

## Probability

Sample space:  $S$

Sum of all probabilities:  $\sum_{all\ i} P(A_i) = 1 = P(S)$

Complements:  $P(A^c) = 1 - P(A)$

Union (“...or...or both”):  $P(A \cup B) = P(A) + P(B) - \underbrace{P(A \text{ and } B)}_{\text{Joint probability}}$

Conditional: 
$$P(A | B) = \frac{P(A \text{ and } B)}{P(B)}$$
$$P(B | A) = \frac{P(A \text{ and } B)}{P(A)}$$

Independence: 
$$P(A | B) = P(A)$$
$$P(A \text{ and } B) = P(A) \cdot P(B)$$

Disjoint events:  $P(A \text{ and } B) = 0$   
(mutually exclusive events)

The Bayes formula: 
$$P(A | B) = \frac{P(B | A) \cdot P(A)}{P(B | A) \cdot P(A) + P(B | A^c) \cdot P(A^c)}$$