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Independence

★ Independence of two events

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

- → Occurrence of A provides no new information about B.
- → We call even B is independent of A
- → $P(A \cap B) = P(A)\,P(B|A)$

$$\boxed{P(A \cap B) = P(A)\,P(B)}$$

{Cleaner way of defining Independence}

⇒ If A and B are independent, then A and B^c are independent.

★ Conditional Independence

$P(A \cap B|C) = P(A|C)\,P(B|C)$

⇒ If Event A & B are independent, that does not mean A|C and B|C are independent.

★ Independence of a Collection of events

- **Intuitive defination**

"Information on some of the events does not change probabilities related to the remaining events"

- **Formal defination**

"Events $A_1, A_2 \ldots A_n$ are called independent if:

$$P(A_i \cap A_j \cap \cdots \cap A_m) = P(A_i)P(A_j)\cdots P(A_m)$$

for any distinct indices i, j, m"