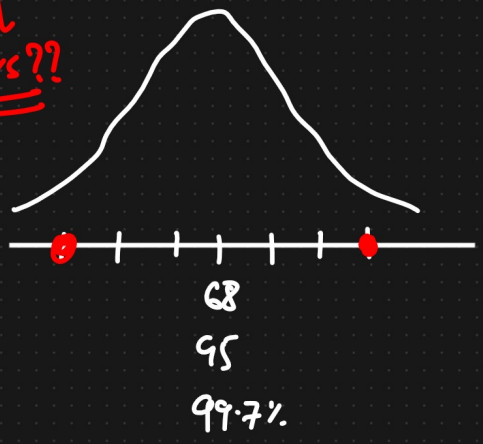
DAY 4 — STATS

1. IQR - python ✓
2. Probability ✓
3. Permutation And Combination ✓
4. Confidence Intervals ✓
5. P value ✓
6. Hypothesis Testing ✓

After 3rd sd outliers??



$$Z_{score} = \frac{x_i - \mu}{\sigma}$$ ✓

4. **Probability** : Probability is a measure of the likelihood of an Event

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

$$Pr(6) = \frac{\#\text{ of way an event can occur}}{\#\text{ of possible outcome}}$$

$$= \frac{1}{6}$$

Toss a coin {H, T}

$$Pr(H) = \frac{1}{2}$$

② Addition Rule (Probability, "or")

Mutual Exclusive Event

Two Events Are mutual exclusive if they cannot occur at the same time

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

$\{1, 2\}$

Tossing a coin $\{H$

$T\}$

Non Mutual Exclusive

Multiple events can occur at the same time

Eg: Deck of cards $\{Q, ♡\}$

① If I Toss a coin, what is the Probability of the coin landing on heads or tails?

Ans) Mutual Exclusive Addition Rule

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

$$= \frac{1}{2} + \frac{1}{2}$$

$$\boxed{Pr(A \text{ or } B) = 1}$$

Roll a Dice

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

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

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

$\frac{52}{52}$ $\frac{2}{}$

Non Mutual Exclusive

You are picking a card randomly from a deck. What is the probability of choosing a card that is queen or a heart? → (52)

Ans) Non mutual Exclusive

$$P(Q) = \frac{4}{52} \qquad P(\heartsuit) = \frac{13}{52} \qquad Pr(Q \text{ and } \heartsuit) = \frac{1}{52}$$

Addition Rule for non mutual exclusive Events

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

$$P(Q \text{ or } \heartsuit) = P(Q) + P(\heartsuit) - P(Q \text{ and } \heartsuit)$$

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

$$= \frac{16}{52} \text{ a} \quad //$$

③ Multiplication Rule

{ Independent Events }

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

1, 1, 2, Each & Every are independent → Red marble ●

Dependent Events → $Pr(Red) = \frac{3}{5}$ → $Pr(Green) = \frac{2}{4}$

Naive Bayes {Conditional Probability}

Independent Events

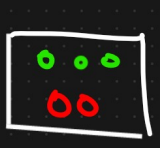
④ What is the probability of rolling a "5" and then a "4" in a dice?

Ans) Independent Event

Multiplication Rule

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

$Pr(5 \text{ and } 4) = \frac{1}{6} * \frac{1}{6} = \frac{1}{36}$ //.



3/5

$\frac{2}{4}$

⑤ What is the probability of drawing a Queen and then a Aces from a deck of cards?

$P(Q \text{ and } R) = P(Q) * P(R/Q)$ → Event

Ans) Dependent

$P(A \text{ and } B) = P(A) * P(B/A)$ → conditional probability

↓

Bayes theorem

$P(Q \text{ and } A) = P(Q) * P(A/Q)$

$= \frac{4}{52} * 4/51$

⑥ Permutation and Combination

Permutation

School trip {choclate factory} → Dairy, 5 star, Milky bar, Eclairs, Gem, Silk

Student {Assignment}

Student → $\underline{6} \times \underline{5} \times \underline{4} = \underline{120}$

⑤

Dairy, Gem, Milky
Milky, Gem, Dairy

$n = 6$
$r = 3$

Permutation

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

$$= \frac{6 \times 5 \times 4 \times 3!}{3!}$$

$$= 120$$

⑥ Combination

Dairy	Gem	Eclair
—	—	—

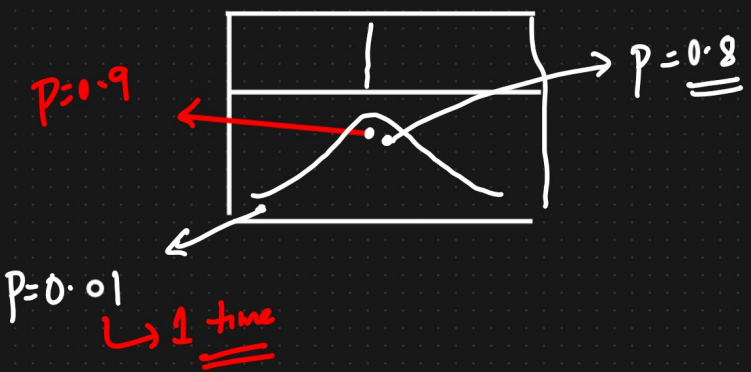
$$^{n}C_{r} = \frac{n!}{r!(n-r)!} = \frac{6!}{3!(6-3)!}$$

$$= \frac{6 \times 5 \times 4 \times 3!}{3 \times 2 \times 1 \times 3!}$$

$$= 20$$

① p value { Many people gets confused }

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



Hypothesis Testing, Confidence Interval, Significance Value, - - - -

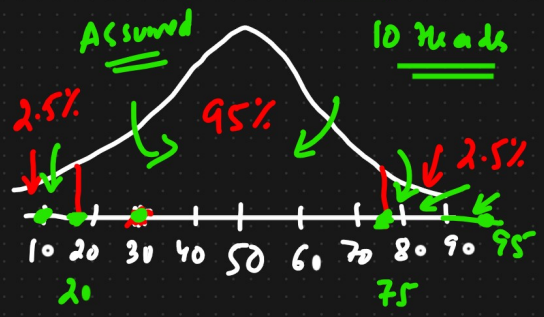
Coin → Test whether this coin is a fair coin or not by performing 100 tosses

Shady coin P(H) = 100%

P(H) = 0.5 P(T) = 0.5

100 → 50 times Head (The coin is fair)

30 Times Head 95 heads



Hypothesis Testing

100% − 5%

⇓

95%

CI

① Null Hypothesis : Coin is fair

✓② Alternate Hypothesis :- Coin is unfair

③ Experiment

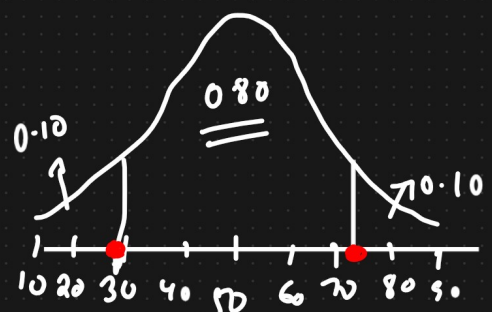
④ Reject or Accept the Null Hypothesis

Significance Value

α = 0.05 { Domain Expert }

α = 0.20 α = 0.3 C.I = 70%

80%



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