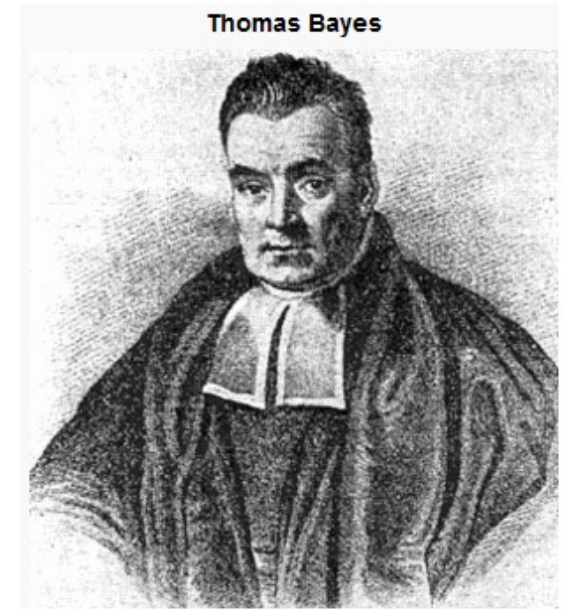


Bayes for Beginners

Anne-Catherine Huys

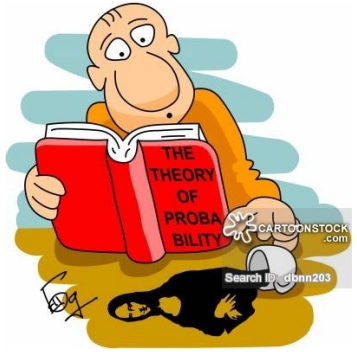
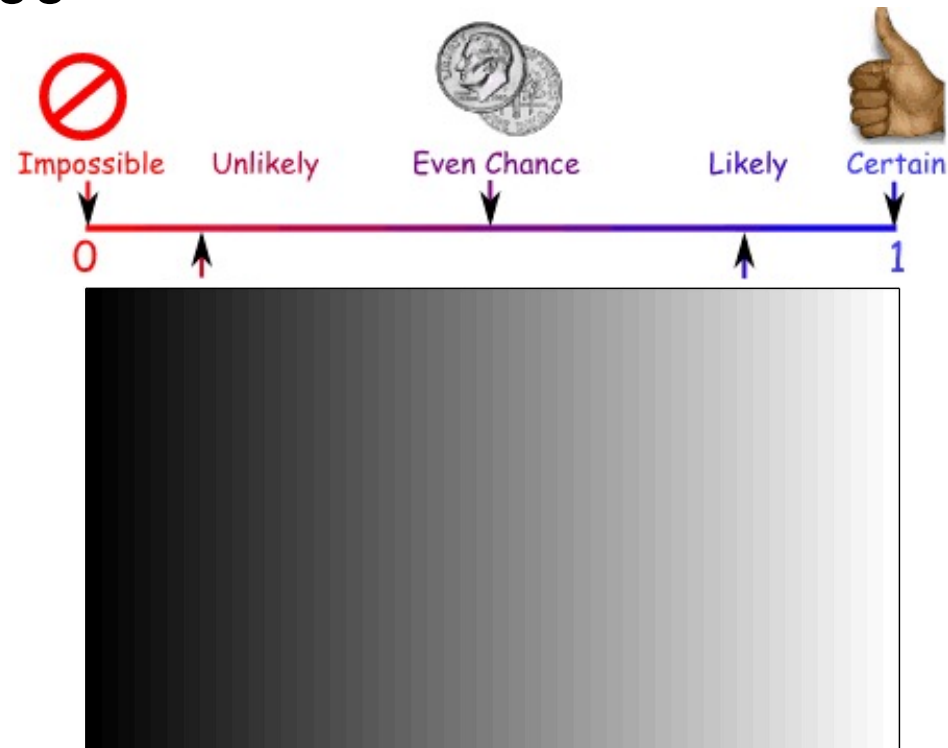
M. Berk Mirza

20th January 2016



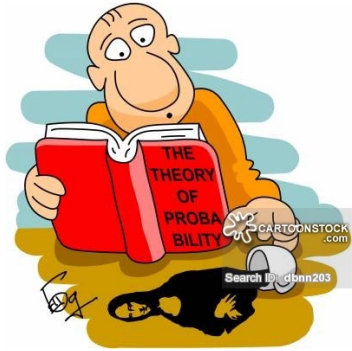
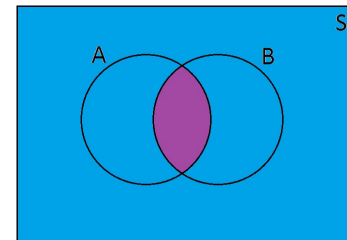
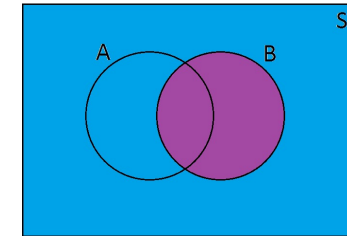
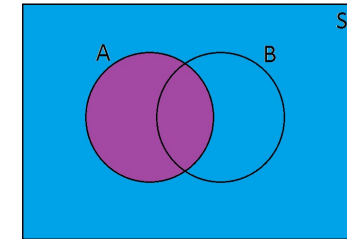
Probabilities

- Probability 0.000 – 1.000



Probabilities

- $P(A)$ = probability of the event A occurring
- $P(B)$ = probability of the event B occurring
- **Joint probability (intersection)**
 - Probability of event A **and** event B occurring
 $P(A, B)$



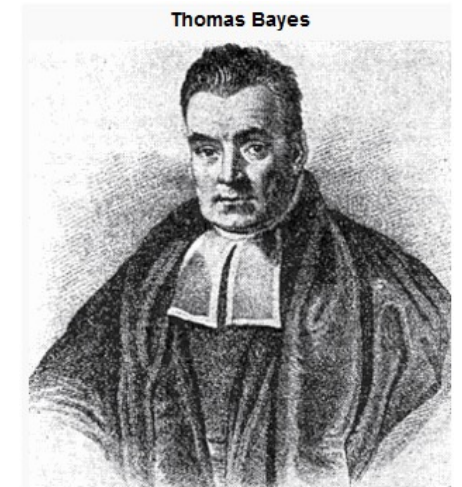
From Conditional Probability to Bayes' Rule

- $P(A|B) = \frac{P(A,B)}{P(B)}$ → $P(A|B) * P(B) = P(A,B)$

- $P(B|A) = \frac{P(B,A)}{P(A)}$ → $P(B|A) * P(A) = P(B,A)$

$$P(A,B) = P(B,A)$$

- $P(A|B) * P(B) = P(B|A) * P(A)$



$$\text{Posterior} \leftarrow \boxed{P(A|B)} = \frac{\boxed{P(B|A)} \times \boxed{P(A)}}{\boxed{P(B)}} \rightarrow \text{Marginal}$$

Likelihood **Prior**

Prior knowledge is incorporated and used to **update** our beliefs.