# Conditional Probabilities

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

**P(A ∩ B)** $= P(A|B)P(B)$

**P(A ∩ B)** $= P(B|A)P(A)$

# Bayes and Naïve Bayes

$$P(S/1^{st}) = \frac{P(1st|S)P(S)}{P(1st)}$$

$$P(\sim S/1^{st}) = \frac{P(1st|\sim S)P(\sim S)}{P(1st)}$$

# Bayes and Naïve Bayes

$$P(S / 1^{st} \text{ \& Female}) = \frac{P(1st \text{ \& } Female | S)P(S)}{P(1st \text{ \& } Female)}$$

$$P(\sim S / 1st \text{ \& Female}) = \frac{P(1st \text{ \& } Female / \sim S)P(\sim S)}{P(1st \text{ \& } Female)}$$

# Naïve Bayes

**P(S/1st&Female)=** $P(1st\&Female|S)P(S) =$

Naive

$$P(1st/S) * p(Female|S)P(S)$$

**P(~S/1s&Female)=** $P\left(1st\&\dfrac{Female}{\sim S}\right)P(\sim S) =$

Naive

$$P(1st|\sim S) * P(Female/\sim S)P(\sim S)$$

# Bayes and Naïve Bayes

**Max of** $P(\ominus|S)P(S)$ **Over all possible** s

**Max of** $P(\ominus1|S)P(\ominus2|S1)P(S)$ , **Over all possible** s