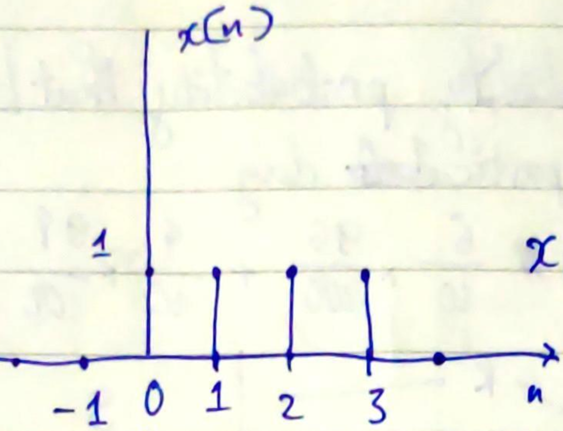
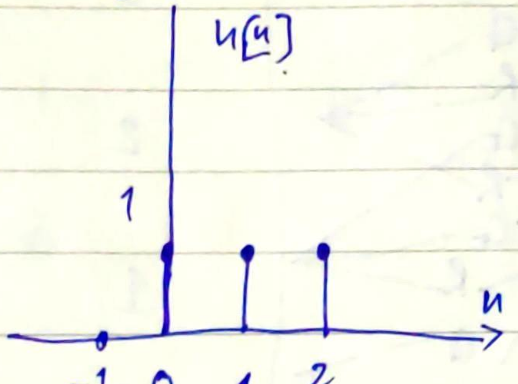
Hà Ngọc Linh M21 ICT 006

① Convolution



$x[n] = 1$ for $3 \geq n \geq 0$

$x[n] = \delta[n] + \delta[n-1] + \delta[n-2] + \delta[n-3]$



$h[n] = \delta[n] + \delta[n-1] + \delta[n-2]$

x[n] 0 1 1 1 1

h[n] 0 1 1 1

0 0 0 0 0

0 1 1 1 1

0 1 1 1 1

0 0 1 1 1 1

$y[n] =$ 0 0 1 2 3 3 2 1

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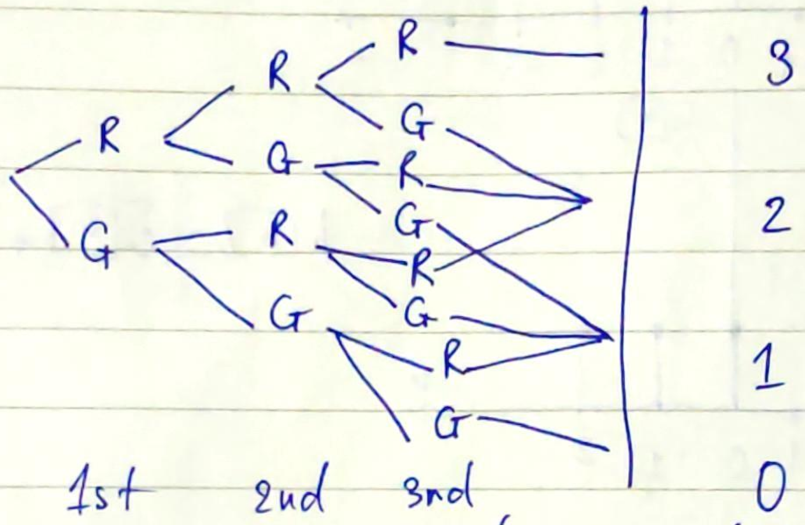
		on time	late
bicicle	60%	95%	5%
bus	40%	98%	2%

a) is ~~probablity~~ probability that Lisa arrives on time on any particular day

$\Rightarrow \frac{6}{10} \times \frac{95}{100} + \frac{4}{10} \times \frac{98}{100} = 96,2\%$

b)



x : number of red lights

PMF : ~~X~~

$\mathbb{P}(x=3) = \frac{1}{8}$

$\mathbb{P}(x=2) = \frac{3}{8}$

$\mathbb{P}(x=1) = \frac{3}{8}$

$\mathbb{P}(x=0) = \frac{1}{8}$

$$\text{PMF } \mathbb{P}_x(x) = \begin{cases} \frac{1}{8} & \text{if } x=3 \\ \frac{3}{8} & \text{if } x=2 \\ 3/8 & \text{if } x=1 \\ \frac{1}{8} & \text{if } x=0 \\ 0 & \text{otherwise} \end{cases}$$

$E[x] = \sum_x x \, p_x(x)$

$= 1/8 \times 3 + \frac{3}{8} \times 2 + \frac{3}{8} \times 1 + \frac{1}{8} \times 0 = 1,5$

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$$\begin{bmatrix} 1 & 3 & 5 \\ -1 & -3 & 1 \\ 0 & 2 & 3 \\ 1 & 5 & 2 \\ 1 & 5 & 8 \end{bmatrix}$$

$V_1 = x_1$

$V_2 = x_2 - \dfrac{V_1 . x_2}{V_1 \; V_1} V_1$

$V_3 = x_3 - \dfrac{V_1 \; x_3}{V_1 \; V_1} . V_1 - \dfrac{V_2 \; x_3}{V_2 \; V_2} . V_2$

$\Rightarrow x_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix}$ $\quad x_3 = \begin{bmatrix} 5 \\ 1 \\ 3 \\ 2 \\ 8 \end{bmatrix}$

$x_2 = \begin{bmatrix} 3 \\ -3 \\ 2 \\ 5 \\ 5 \end{bmatrix}$

$\Rightarrow V_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix}$

$x_2 . v_1 = \begin{bmatrix} 3 \\ -3 \\ 2 \\ 5 \\ 5 \end{bmatrix} . \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix} = 19$

$v_1 . V_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix} = 4$

$\Rightarrow V_2 = \begin{bmatrix} 3 \\ -3 \\ 2 \\ 5 \\ 5 \end{bmatrix} - \dfrac{19}{4} . \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} -1{,}75 \\ -7{,}75 \\ 2 \\ 0{,}25 \\ 0{,}25 \end{bmatrix}$

$$x_3 \cdot v_1 = \begin{bmatrix} 5 \\ 1 \\ 3 \\ 2 \\ 8 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix} = 14$$

$$x_3 \cdot v_2 = \begin{bmatrix} 5 \\ 1 \\ 3 \\ 2 \\ 8 \end{bmatrix} \cdot \begin{bmatrix} -1,75 \\ -7,75 \\ 2 \\ 0,25 \\ 0,25 \end{bmatrix} = 8$$

$$v_2 \cdot v_2 = \begin{bmatrix} -1,75 \\ -7,75 \\ 2 \\ 0,25 \\ 0,25 \end{bmatrix} \begin{bmatrix} -1,75 \\ -7,75 \\ 2 \\ 0,25 \\ 0,25 \end{bmatrix} = 67,25$$

$$v_3 = \begin{bmatrix} 5 \\ 1 \\ 3 \\ 2 \\ 8 \end{bmatrix} - \frac{14}{4} \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix} - \frac{8}{67,25} \begin{bmatrix} -1,75 \\ -7,75 \\ 2 \\ 0,25 \\ 0,25 \end{bmatrix}$$

$$= \begin{bmatrix} 5 \\ 1 \\ 3 \\ 2 \\ 8 \end{bmatrix} - \begin{bmatrix} 3,5 \\ -3,5 \\ 0 \\ 3,5 \\ 3,5 \end{bmatrix} - \begin{bmatrix} -0,208 \\ -0,922 \\ 0,238 \\ 0,03 \\ 0,03 \end{bmatrix}$$

$$v_3 = \begin{bmatrix} 1,5 \\ 4,5 \\ 3 \\ -1,5 \\ 4,5 \end{bmatrix} - \begin{bmatrix} -0,208 \\ -0,922 \\ 0,238 \\ 0,03 \\ 0,03 \end{bmatrix} = \begin{bmatrix} 1,708 \\ 5,422 \\ 2,762 \\ -1,53 \\ 4,47 \end{bmatrix}$$

$$v_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix} \quad v_2 = \begin{bmatrix} -1,75 \\ -7,75 \\ 2 \\ 0,25 \\ 0,25 \end{bmatrix} \quad v_3 = \begin{bmatrix} 1,708 \\ 5,422 \\ 2,762 \\ 1,53 \\ 4,47 \end{bmatrix}$$

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Bài 2

$$P(A) = P(A \cap B) + P(A \cap B^c) \ ?$$

* if $P(A) = 0$

(1) $\Rightarrow P(A \cap B) + P(A \cap B^c) = P(0 \cap B) + P(0 \cap B^c)$

$= 0$

$\Rightarrow P(A) = P(A \cap B) + P(A \cap B^c)$ if $P(A) = 0$

* if $P(A) \neq 0$

(2)

$P(A \cap B) + P(A \cap B^c)$

$= P(A)\,P(B|A) + P(A)\,P(B^c|A)$

$= P(A)\left(P(B|A) + P(B^c|A)\right)$

$= P(A)\left(P(B|A) + (1 - P(B|A))\right)$

$= P(A) \cdot 1 = P(A)$

$\Rightarrow P(A) = P(A \cap B) + P(A \cap B^c)$ if $P(A) \neq 0$

(1) + (2) $\Rightarrow$

$$P(A) = P(A \cap B) + P(A \cap B^c)$$