Probability Assignment 2

Fares Ahmed

① A bernoulli random Variable takes 1 (sucess) or 0 (faliure) with fixed Probabilites.
Ex. head → 0, Tail → 1 (Coin Toss)

---

② Bernoulli : one Trial → 2 outcomes
Binomial : Repeat n Bernoulli trials and Count the successes

- use Bernoulli for single event
- use Bionomial for n repeated Similar events

---

③ Corr = 0 → Means no linear relationship

---

④ Discrete → Countable outcomes
Continous → Infinite values in an interval

---

⑤ $P(X=9) = \binom{10}{9} (0.9)^9 (0.1)^1$

---

⑥ H_0: Preference for AI tools is independent of academic year.
H_1: Preference is not independent of the academic year.

---

⑦ Covariance depends on scale
125 doesn't tell if the relation is strong or weak because the value isn't standardized. (Needs correlation)

(8) PDF: Shows Probability density
CDF: gives Probability $P(X \leq x)$
- CDF is the integral of PDF

---

(9) p-value = $0.025 < 0.05$ ⟶ Reject H_0
Traffic distribution doesn't follow the expected Pattern; it Varies by week day

---

(10)
- Fixed no. of trials.
- each trial is independent.
- each trial has the same Probability of Success
- only 1/0 outcomes.
- It failes when the user feedback depend on Previous replies (not independent)

---

(11). We Cannot say "time Causes better grades" because Correlation ≠ Causation
- Possible Confounder: Student Motivation, Study habits, etc...

---

(12) P(Wait > 5)
CDF: $1 - F(5)$
PDF: integrate density from 5 to ∞ ⟶

$$\int_5^{\infty} f(x)\,dx$$