The Evolution of Cooperation

Cardiff University

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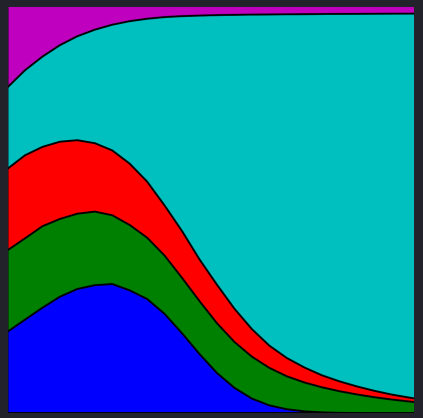
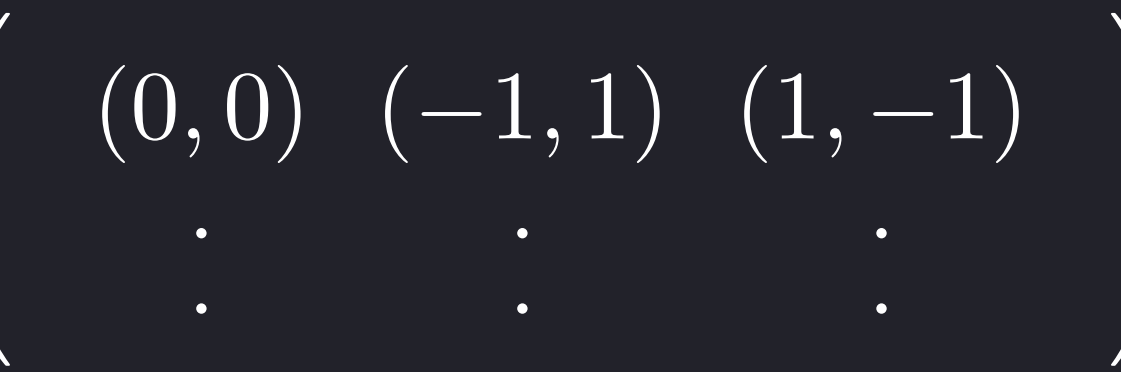
Software
Sustainability
Institute



Classical Game Theory

Evolutionary Game Theory





$$\begin{pmatrix} (0,0) & (-1,1) & (1,-1) \\ (1,-1) & (0,0) & (-1,1) \\ (-1,1) & (1,-1) & (0,0) \end{pmatrix}$$

$$\begin{pmatrix} (0,0) & (3,1) \\ (1,3) & (2,2) \end{pmatrix}$$

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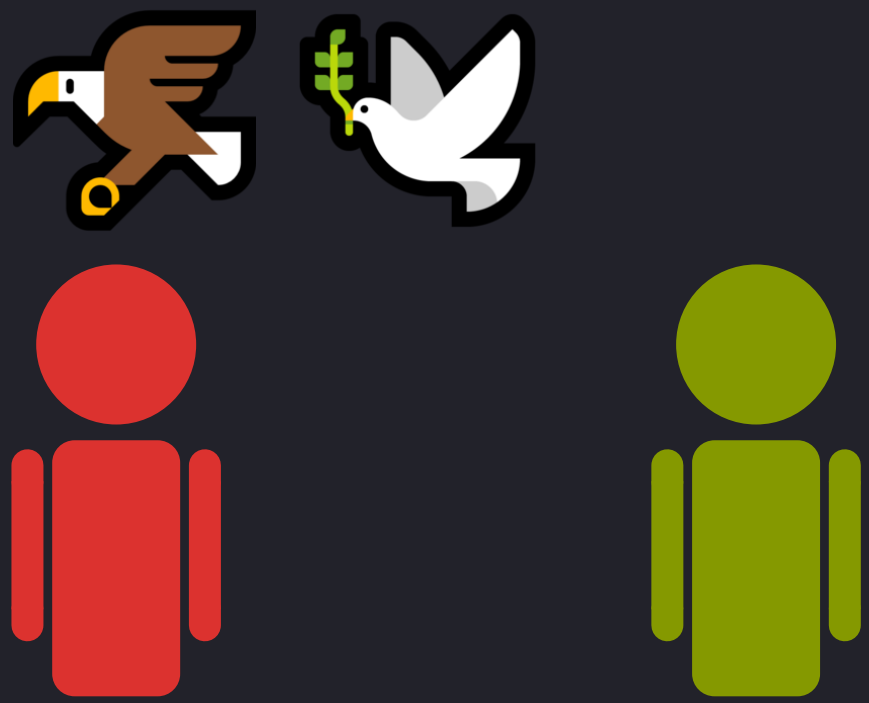
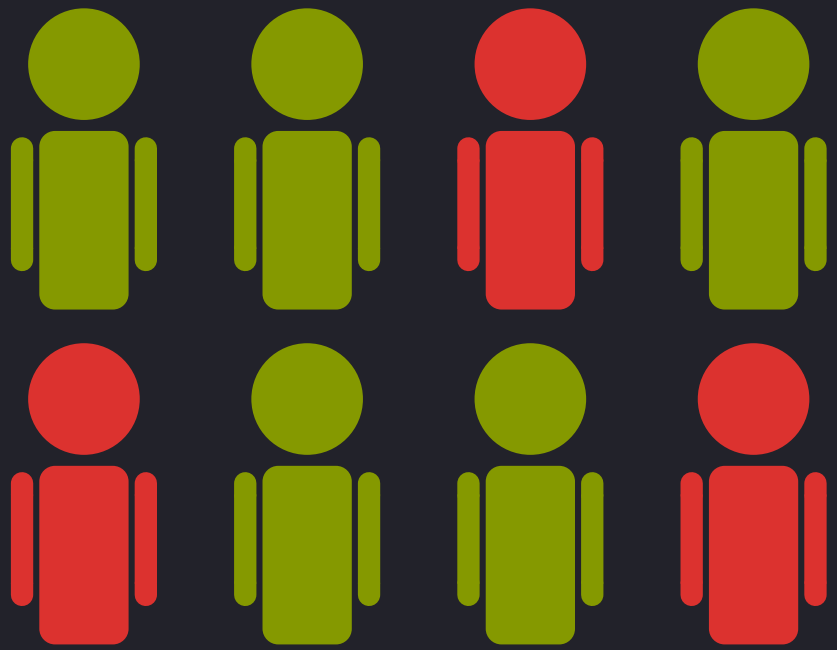


Understanding responses to environments for the Prisoner's Dilemma: A meta analysis, multidimensional optimisation and machine learning approach

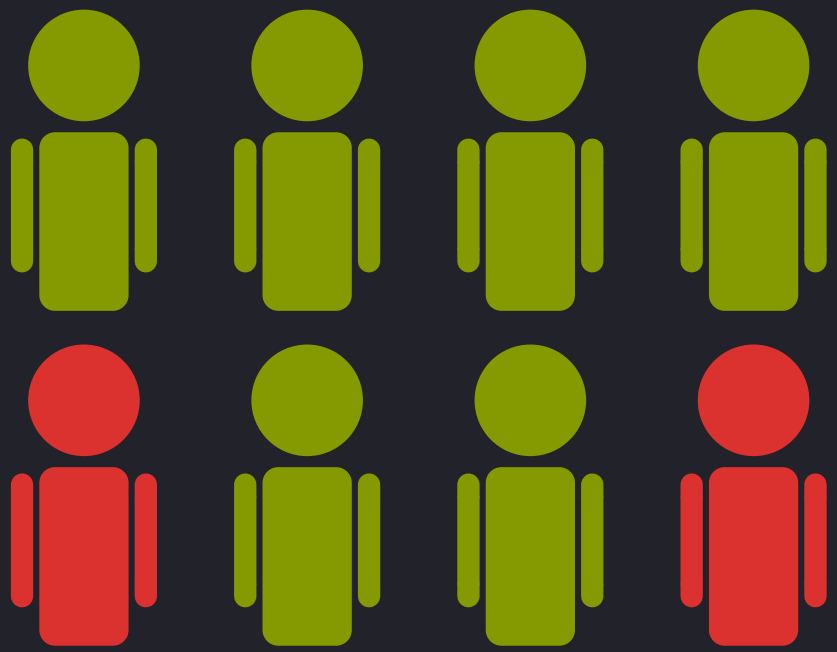
Nikoleta E. Glynatsi

Submitted in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy.

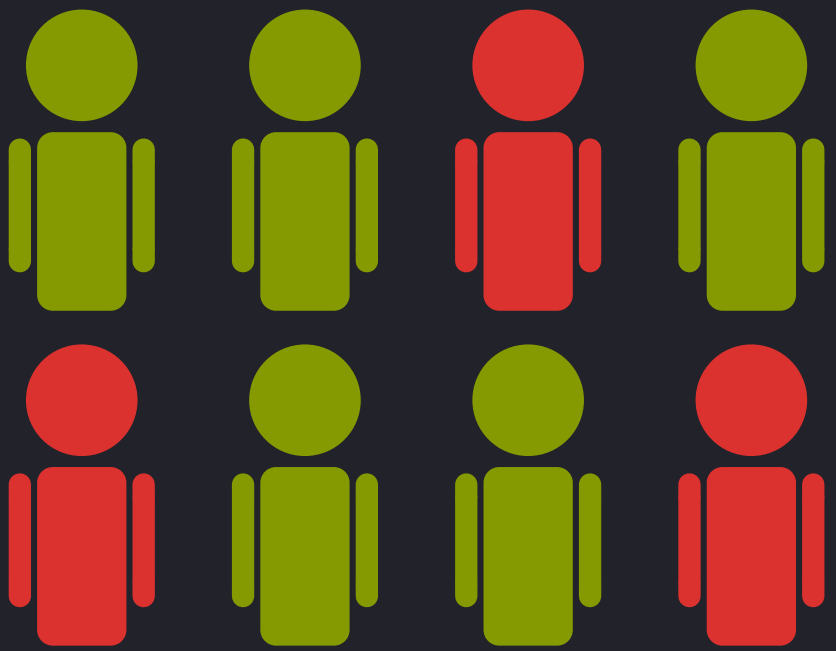
June 2020



Oh no



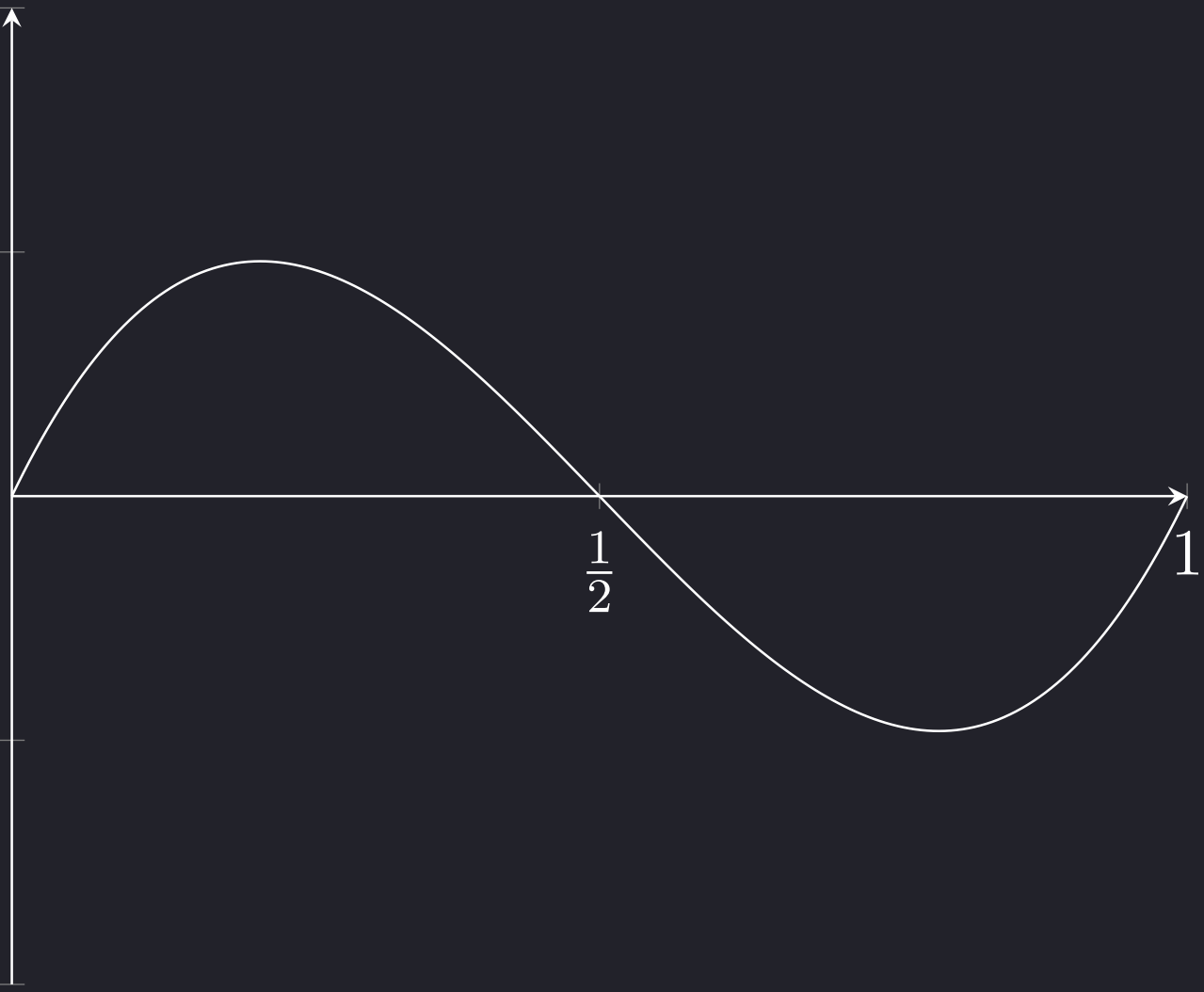
Replicator Dynamics



$$\chi = (x_1, x_2)$$

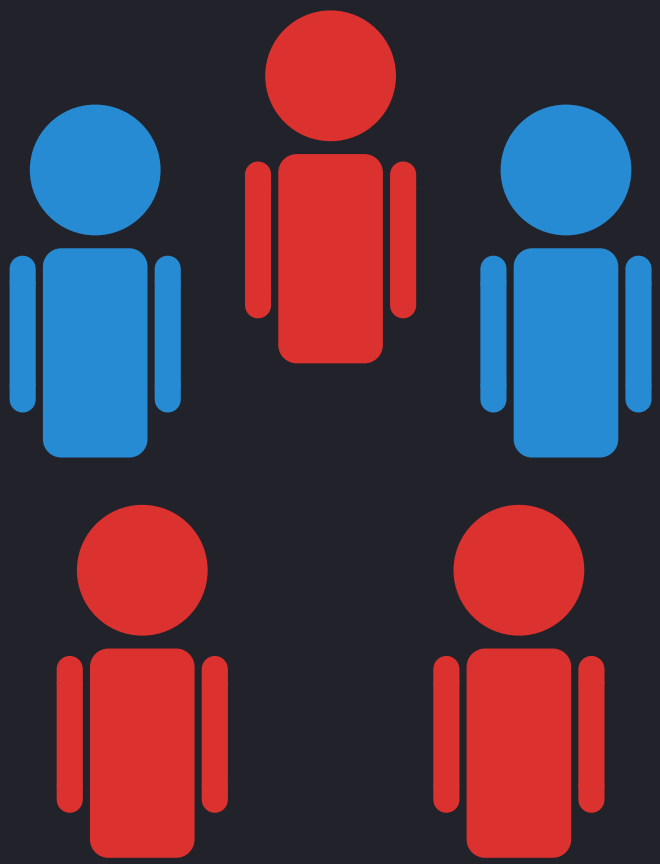
$$f_1(\chi) = 0 \times x_1 + 3 \times x_2$$
$$f_2(\chi) = 1 \times x_1 + 2 \times x_2$$

$$\phi = x_1 f_1(\chi) + x_2 f_2(\chi)$$
$$\frac{dx_1}{dt} = x_1(f_1(\chi) - \phi)$$


$\frac{1}{2}$
1

Moran Proccess


Selection
Birth
Selection
Death



$$f_{1i} = \frac{0 \times (i-1) + 3 \times (N-i)}{N-1}$$

$$f_{2i} = \frac{1 \times i + 2 \times (N-i-1)}{N-1}$$

$$p_{i,i+1} = \frac{i f_{1i}}{i f_{1i} + (N-i) f_{2i}} \frac{N-i}{N}$$

$$p_{i,i-1} = \frac{(N-i) f_{2i}}{i f_{1i} + (N-i) f_{2i}} \frac{i}{N}$$

$$\varphi = \frac{1}{1 + \sum_{i=1}^{N-1} \prod_{k}^{i} \frac{p_{i,i-1}}{p_{i,i+1}}}.$$

Evolution of Cooperation?

Prisoner's Dilemma

$$\begin{pmatrix} (1,1) & (5,0) \\ (5,0) & (1,1) \end{pmatrix}$$

Group Dynamics of Social Behaviour

Moran Proccess


THIS IS FINE.

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http://web.evolbio.mpg.de/social-behaviour/