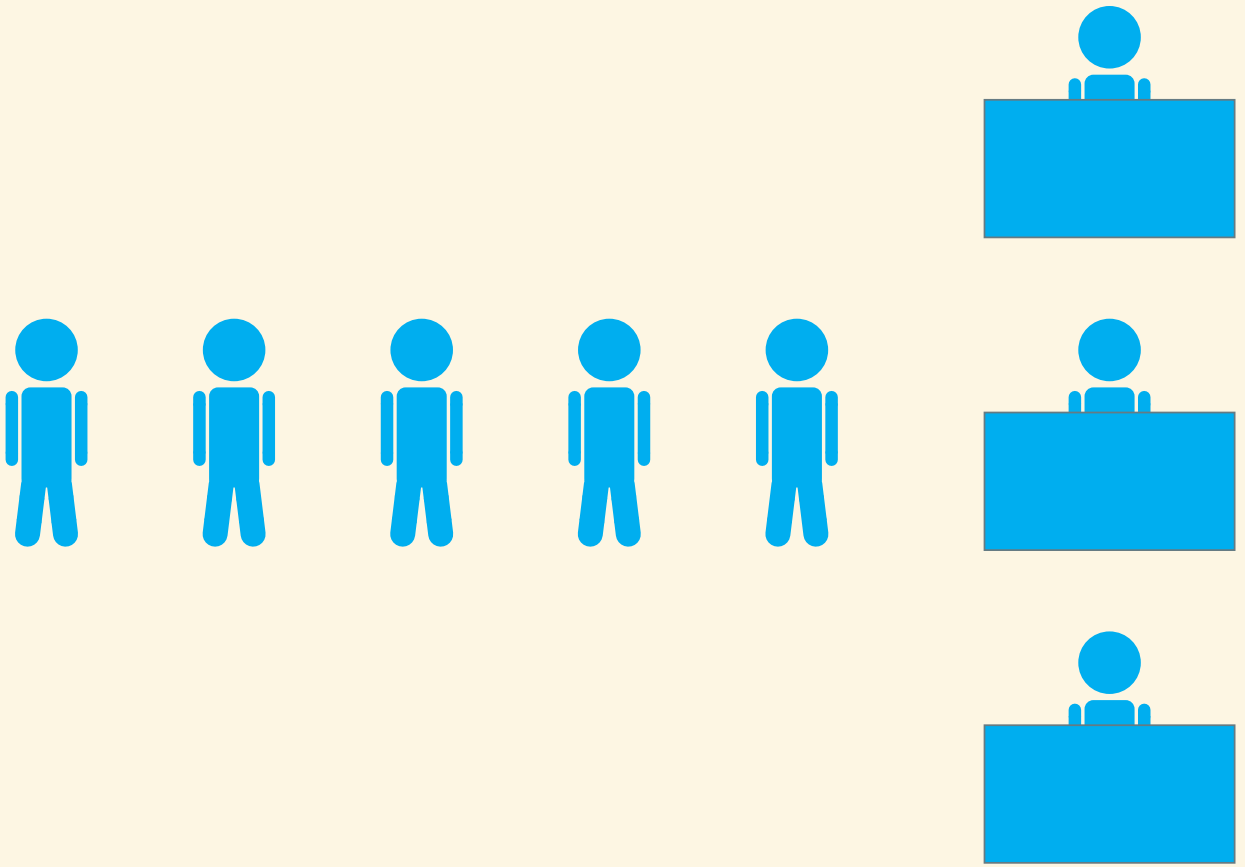
A 3-player game theoretic model of a choice between two queueing systems with strategic managerial decision making

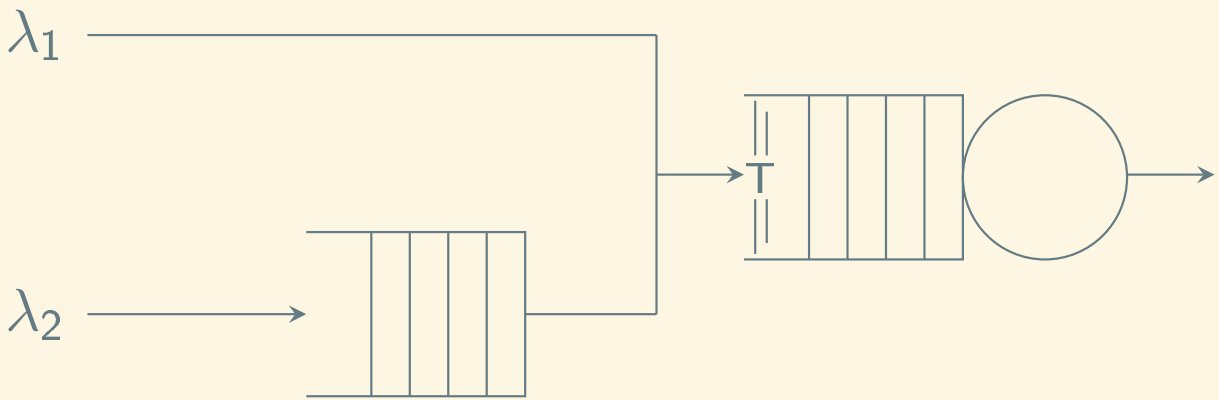
Queues - Examples

Queues - Examples

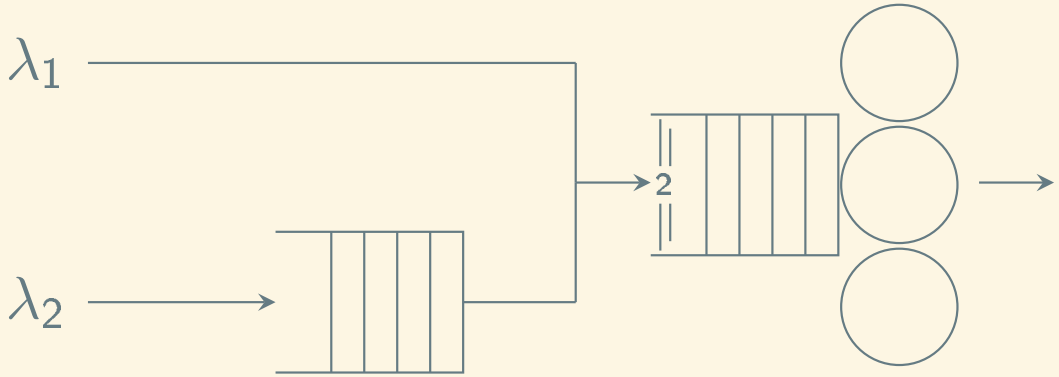


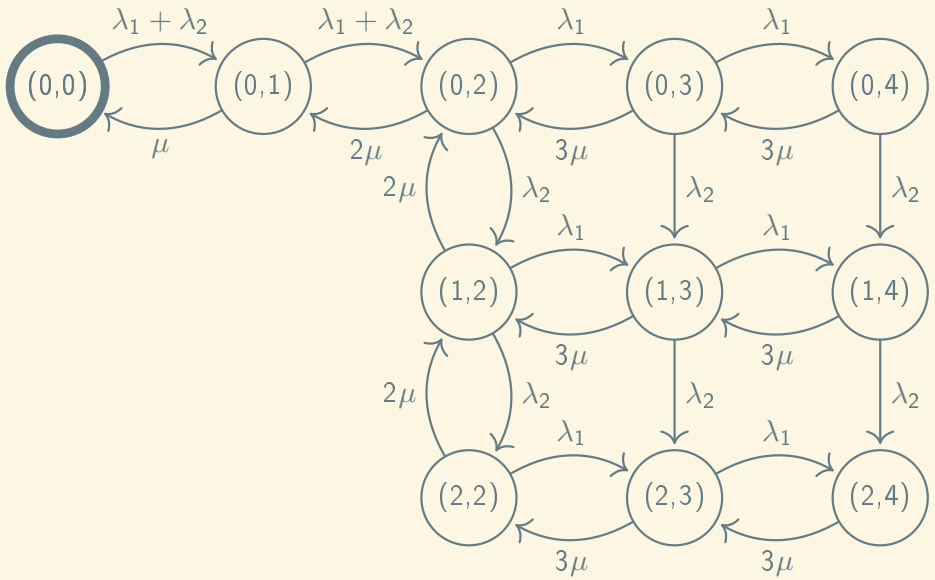
Queues - Examples

Queueing network structure

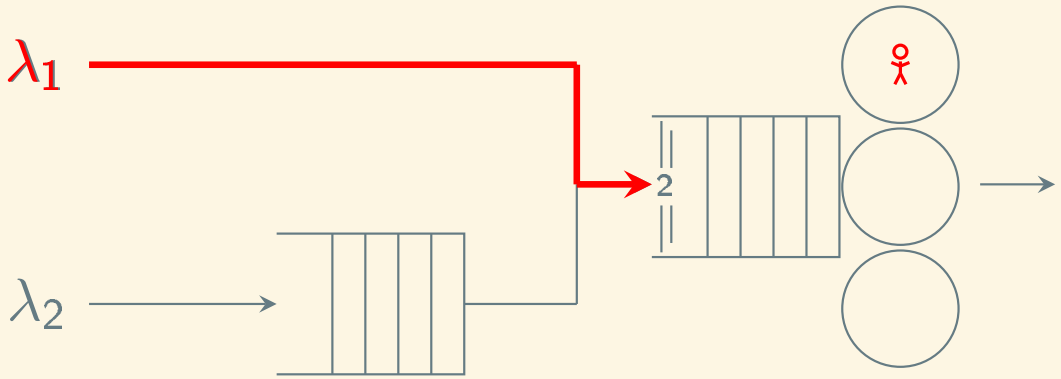


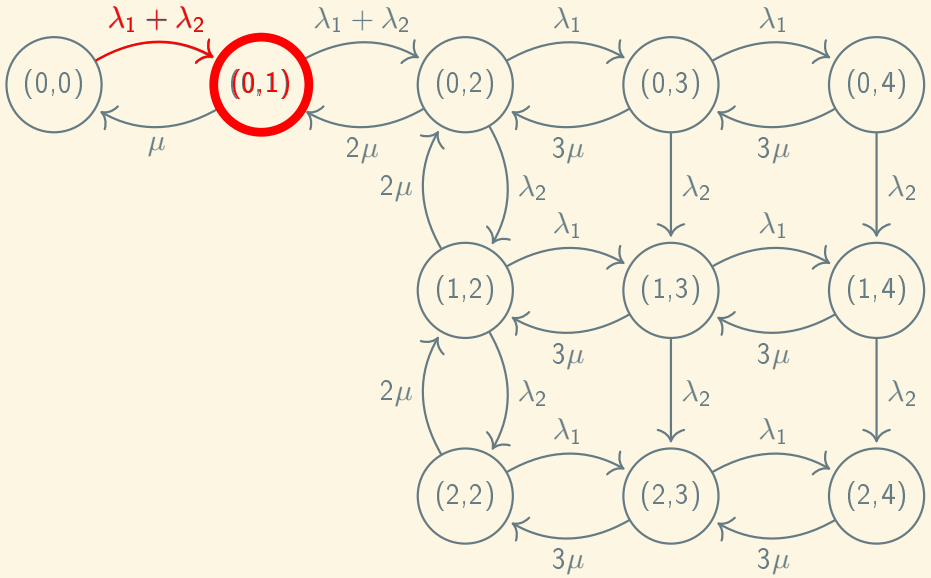
Markov Chain - Custom network



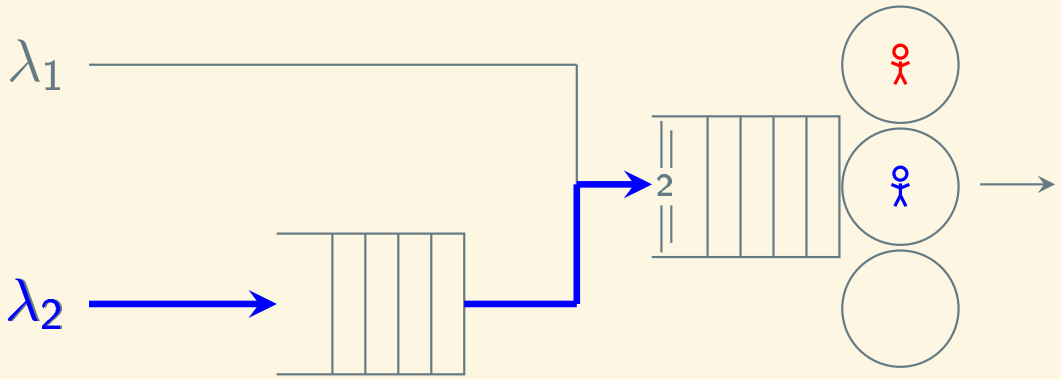


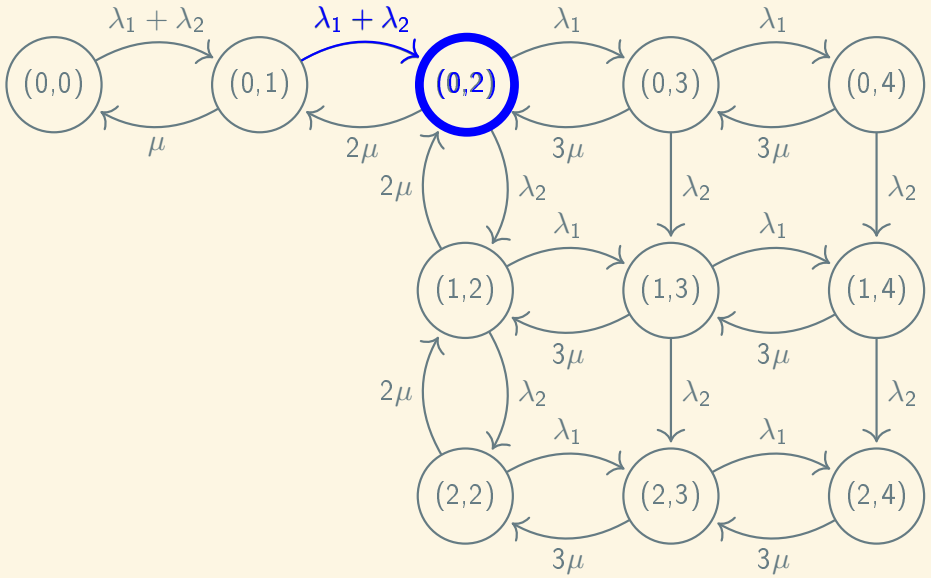
Markov Chain - Custom network



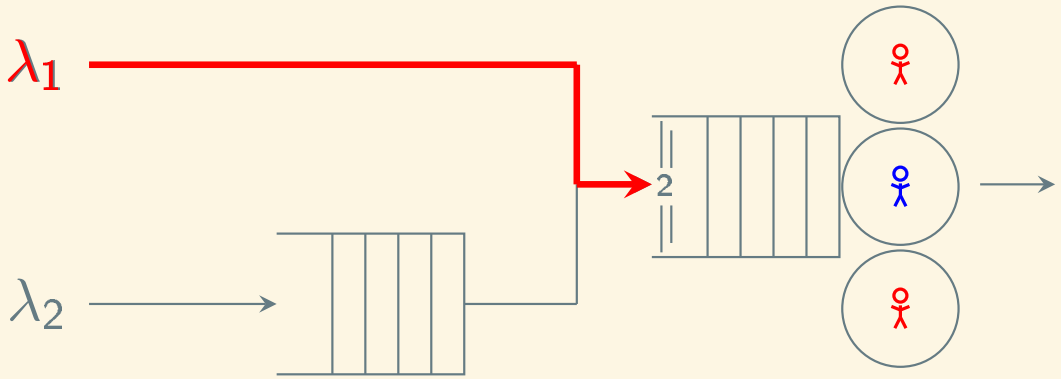


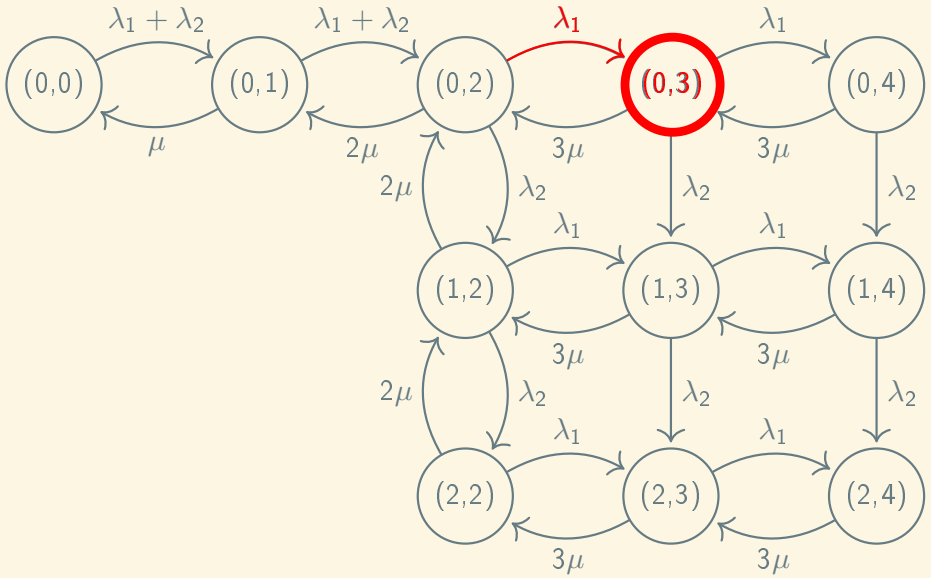
Markov Chain - Custom network



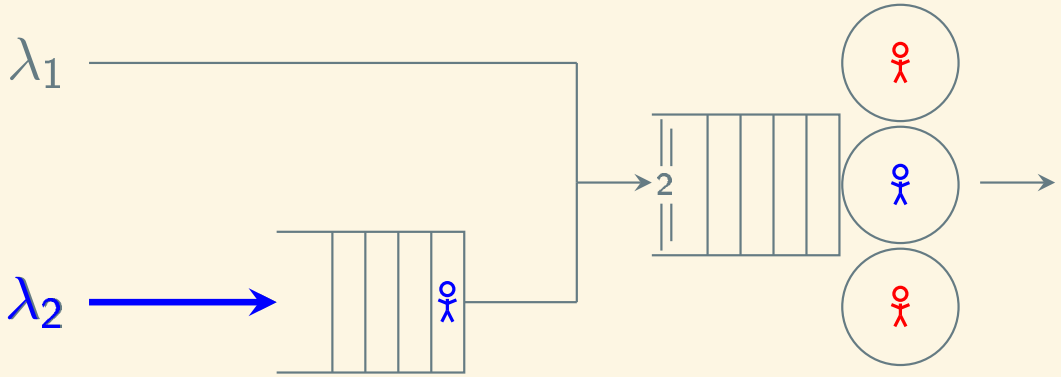


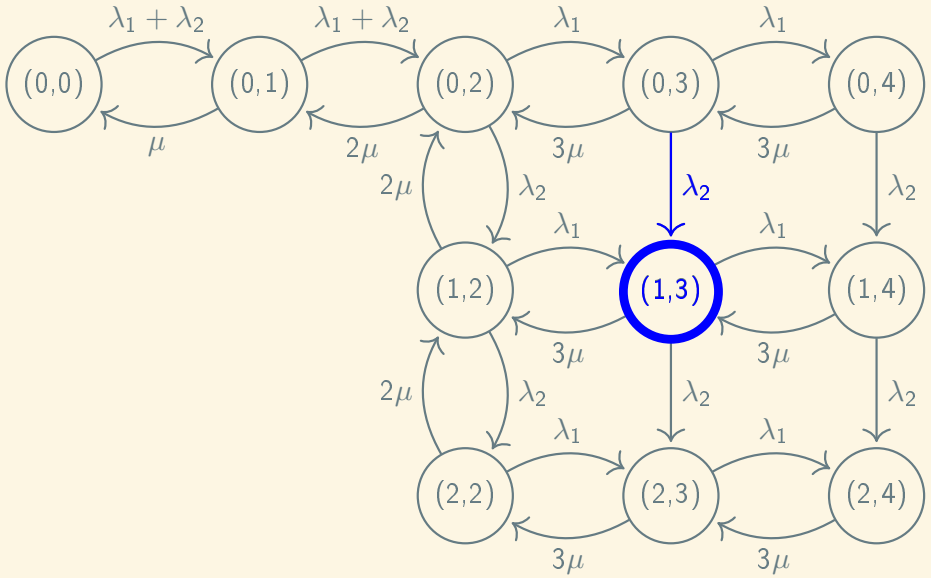
Markov Chain - Custom network



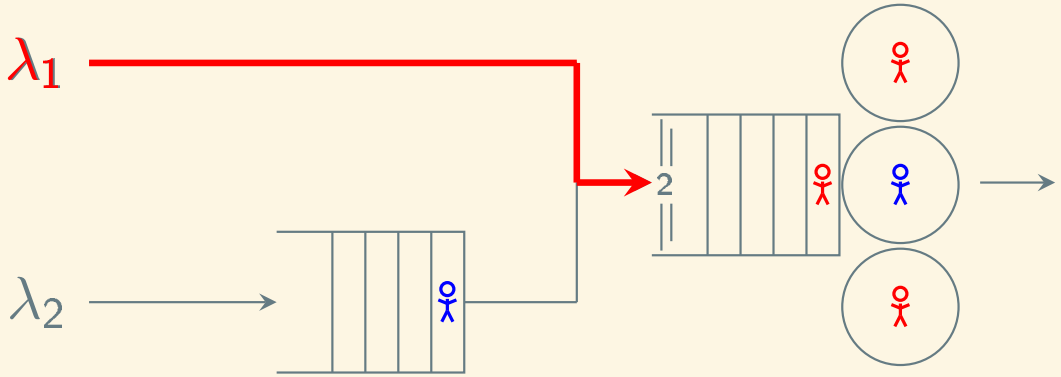


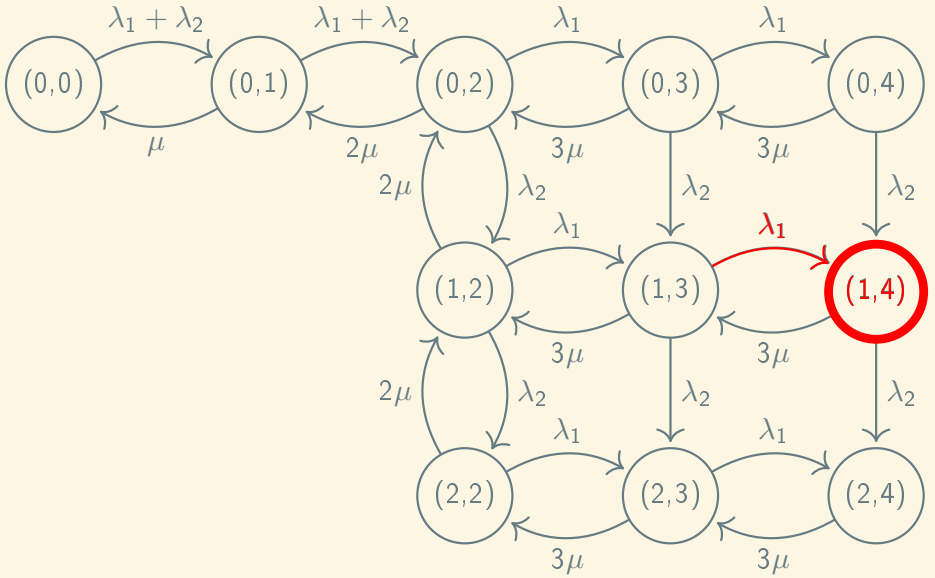
Markov Chain - Custom network



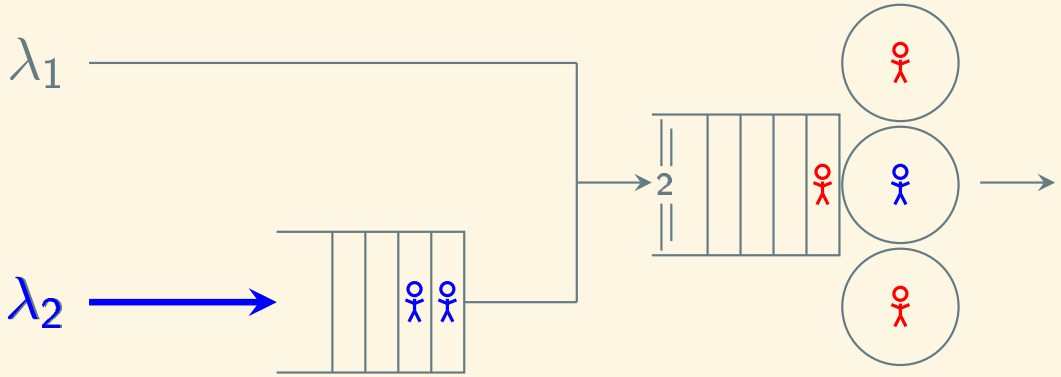


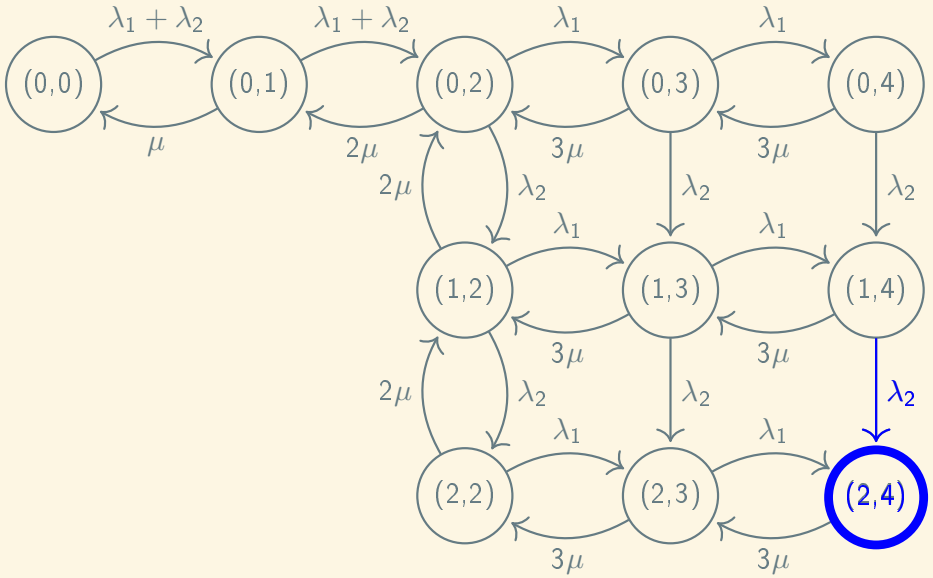
Markov Chain - Custom network



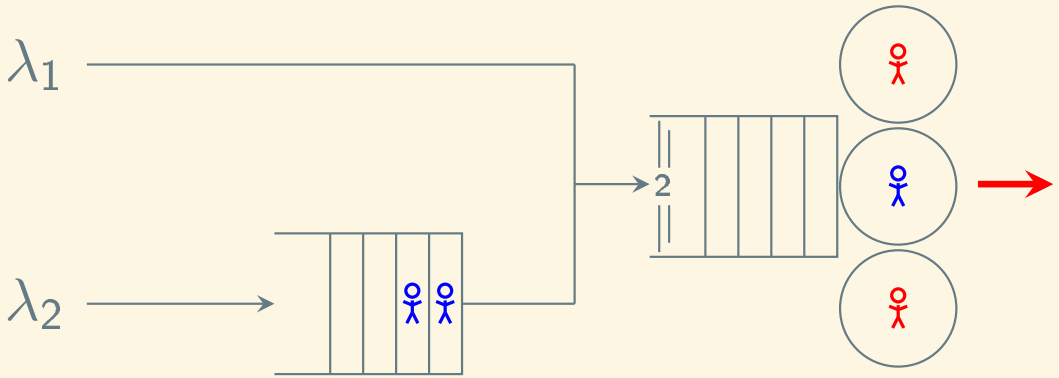


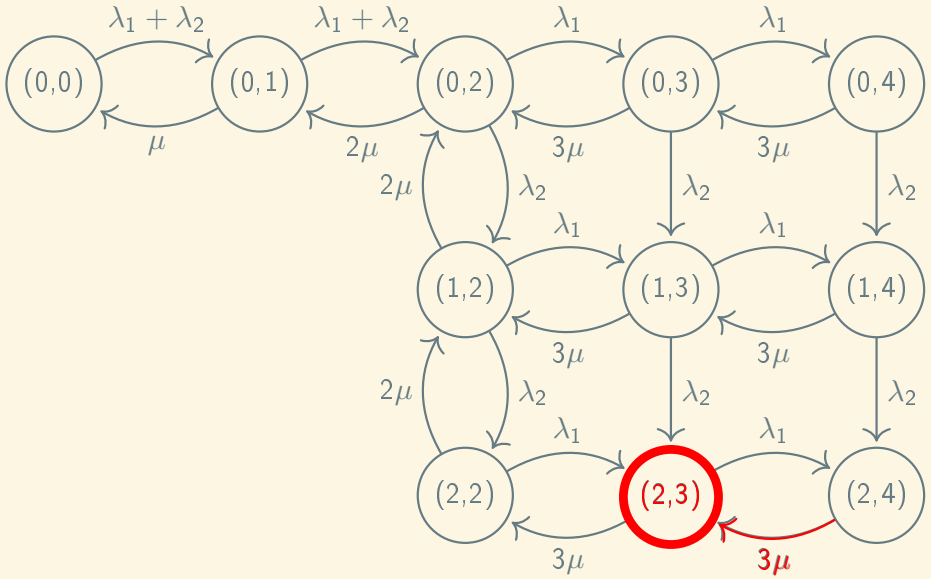
Markov Chain - Custom network



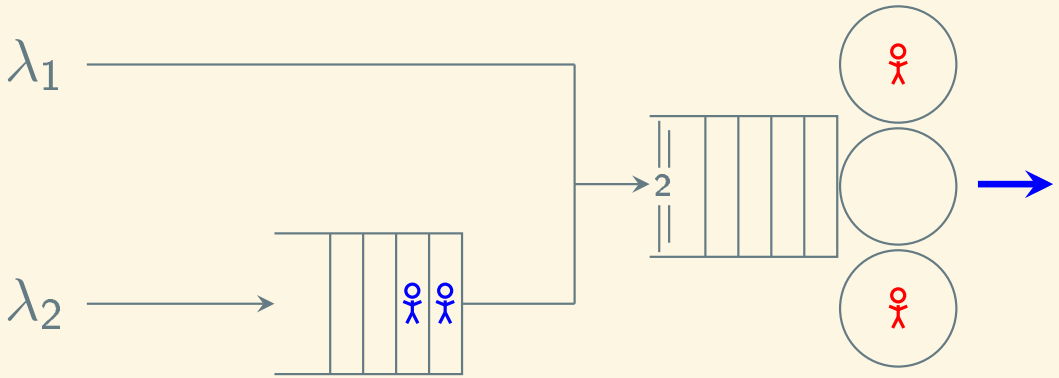


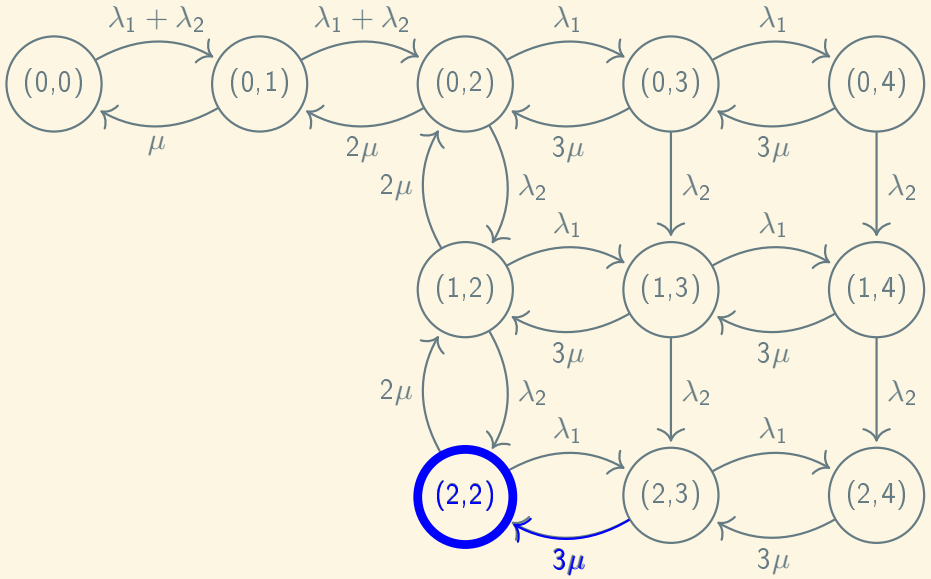
Markov Chain - Custom network



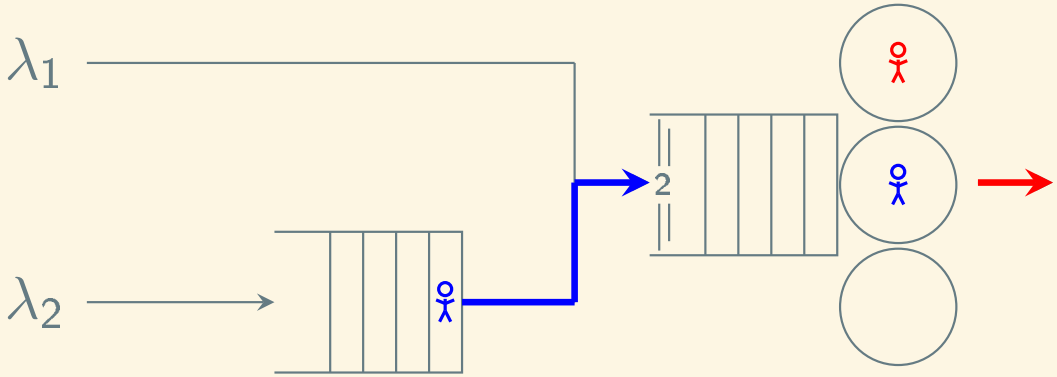


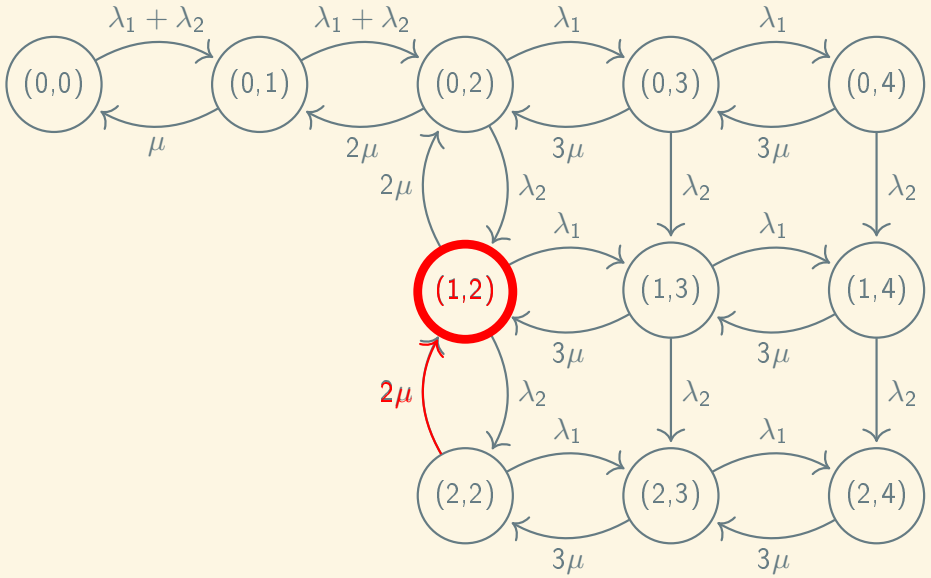
Markov Chain - Custom network





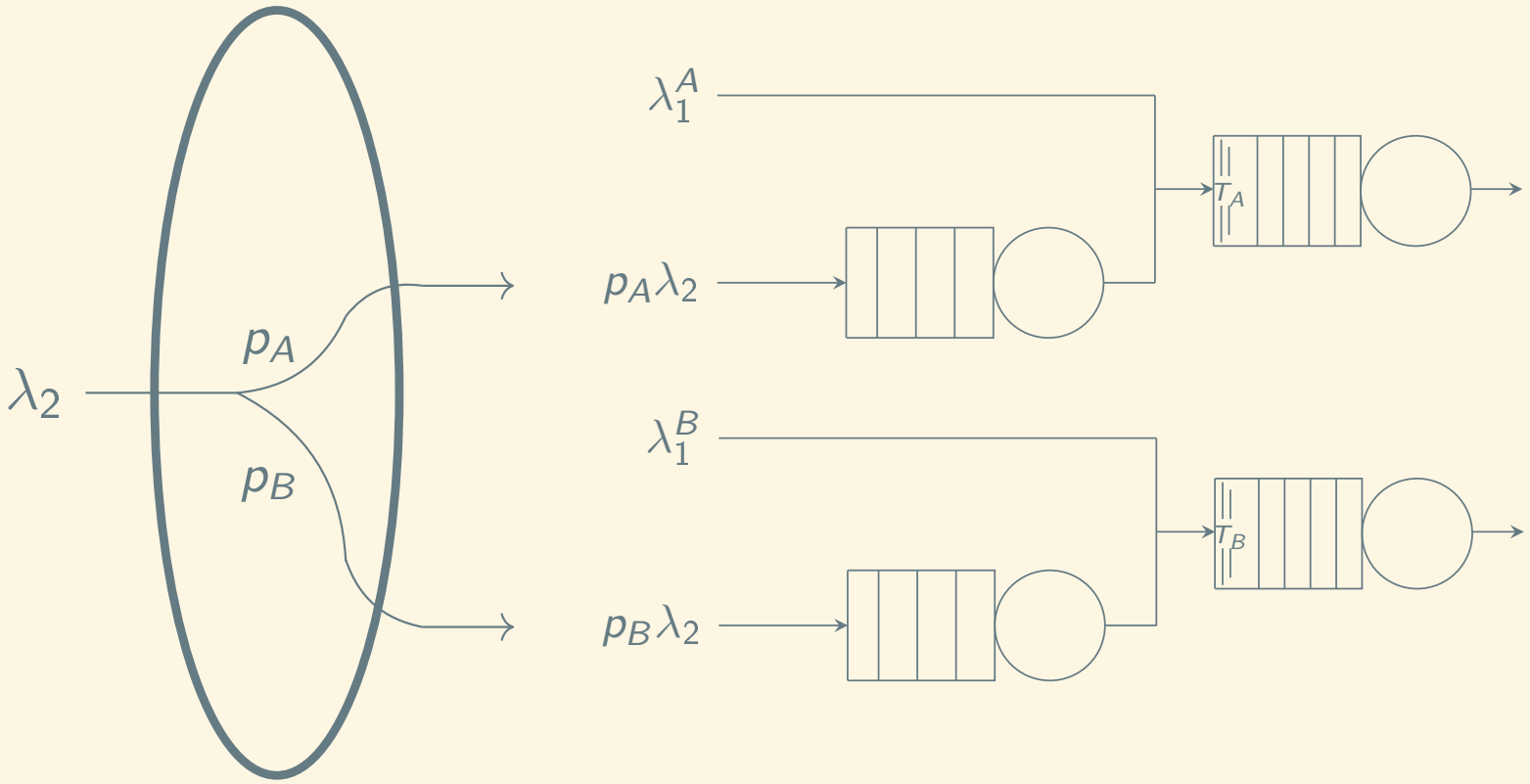
Markov Chain - Custom network



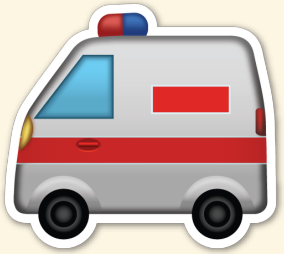


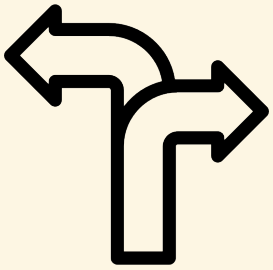
Game - Definition

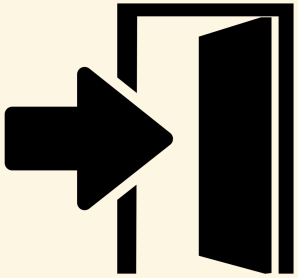
Game - Players

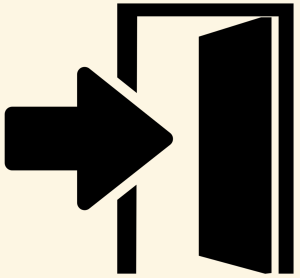


Game - Strategies









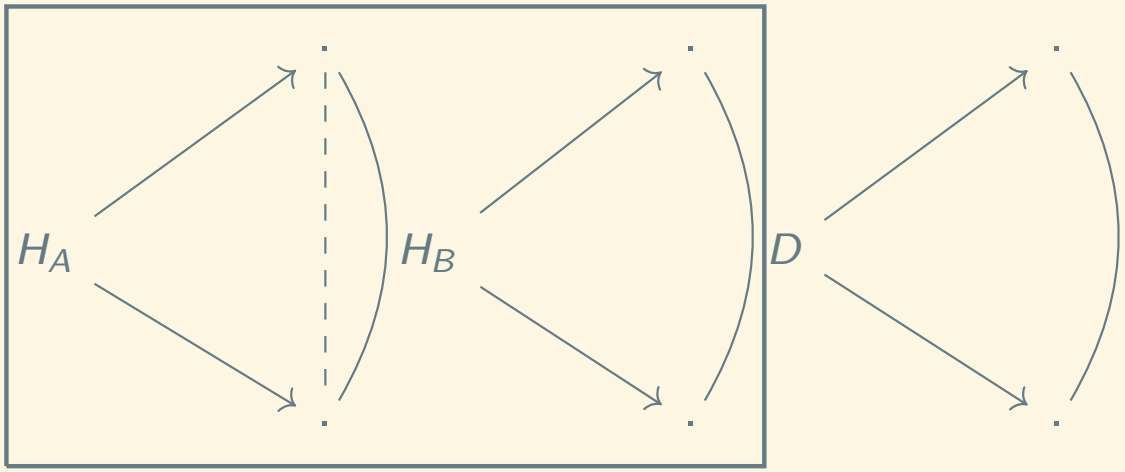
$p_A, p_B \in [0, 1]$

$T_A \in [1, N_A]$

$T_B \in [1, N_B]$

$p_A + p_B = 1$

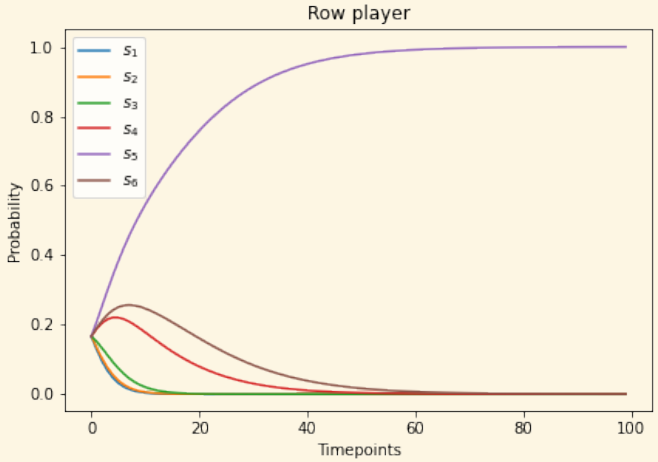
Game - Formulation

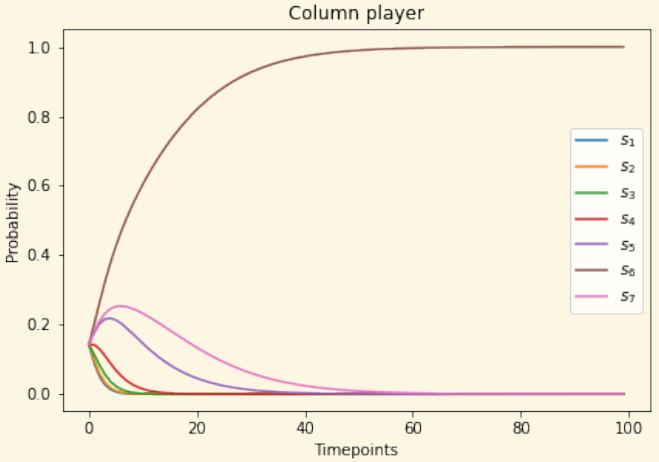


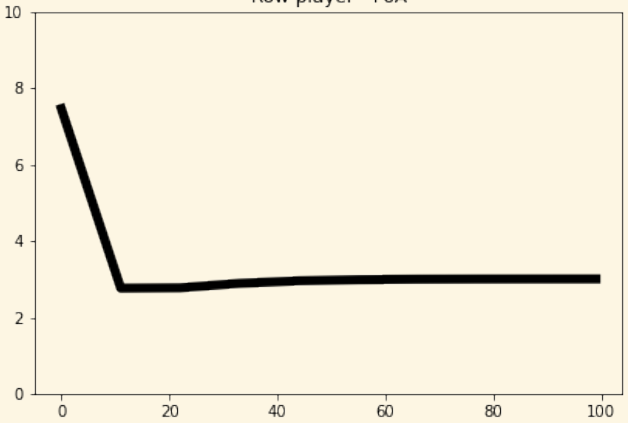
$$A = \begin{pmatrix} U^A_{1,1} & U^A_{1,2} & \cdots & U^A_{1,N_B} \\ U^A_{2,1} & U^A_{2,2} & \cdots & U^A_{2,N_B} \\ \vdots & \vdots & \ddots & \vdots \\ U^A_{N_A,1} & U^A_{N_A,2} & \cdots & U^A_{N_A,N_B} \end{pmatrix}, \quad B = \begin{pmatrix} U^B_{1,1} & U^B_{1,2} & \cdots & U^B_{1,N_B} \\ U^B_{2,1} & U^B_{2,2} & \cdots & U^B_{2,N_B} \\ \vdots & \vdots & \ddots & \vdots \\ U^B_{N_A,1} & U^B_{N_A,2} & \cdots & U^B_{N_A,N_B} \end{pmatrix}$$

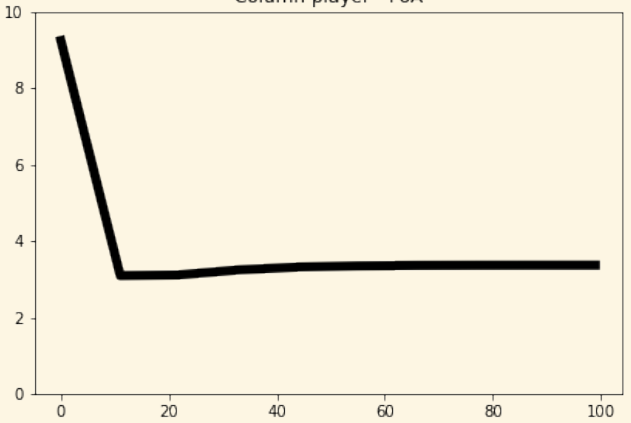
$$R = \begin{pmatrix} p_{1,1} & p_{1,2} & \cdots & p_{1,N_B} \\ p_{2,1} & p_{2,2} & \cdots & p_{2,N_B} \\ \vdots & \vdots & \ddots & \vdots \\ p_{N_A,1} & p_{N_A,2} & \cdots & p_{N_A,N_B} \end{pmatrix}$$

Learning algorithms - Asymmetric replicator dynamics



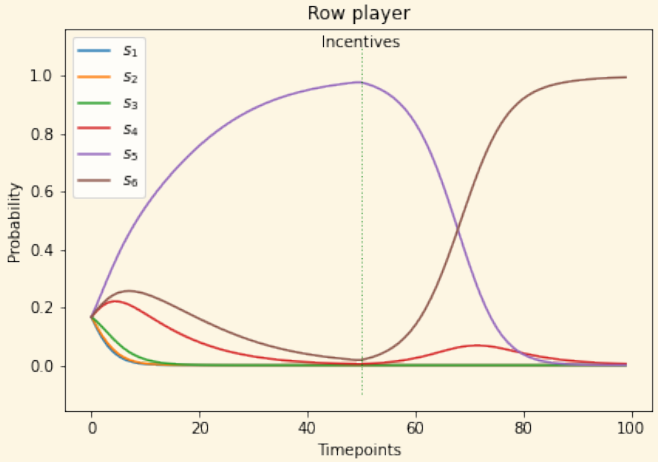


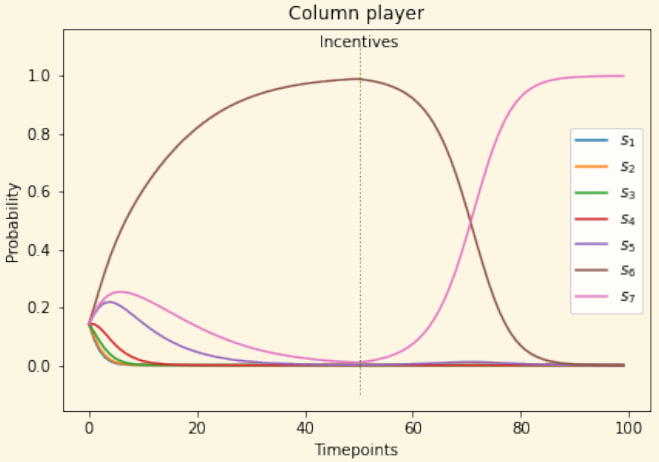


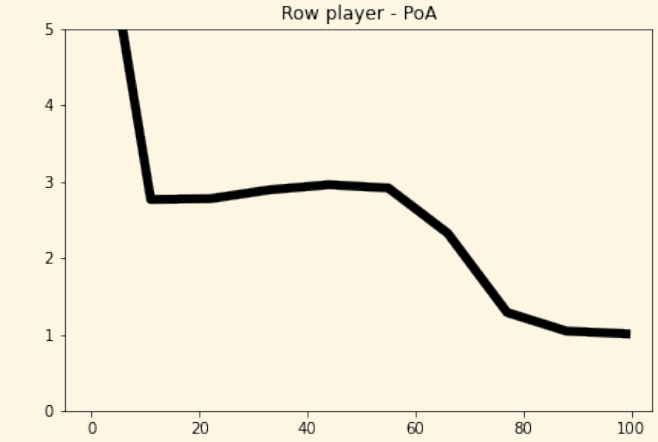


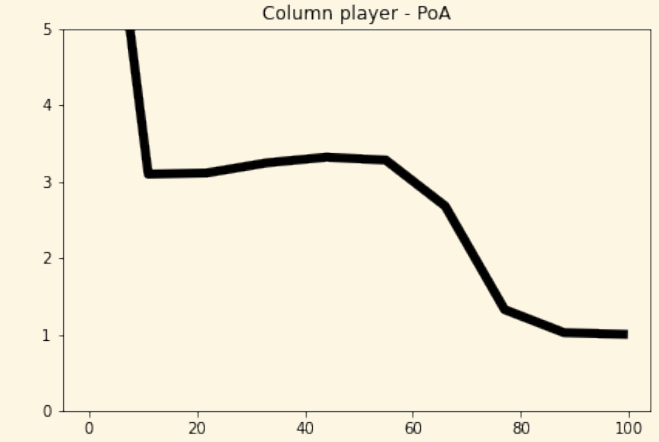
“Inefficiencies can be learned and emerged naturally in an interactive system”

Learning algorithms - Asymmetric replicator dynamics





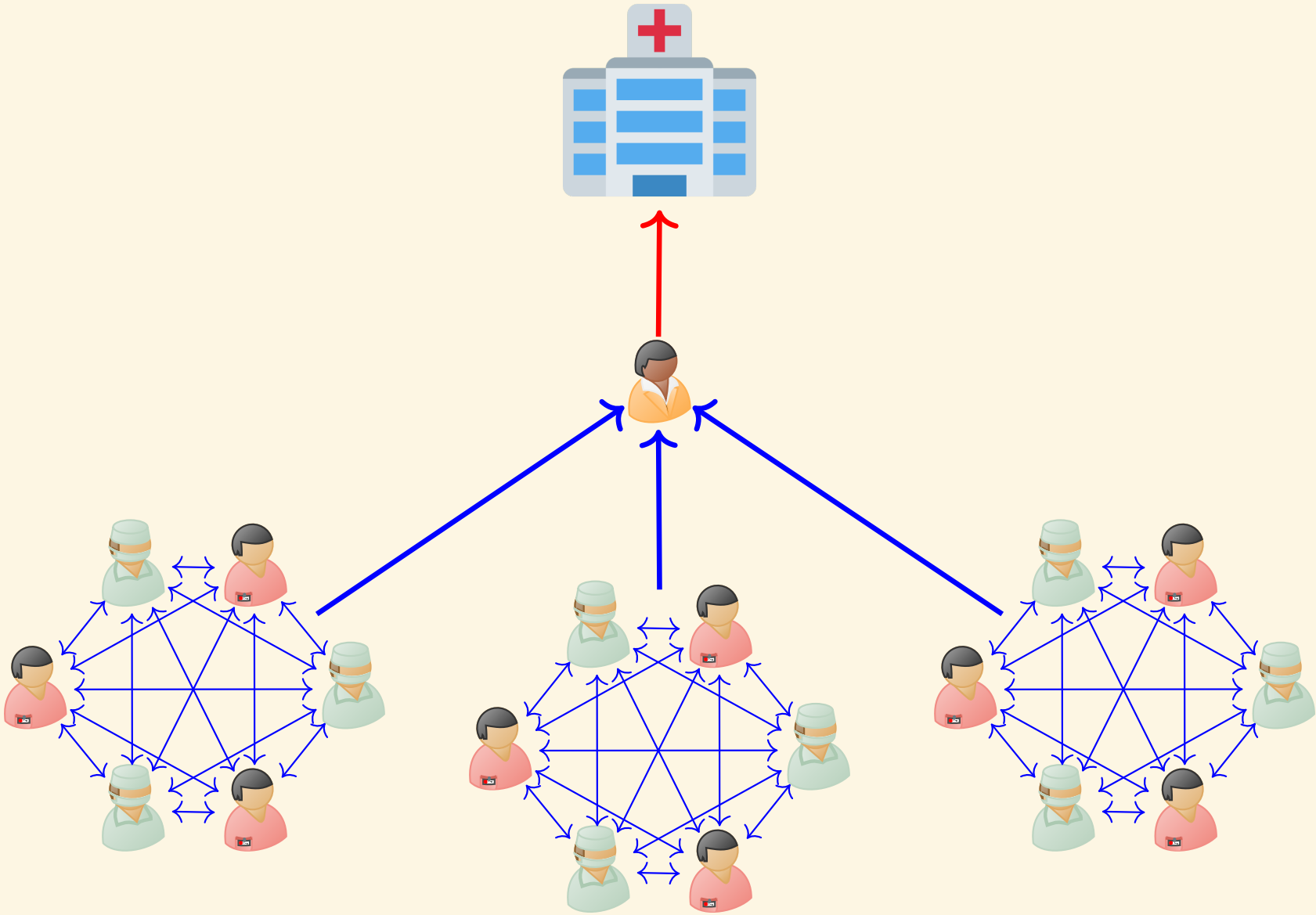




“Targeted incentivisation of behaviours can help escape learned inefficiencies”

Ethnography?

Potential future model



Interfaces and transfers study

1. Ambulance Control Centre
   - Patients are translated into objects of practise for EMS workers
2. Emergency Medical Services
   - Organising logic (clinical, patient, collaborative)
   - Patients are translated into an object of practise for ED workers
3. Emergency Department
   - Sense making process to determine care trajectory
   - Clinical logics (treatment, care)
   - Management logics (resource utilisation, targets)