A 3-player game theoretic model of a choice

managerial decision making

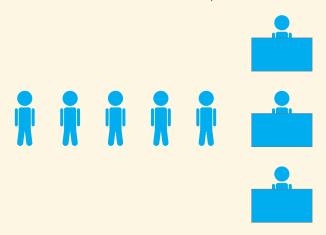
A 3-player game theoretic model of a choice between two queueing systems with strategic





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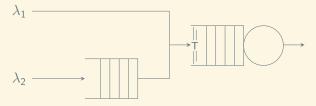


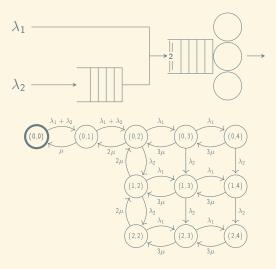


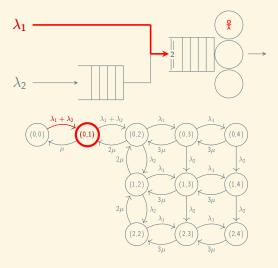
- ► Knight V, Harper P. The Impact of Choice on Public Services.
- Wang X, Song C, Zhuang J. Simulating a multi-stage screening network: A queueing theory and game theory application.

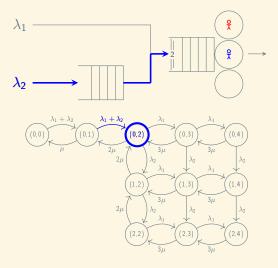


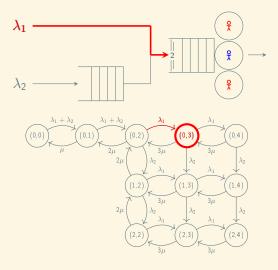
Queueing network structure

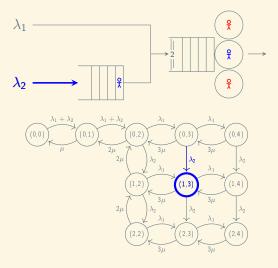


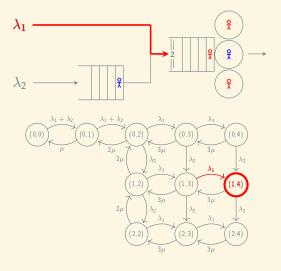


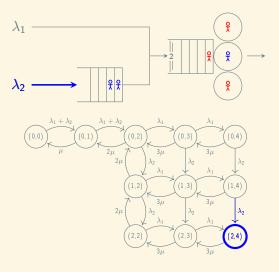


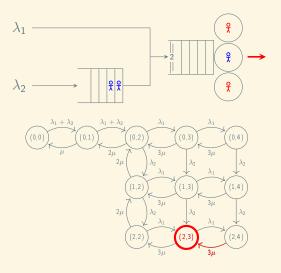


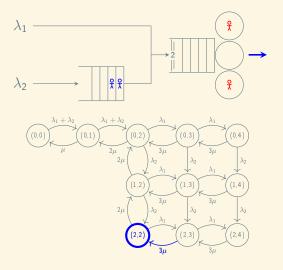


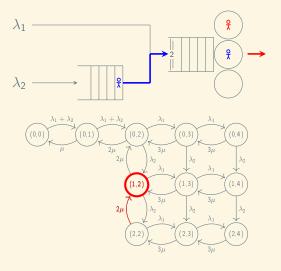








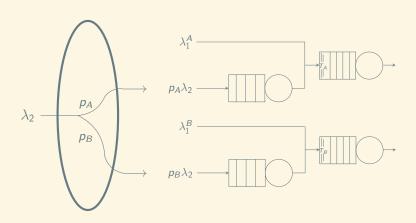




Game - Definition



Game - Players



Game - Strategies











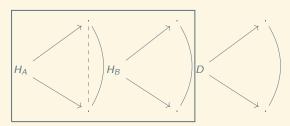


 $p_A, p_B \in [0, 1]$ $p_A + p_B = 1$

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

 $T_B \in [1, N_B]$

Game - Formulation



$$A = \begin{pmatrix} U_{1,1}^A & U_{1,2}^A & \dots & U_{1,N_B}^A \\ U_{2,1}^A & U_{2,2}^A & \dots & U_{2,N_B}^A \\ \vdots & \vdots & \ddots & \vdots \\ U_{N_A,1}^A & U_{N_A,2}^A & \dots & U_{N_A,N_B}^A \end{pmatrix}, \quad B = \begin{pmatrix} U_{1,1}^B & U_{1,2}^B & \dots & U_{1,N_B}^B \\ U_{2,1}^B & U_{2,2}^B & \dots & U_{2,N_B}^B \\ \vdots & \vdots & \ddots & \vdots \\ U_{N_A,1}^B & U_{N_A,2}^B & \dots & U_{N_A,N_B}^B \end{pmatrix}$$

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

Learning algorithms - Asymmetric replicator dynamics



"Inefficiencies can be learned and emerged naturally in an

interactive system"

Learning algorithms - Asymmetric replicator dynamics



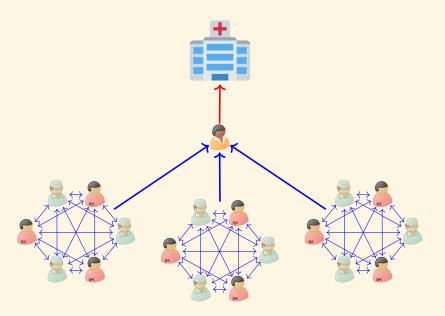
"Targeted incentivisation of

"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)