Topic 2 Basic Probability

Tutorial agenda:

1. go through key concepts
2. tutorial questions

Key concept

T3 L2

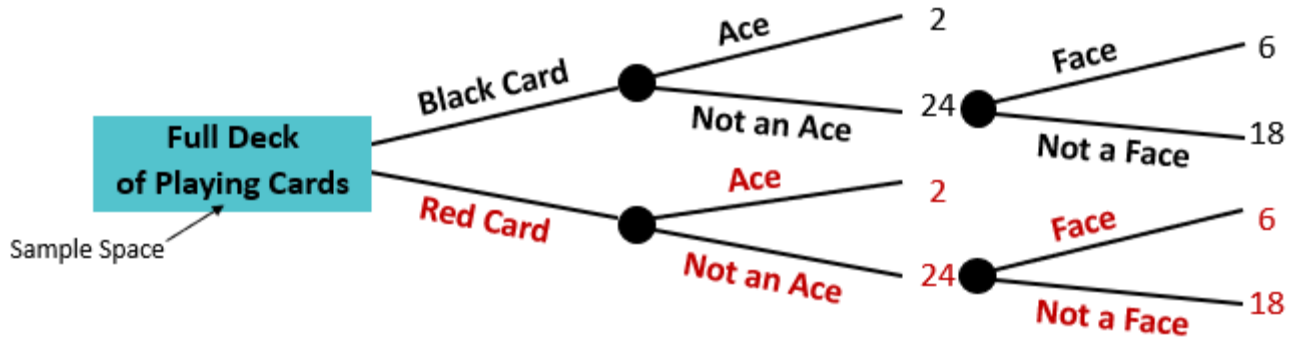
Basic concepts

- Outcome
  - Sample space - all outcomes
- Event - outcome / combo of outcome
  - Simple (A)
  - Joint (A&B)
  - Complement (A')

- Visualizing
  - Contingency table
  - Decision tree

	Ace	Not Ace	Total
Black	2	24	26
Red	2	24	26
Total	4	48	52

Sample Space



Basic concepts

- Probability - P(A)
  - Rang: [0, 1]
  - P(A) = 0
  - P(A) = 1

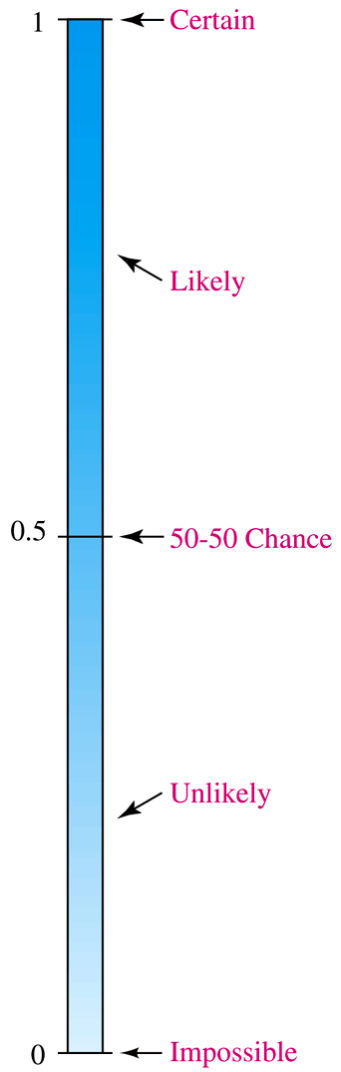
- 1. Marginal probability - single event P(A)
  - $P(A) = P(A \text{ and } B_1)+P(A \text{ and } B_2)+\ldots\ldots+P(A \text{ and } B_k)$

    where $B_1, B_2, \ldots\ldots, B_k$ are mutually exclusive and collectively exhaustive events

    $P(A \text{ and } B) = 0$

    $P(A)+P(B) = 1$

- 2. Joint probability - P(A and B …)



Basic concepts

- 3. either event A or event B occurs - P(A or B)

  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

- 4. Conditional probability - event A given event B P(A|B)
  - $P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$ with $P(B) > 0$
  - $P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$ with $P(A) > 0$
  - $P(A \text{ and } B) = P(A|B)P(B) = P(B|A)P(A)$
    - general multiplication rule

- mutually exclusive=statistical independence
  - $P(A|B) = P(A)$ or $P(B|A) = P(B)$
  - $P(A \text{ and } B) = P(A)P(B)$

Counting Rules

- 1. k^n
  - mutually exclusive and collectively exhaustive events can occur on each of n trials
- 2. $(k_1)(k_2)\cdots\cdots(k_n)$
  - If there are k_1 events on the first trial, k_2 events on the second trial, … and k_n events on the n^{th} trial
- 3. $n! = (n)(n-1)\cdots(1)$
  - n items can be arranged in order
- 4. Permutations: $_nP_X = \frac{n!}{(n-X)!}$
  - arranging X objects selected from n objects
  - order matters
- 5. Combinations: $_nC_X = \frac{n!}{X!(n-X)!}$
  - selecting X objects from n objects
  - ignore order

Tutorial questions

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Q & A

> Asking questions is probably the most effortless way to learn and remember anything

CB2200 Tutorial

See you next week :)