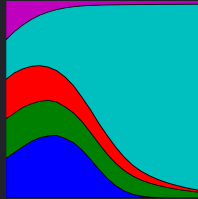


Evolution of cooperation among individuals with limited payoff memory

ICSD 2022

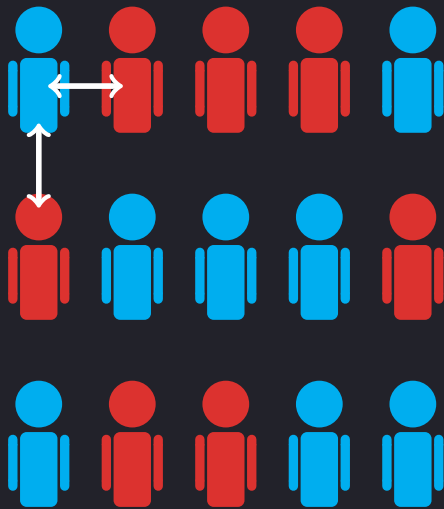
Nikoleta Glynatsi, Christian Hilbe, Alex McAvoy



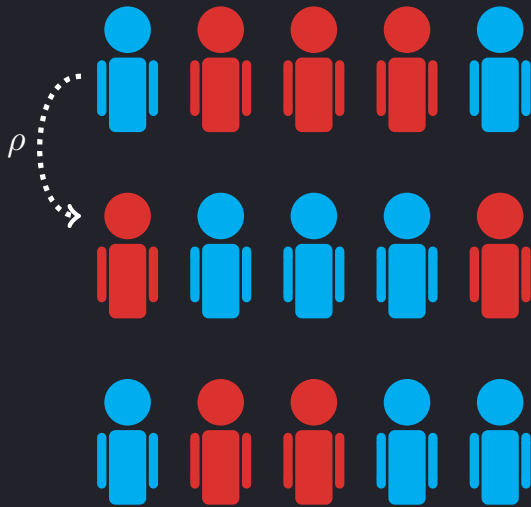
$$\begin{pmatrix} b - c & -c \\ b & 0 \end{pmatrix}$$

How do we model the evolution of cooperation?





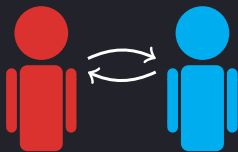


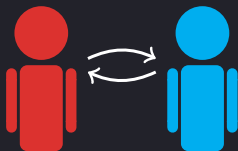


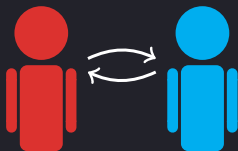


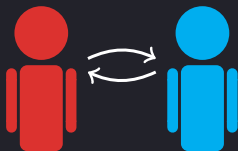
$$\rho = \frac{1}{1 + e^{-\beta(\pi_A - \pi_B)}}$$

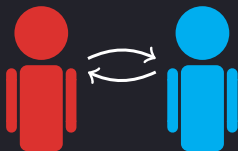










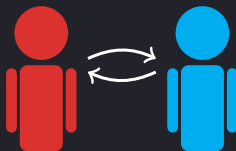


...



...





(y, p, q)



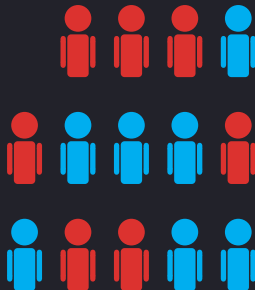
...

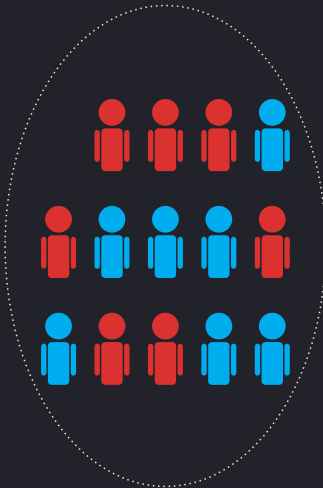


...



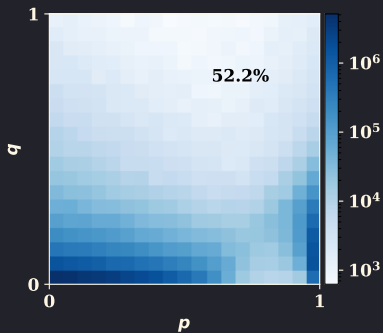
π_A and π_B ?



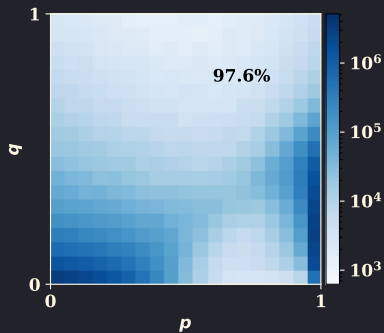


$$\pi_{\text{B}} = (k-1) \begin{array}{c} \text{blue} \\ \text{blue} \end{array} + (N-k) \begin{array}{c} \text{blue} \\ \text{red} \end{array}$$

Perfect Memory Payoffs



Low benefit ($c = 1, b = 3$)



High benefit ($c = 1, b = 10$)

Interactions stage:



- remembers last turn
- + knows opening action

Interactions stage:



- remembers last turn
+ knows opening action

Updating stage:



- remembers $N - 1$ interactions
- remembers each turn

Interactions stage:



- remembers last turn
- + knows opening action

Interactions stage:

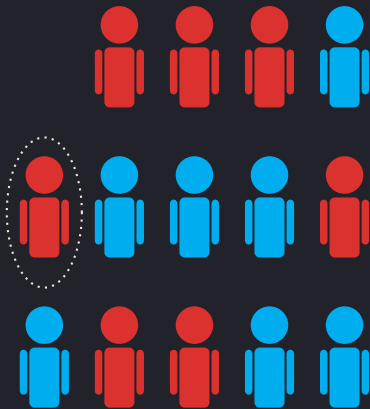


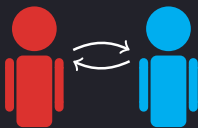
- remembers last turn
- + knows opening action

Updating stage:



- remembers $N-1$ interactions
- remembers each last turn





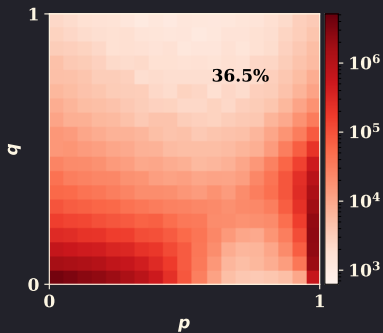
...



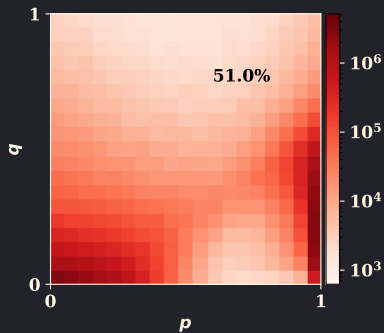
...



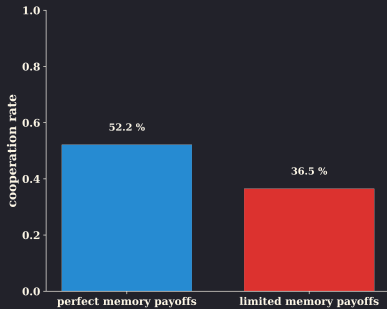
Limited Memory Payoffs



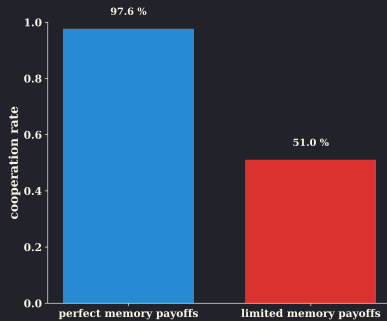
Low benefit ($c = 1, b = 3$)



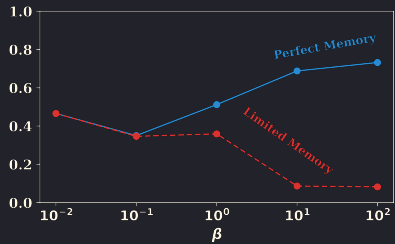
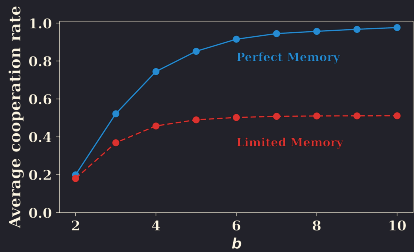
High benefit ($c = 1, b = 10$)



Low benefit ($c = 1, b = 3$)



High benefit ($c = 1, b = 10$)





- remembers 1 interactions
- remembers last turn



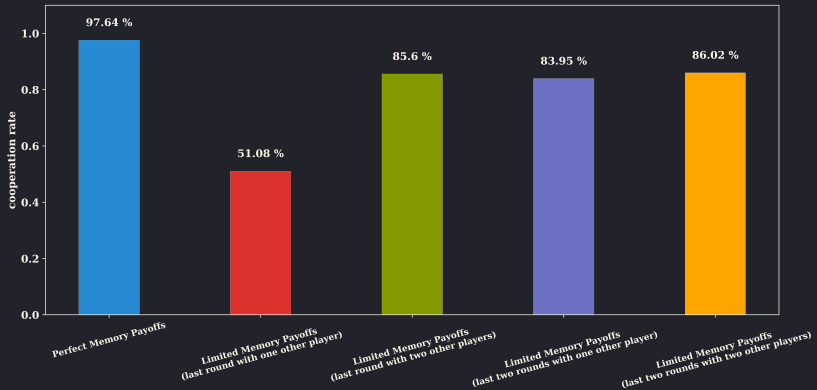
- remembers 2 interactions
- remembers last turn



- remembers 1 interactions
- remembers 2 last turn



- remembers 2 interactions
- remembers two last turn



🐦 @NikoletaGlyn

🐦 @chilbe3

🔗 Nikoleta - v3

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

