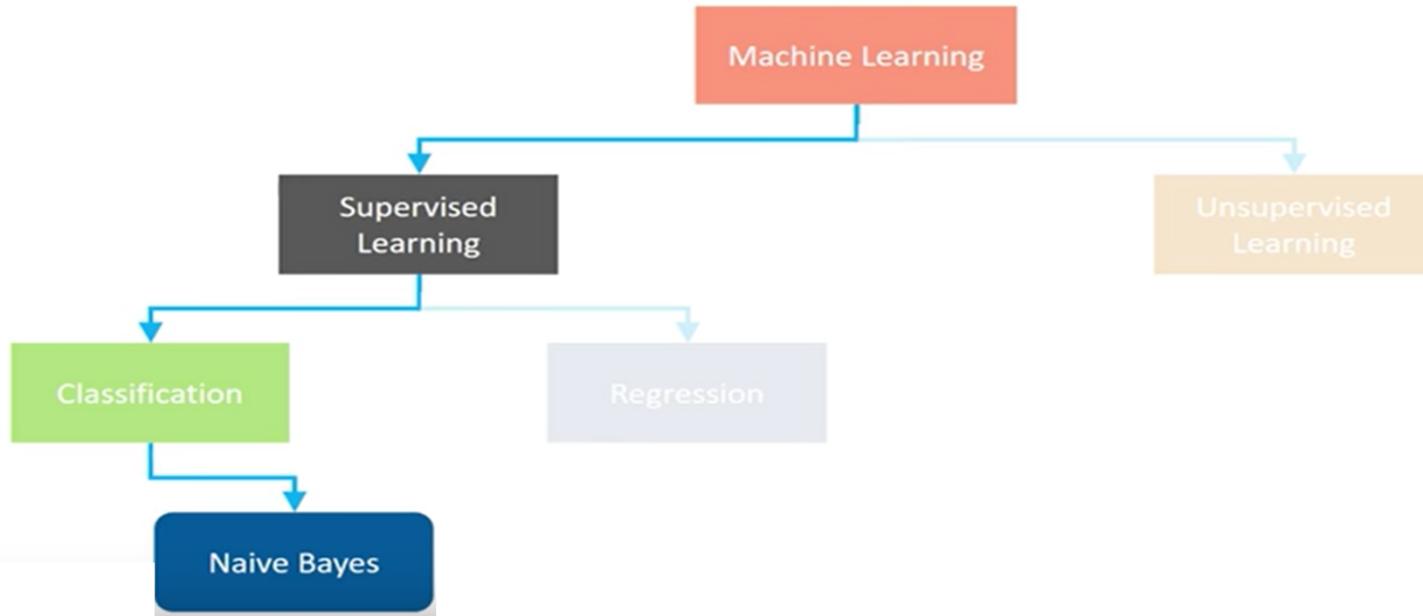
- Named after [Thomas Bayes](#)(1702 - 1761), who proposed Bayes Theorem.



Why
naive?







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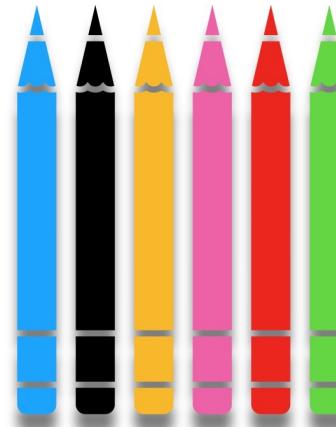
Classification

- In machine learning and statistics, classification is the problem of identifying to which of a set of categories new observation belongs.



Naive Bayes Classifier

- It is a simple probabilistic classifier based on applying bayes's theorem with strong(naive) independent assumptions.





Independent features

Machine Learning
model

Dependent features

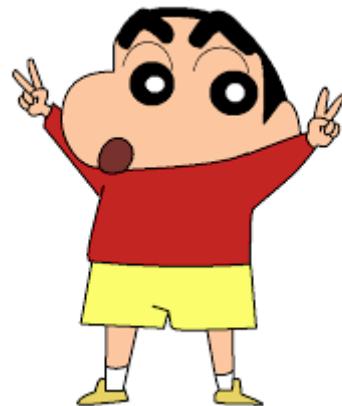
Simple Terms

- It assumes that the presence(or absence) of a particular feature of a class is unrelated to the presence (or absence) of any other feature , given the class variable.

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Independent Features



- Given a hypothesis h and data D which bears on the hypothesis:

$$P(h | D) = \frac{P(D | h) P(h)}{P(D)}$$

- $P(h)$: independent probability of h : **prior probability**
- $P(D)$: independent probability of D
- $P(D|h)$: conditional probability of D given h : **likelihood**
- $P(h|D)$: conditional probability of h given D : **posterior probability**

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

THE PROBABILITY OF "B" BEING TRUE GIVEN THAT "A" IS TRUE

↓

↑ THE PROBABILITY OF "A" BEING TRUE

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↑ THE PROBABILITY OF "B" BEING TRUE

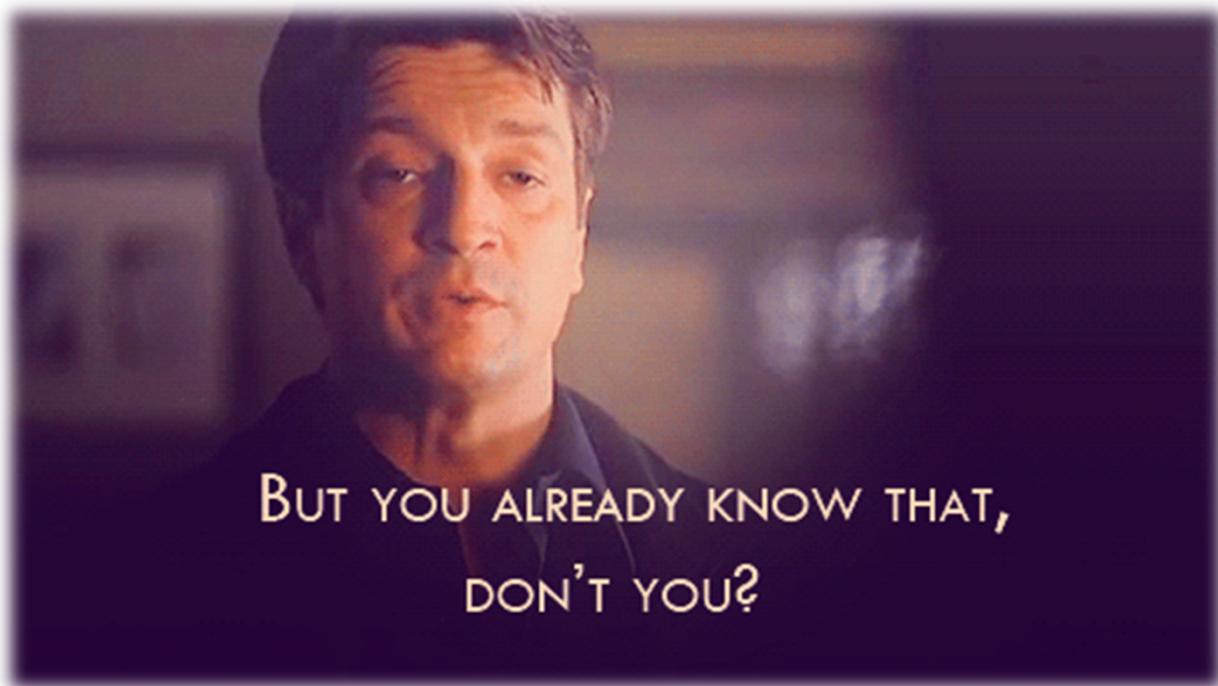
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Lets understand Prior Probability

- Probability calculated from some **prior information** about the event.





BUT YOU ALREADY KNOW THAT,
DON'T YOU?



Lets consider an example

