TWO EVENTS A & B ARE INDEPENDENT IF

$$P(A \cap B) = P(A) \cdot P(B)$$

$\cap$ ↑ AND

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

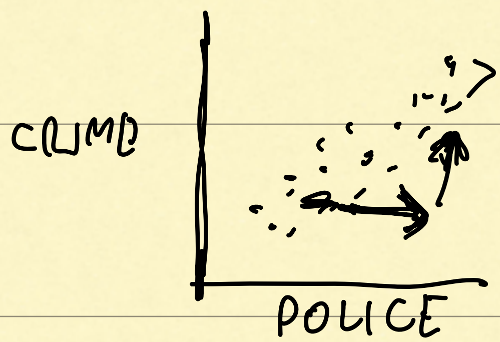
$$= \frac{P(A)\,P(B)}{P(B)} = P(A)$$

---

i) NOT INDEP ✓✓✓✓

ii) INDEP ✓✓✓✓

iii) ONLY SUM 7 IS INDEP ✓✓✓✓

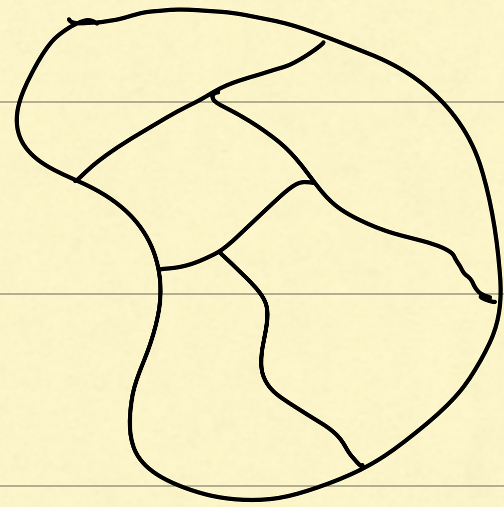


SUPPOSE A SAMPLE SPACE S IS SPLIT INTO SUBSETS

$$F_1, F_2 \ldots F_N$$

SUCH THAT

$$\bigcup F_i = S$$



AND

$$F_i \cap F_j = \phi$$

FOR ANY $i \neq j$

"PARTITION"

$$\mathbb{P}(e) = \mathbb{P}(e|F_1)\,\mathbb{P}(F_1) + \ldots + \mathbb{P}(e|F_N)\,\mathbb{P}(F_N)$$

LAW OF TOTAL PROBABILITY

X - RANDOM VARIABLE

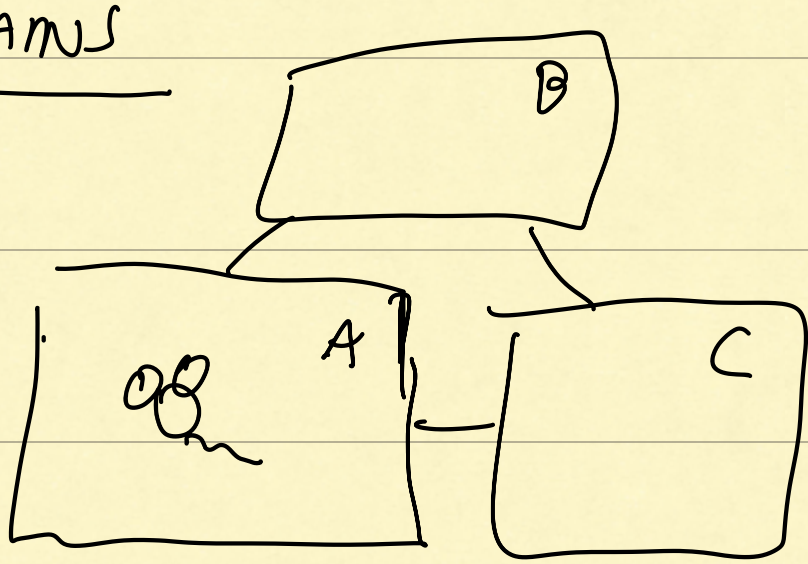
A COLLECTION OF RANDOM VARIABLES

X_t INDEXED BY t IS

CALLED A STOCHASTIC PROCESS

t - DISCRETE OR CONTINUOUS

MARKOV CHAINS



EX

A MOUSE IS TRAVELING BETWEEN 3 ROOMS. THE DOORS OPEN EACH MINUTE

ASSUME

$$P(X_t = i \mid X_{t-1} = j, X_{t-2} = k, \ldots\ldots) = P(X_t = i \mid X_{t-1} = j)$$

THEN

$$\begin{bmatrix} P_A \\ \end{bmatrix} \qquad \begin{bmatrix} & \end{bmatrix} \begin{bmatrix} P_A \\ \end{bmatrix}$$

$$\begin{bmatrix} p_B \\ p_C \end{bmatrix}(t+1) = \begin{bmatrix} & M & \end{bmatrix} \begin{bmatrix} p_B \\ p_C \end{bmatrix}(t)$$

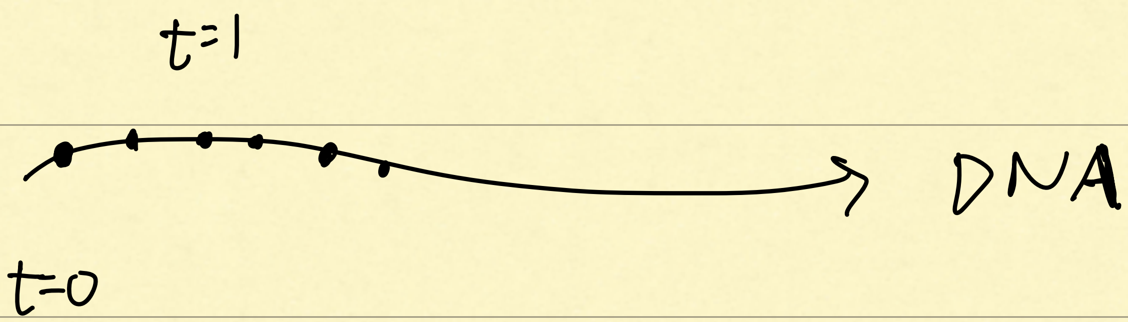
$$M = \begin{bmatrix} P(X_{t+1}=A \mid X_t=A) & \cdots & \\ \vdots & & \\ & & P(X_{t+1}=C \mid X_t=C) \end{bmatrix}$$

THE P_{ij} ELEMENT OF M

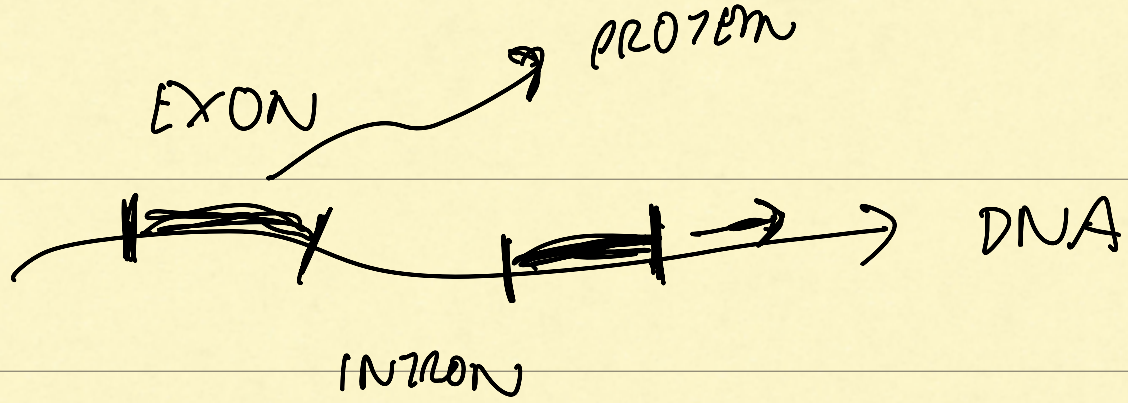
IS THE TRANSITION PROBABILITY

FROM j TO i.

PS 2



BASEPAIRS


EXON
PROTEIN
DNA
INTRON