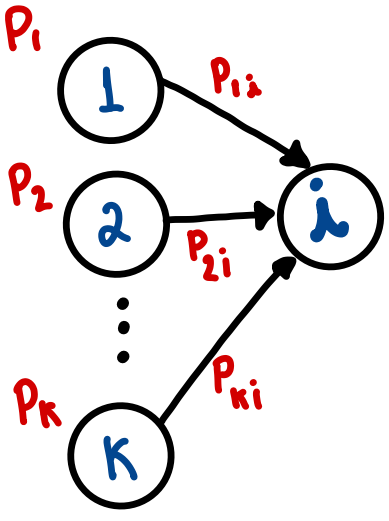


$$\underbrace{P(X_m = i)}_{\pi_i(m)} = P(X_m = i \mid X_0 = 1)P(X_0 = 1) + P(X_m = i \mid X_0 = 2)P(X_0 = 2) + \cdots + P(X_m = i \mid X_0 = K)P(X_0 = K)$$

$$= \sum_{K \in S} \underbrace{P(X_m = i \mid X_0 = K)}_{P^m} \underbrace{P(X_0 = K)}_{\pi_K(0)}$$

$P^m$: Transition matrix

$\pi_K(0)$: Initial distribution

Which matrix notation:

$$\left[ * \; * \; * \; \cdots \; * \right] \left[ \begin{matrix} * \\ * \\ * \\ \vdots \\ * \end{matrix} \right] = \left[ \begin{matrix} * \\ * \\ * \\ \vdots \\ * \end{matrix} \right]$$

$\sum_{K \in S} P(X_m = i \mid X_0 = K) P(X_0 = K)$

$\pi(0)$ $\quad$ $P^m$ $\quad$ $\pi(m)$

$$\boxed{\pi(m) = \pi(0)\, P^m}$$