22/01/25

Day-4

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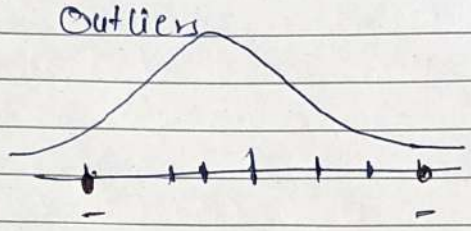
* Agenda

1. IQR - Python
2. Probability
3. Permutation and Combination
4. Confident Intervals
5. p-value
6. Hypothesis Testing.

⇒ After 3rd Standard deviation data is an Outliers



formula :- $Z\,Score = \frac{xi - M}{\sigma}$

Imp * Probability :- Probability is a measure of the likelihood of an Event

Eg :- Dice Roll {1, 2, 3, 4, 5, 6}

$P(D) = 1/6$

⇒ No of ways Event Can occur / No of possible outcomes

1. Toss coin (H, T)

$P(H) = 1/2$, $P(T) = 1/2$

2) Addition Rule :- (Probability, "or")

→ Mutual Exclusive Events :-

⇒ Two Events are mutual Exclusive if they Can't occure at the Same time

Eg :- Rolling a dice {1, 2, 3, 4, 5, 6}

→ Non - mutual Exclusive Events :-

⇒ Mutual Events Can occur at the Same time

Eg :-

A deck of Cards {♠, ♣, ♡}

i). If i toss coin, what is the Probability of the coin landing on heads or tails ?

⇒ Mutual Exclusive ⇒ (Addition rule)

$Pr(H, T) = P(H) + P(T)$

$= 1/2 + 1/2$

$= 2/2 = 1$

$Pr(H, \text{or } T) = 1$

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Ex :- Roll a die

$Pr(1 \text{ or } 3 \text{ or } 6) = P(1) + P(3) + P(6)$

$= 1/6 + 1/6 + 1/6$

$= 3/6 = 1/2 = 0.5$ //

* Non-Mutual Exclusive :-

Q.) you are picking a card randomly from a deck, what is the probability of choosing a card that is queen or a heart ?

Ans → non-mutual Exclusive :

$P(\text{cards}) \Rightarrow P(Q) = \frac{4}{52}$, $P(\heartsuit) = \frac{13}{52}$

$P(Q \text{ and } H) = \frac{1}{52}$

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

$= \frac{4}{52} + \frac{13}{52} - \frac{1}{52}$

$P(Q \text{ or } H) = \frac{17-1}{52} = \frac{16}{52} = 0.30$

iii) Multiplication Rule :-

⇒ Independent Event

Eg :- Rolling a die {1, 2, 3, 4, 5, 6}

First incident :- 1

Second " :- 2

Third " : 1

→ Each and Every Events are Independent.

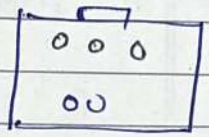
⇒ Dependent Events :-

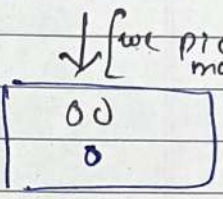
Eg

Q. In my bag 3 black marble and 2 blue marble

Ans :- $p(Red) = 3/5$

$p(Green) = 2/5$





Now, update my bag

$p(Red) = 2/3$

$p(Green) = 1/3$

This dependent Events Such as use a Naive Bage's algorithm (Conditional Probability)

⇒ Independent Events :-

Q.) What is the Probability of rolling a "5" and then a "4" in a dice?

Ans :⇒ Independent Events :-

⇒ Multiplication Rule :-

$p(A \text{ and } B) = p(A) * p(B)$

$p(5 \text{ and } 4) = \frac{1}{6} \times \frac{1}{6}$

$= \frac{1}{36}$

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Example :- Dependent Event :

Q) What is Probability of drawing a queen and then a Aces from a deck of card ?

⇒ Dependent Event → conditional Probability

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

↓

This is helpful for Bayes theorem

$P(Q \text{ and Aces}) = P(Q) \times P(\text{Aces}/Q)$

$= 4/52 \times 4/51$

$= 0.095 \times 0.078$

$= 0.00741$ //

* Permutation and Combination :

⇒ Permutation :

School trip {choclak factory} → Dairy milk / milky, 5 star

Student {Assignment}

$3 \quad 2 \quad 1 = 6$

$nP_r = \frac{n!}{(n-r)!} = \frac{6!}{(6-3)!}$

$= \frac{6!}{3!}$

$= 6 \times 5 \times 4$

$= 120$ //

$\Rightarrow {}^{n}P_{r} = \frac{n!}{(n-r)!} = \frac{3!}{(3-2)!} = 6$

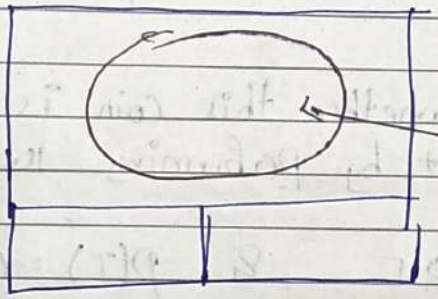
* Combination :-

Daisy · Gems Euclaid

$${}^{n}C_{r} = \frac{n!}{(n-r)!\,r!} = \frac{6!}{3!(6-3)!}$$

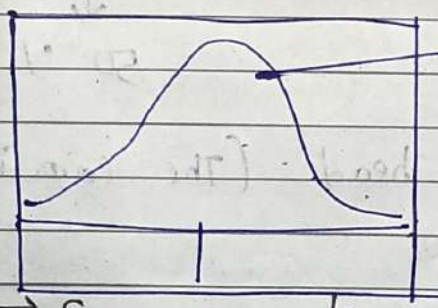
$$= \frac{6!}{3! \times 3!} = \frac{6 \times 5 \times 4^{2}}{3 \times 2 \times 1} = 20 \text{ // ways}$$

* P-value :-



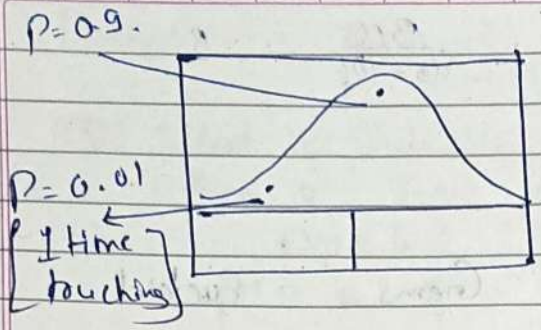
⇒ ← laptop mouse pad

Mostly we touch here



⇒ → P = 0.8

→ Every 100 times I touch the mouse pad 80 times I touch this specific region



* Hypothesis testing
* Confident Intervals,
* Significant values
* Null hypothesis.

} Combining multiple

Eg:-

Coin → Test whether this coin is a fair coin or not by performing 100 tosses

$P(H) = 0.5$ & $P(T) = 0.5$

↓ ↓

50 % 50 %

→ 50 times head (The coin is fair)

Now,

Hypothesis testing :-

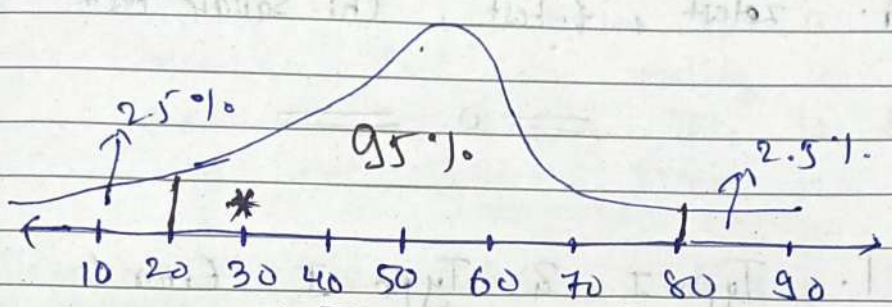
i) Null Hypothesis

→ The coin is fair

2. Alternate hypothesis :- (The coin is un-fair)

3. Experiment

4. Reject / Except the Null hypothesis



→ The coin is fair

→ When i define the coin is fair or not in that we use

Significant value : $\alpha = 0.05$,,

100% - 5% = 95% (Confident Interval)

$\therefore \alpha = 0.05$ {Domain Expert}