

Annual Review

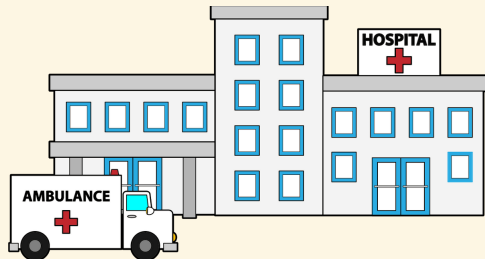
Michalis Panayides

2021-06-11

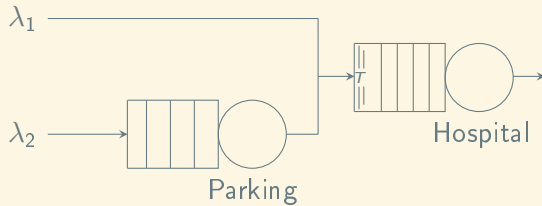
Motivation



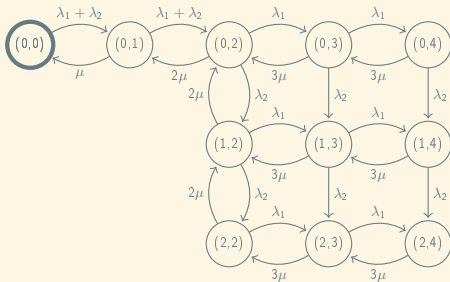
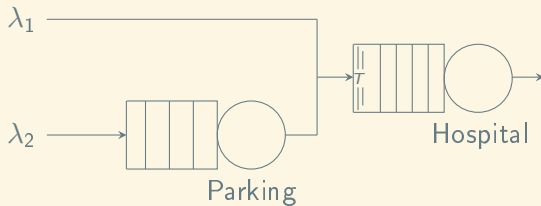
Motivation



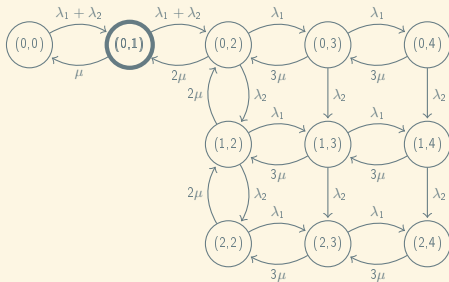
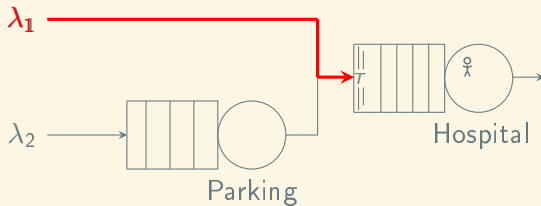
Hospital queueing model



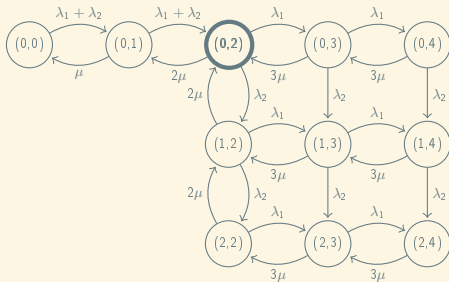
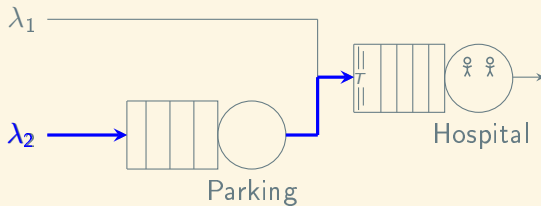
Hospital queueing model



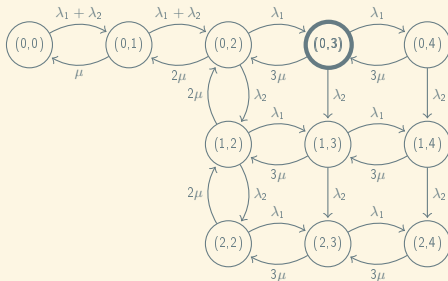
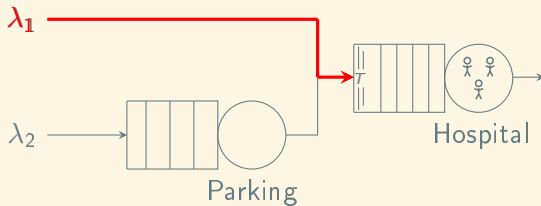
Hospital queueing model



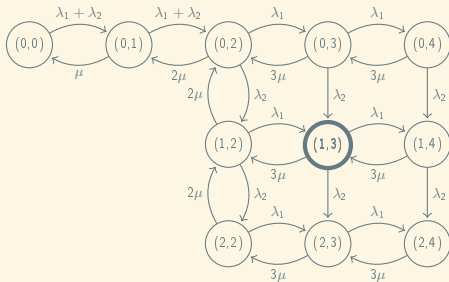
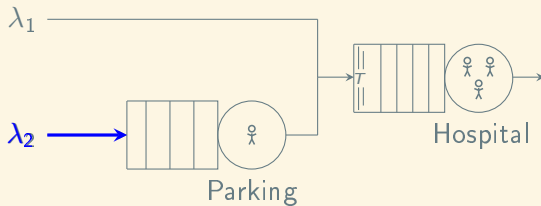
Hospital queueing model



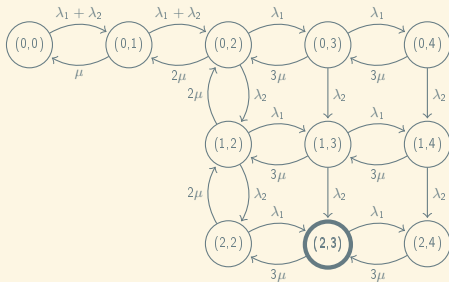
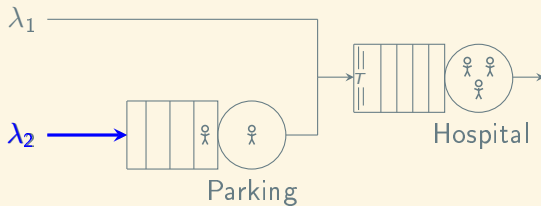
Hospital queueing model



Hospital queueing model



Hospital queueing model



Performance Measures - Steady state vector

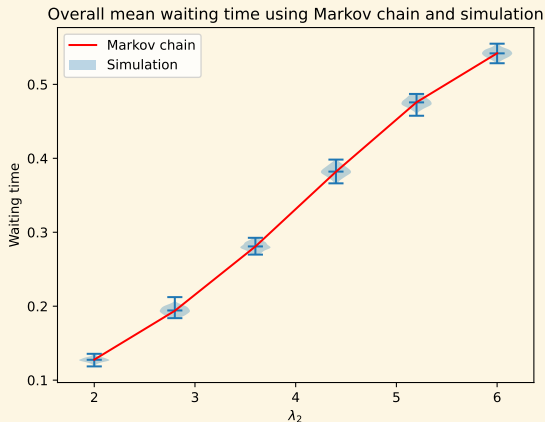
$$Q = \begin{matrix} & \begin{matrix} (0,0) & (0,1) & (0,2) & \dots & (2,3) & (2,4) \end{matrix} \\ \begin{matrix} (0,0) \\ (0,1) \\ (0,2) \\ \vdots \\ (2,3) \\ (2,4) \end{matrix} & \begin{pmatrix} -\lambda_1 - \lambda_2 & \lambda_1 + \lambda_2 & 0 & \dots & 0 & 0 \\ \mu & -\mu - \lambda_1 - \lambda_2 & \lambda_1 + \lambda_2 & \dots & 0 & 0 \\ 0 & 2\mu & -2\mu - \lambda_1 - \lambda_2 & \dots & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & -\lambda_1 - 3\mu & \lambda_1 \\ 0 & 0 & 0 & \dots & 3\mu & -3\mu \end{pmatrix} \end{matrix}$$

$$\pi Q = 0$$

$$\pi = [\pi_{(0,0)}, \pi_{(0,1)}, \pi_{(0,2)}, \dots, \pi_{(2,3)}, \pi_{(2,4)}]$$

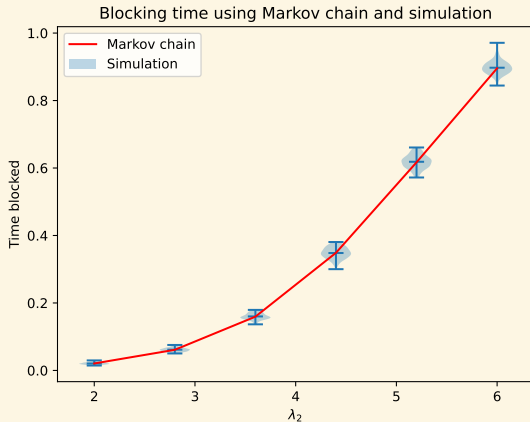
Performance Measures - Waiting time

$$W = \frac{\lambda_1 P_{L'_1}}{\lambda_2 P_{L'_2} + \lambda_1 P_{L'_1}} W^{(1)} + \frac{\lambda_2 P_{L'_2}}{\lambda_2 P_{L'_2} + \lambda_1 P_{L'_1}} W^{(2)} \quad (1)$$



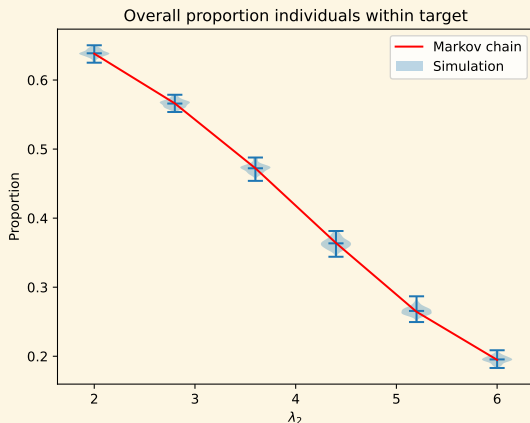
Performance Measures - Blocking time

$$B = \frac{\sum_{(u,v) \in S_A^{(2)}} \pi(u,v) b(u,v)}{\sum_{(u,v) \in S_A^{(2)}} \pi(u,v)} \quad (2)$$

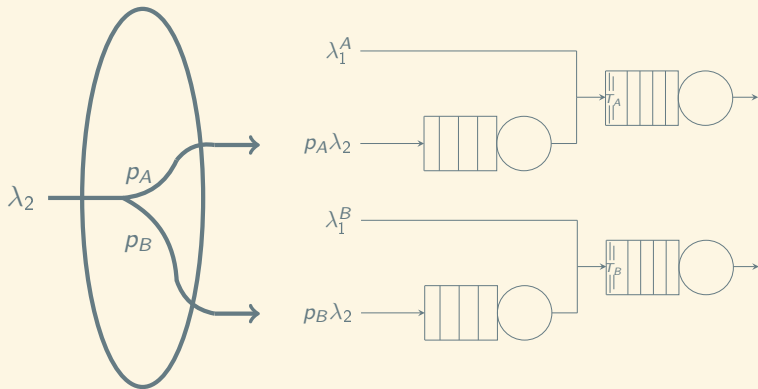


Performance Measures - Proportion within time

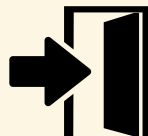
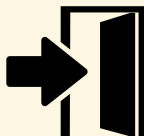
$$P(X < t) = \frac{\lambda_1 P_{L'_1}}{\lambda_2 P_{L'_2} + \lambda_1 P_{L'_1}} P(X^{(1)} < t) + \frac{\lambda_2 P_{L'_2}}{\lambda_2 P_{L'_2} + \lambda_1 P_{L'_1}} P(X^{(2)} < t) \quad (3)$$



Game - Players



Game - Strategies



$$p_A, p_B \in [0, 1]$$

$$p_A + p_B = 1$$

$$T_A \in [1, N_A]$$

$$T_B \in [1, N_B]$$

Incentivised game

