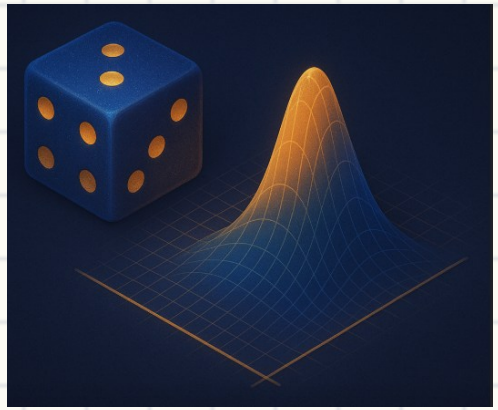
Last lecture

- What is probability?
  - Roll dices, rainy/sunny -> Prediction/ model
- Why should I know probability?
  - Reason the events -> Circuits, Communication, ML, etc.
- What to expect in 313?
  - Describe and solve probable events
- Finished Ch 1.1

Probability vs. Statistics



- Similar, but there are some differences
  - Probability a (precisely), statistics inference from
  - What's the probability of 6 Head out of 10 tosses on a fair coin?
  - We got 6 Head out of 10 tosses on a coin, is the coin a fair coin?
    - I have confidence it's fair

Agenda

Probability Event (Ch 1.2)

- Terminologies
- Karnaugh map
- De Morgan’s Law
- Axioms of Probability

Terminologies

Probability Terminologies

-
  - Toss a fair coin
-
  - {Head} or {Tail}
-
  - Do this x times – x trials

Sample space

- The of of an experiment is called a of the experiment
- For example :
  - Tossing a coin
  - Rolling a die
  - Measuring a noise voltage

Event

- A subset of the sample space Ω
- Experiment of rolling a fair die
  - What's the probability that the outcome is odd?
  - We call this odd subset an " "
  - $A = \{$ $\}$ are events on a sample space $\Omega = \{$ $\}$

We are ready to describe!

Roll two fair dices, what's the probability that you get a "Pair" (two of the same kind)

$\Omega =$

$\mathrm{A} =$

If every outcome is , $P(A) =$

How should we define the outcome?

Roll two fair dices, what's the probability that the sum is 7

$\Omega_1 =$

$A_1 =$

$\Omega_2 =$

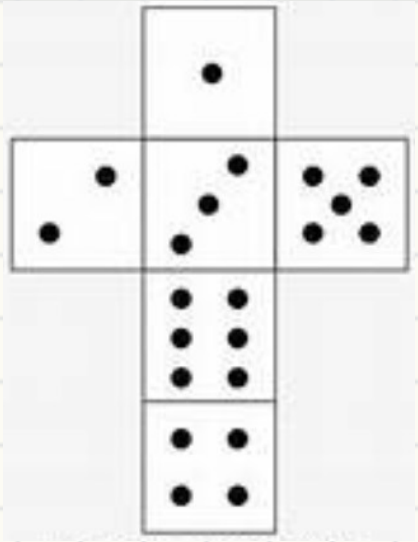
$A_2 =$

Complement set/ other terminologies

- $A^c =$ or $A \cup A^c = \Omega$ or $AA^c = \emptyset$
  - E.g., “Odd numbers” and “Even numbers”

- If any $A_i A_j = \emptyset$ for $A_1, A_2 \ldots A_N$
  - A_i excludes A_j
  - $A_1, A_2 \ldots, A_N$ are /
  - E.g. $A_1 = \{1,2\}, A_2 = \{4,5\}$

- If $A_1 \cup A_2 \ldots \cup A_N = \Omega$
  - $A_1, A_2 \ldots, A_N$ is a of Ω
  - E.g. $A_1 = \{1,6\}, A_2 = \{2,5\}, A_3 = \{3,4\}$



Slido!

A = “Even”
B= “divided exactly by 3”
C= “Greater than 4”

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B		B^c		
	x			A
y				A^c
C^c		C		C^c

Karnaugh Map/ De Morgan’s Law

Karnaugh Map

- A table list combinations of events
- For N events, there will be entries

- Roll a die
  - A is “odd numbers”; B is “greater than 3”

De morgan's Law

- $(A \cup B)^c =$, $(AB)^c =$
- Can be verified with Karnaugh map

Karnaugh Map – 3 events