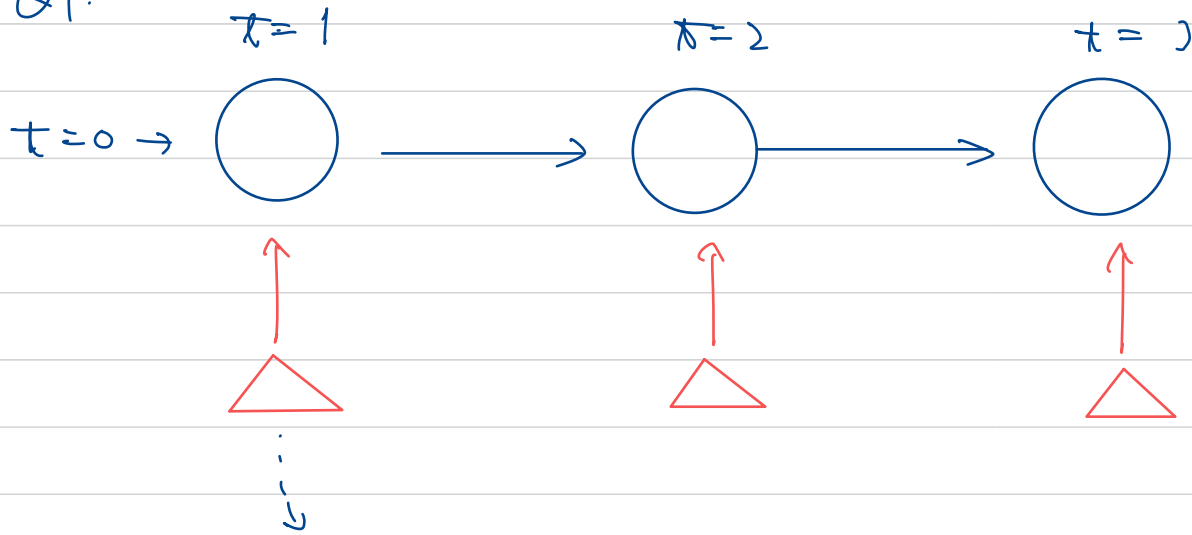


Q1.



$$\begin{cases} P_t(\text{high} | \text{healthy}) = 0.2 \\ P_t(\text{medium} | \text{healthy}) = 0.3 \\ P_t(\text{low} | \text{healthy}) = 0.5 \end{cases}$$

$$\begin{cases} P_t(\text{high} | \text{unhealthy}) = 0.4 \\ P_t(\text{medium} | \text{unhealthy}) = 0.3 \\ P_t(\text{low} | \text{unhealthy}) = 0.3 \end{cases}$$

$$\begin{cases} P_{t=0}(\text{healthy}) = 0.5 \\ P_{t=0}(\text{unhealthy}) = 0.5 \end{cases}$$

$$\text{transition matrix} = \begin{bmatrix} 0.8 & 0.2 \\ 0.2 & 0.8 \end{bmatrix}$$

Q 1.2.

$t=1$

$$P_{t=0} = \begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \end{bmatrix}$$

$$P_{t=1} = \begin{bmatrix} 0.8 & 0.2 \\ 0.2 & 0.8 \end{bmatrix} \begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \end{bmatrix}$$
$$= \begin{bmatrix} 0.5 \\ 0.5 \end{bmatrix}$$

$$P_{t=1}(\text{healthy} | \text{low}) = \frac{P(\text{low} | \text{healthy}) \cdot P(\text{healthy})}{P(\text{low})}$$

$$= \frac{0.5 \cdot 0.5}{0.5 \cdot 0.5 + 0.3 \cdot 0.5}$$

$$= \frac{0.5}{0.8} = \frac{5}{8}$$

$$P_{t=1}(\text{unhealthy} | \text{low}) = \frac{3}{8}$$

$t=2$

$$P_{t=2} = \begin{bmatrix} 0.8 & 0.2 \\ 0.2 & 0.8 \end{bmatrix} \begin{bmatrix} \frac{5}{8} \\ \frac{3}{8} \end{bmatrix} = \begin{bmatrix} 0.575 \\ 0.425 \end{bmatrix}$$

$$P_{t=2}(\text{healthy} | \text{low}) = \frac{0.5 \cdot 0.575}{0.5 \cdot 0.575 + 0.3 \cdot 0.425}$$

$$= 0.69$$

$$P_{t=2}(\text{unhealthy} | \text{low}) = 0.31$$

Q1.3.

(healthy

~~unhealthy~~

, healthy, healthy)