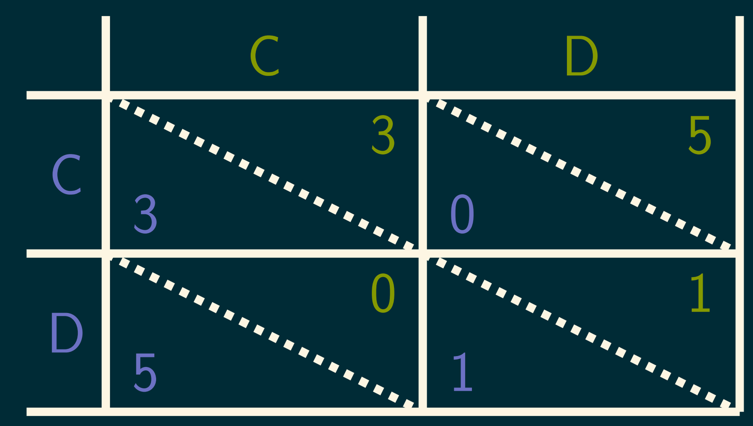
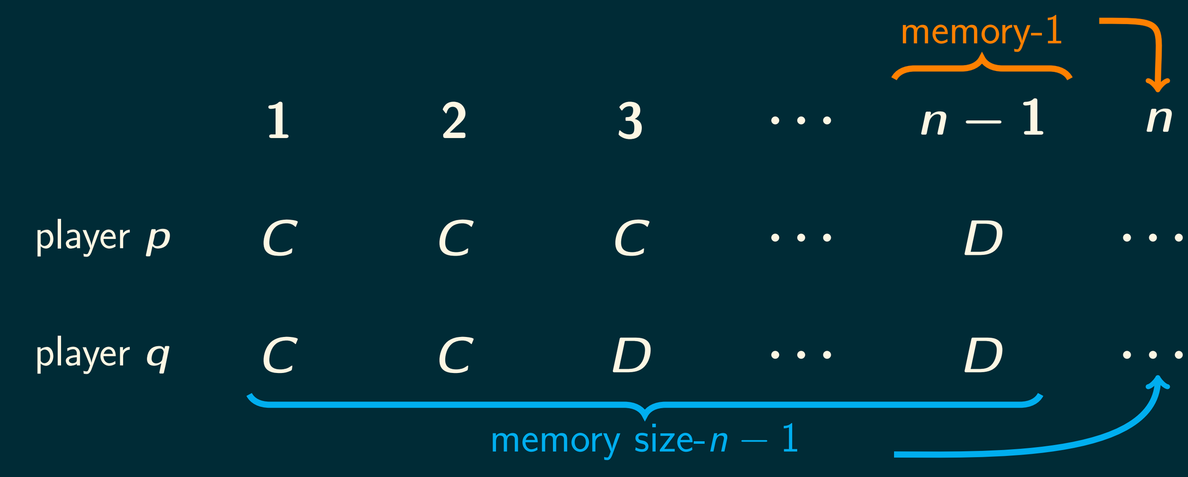
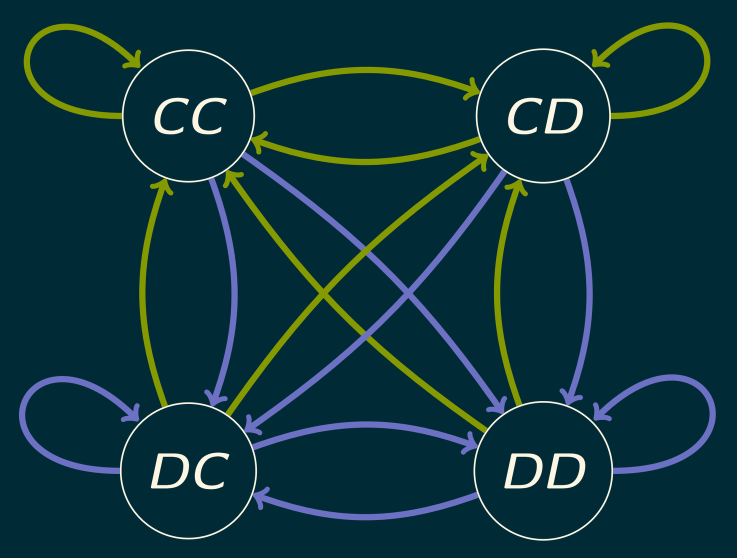
THE POWER OF MEMORY

In interactions both social and biological is memory size advantageous?







$$\begin{bmatrix} p_1q_1 & p_1(-q_1+1) & q_1(-p_1+1) & (-p_1+1)(-q_1+1) \\ p_2q_3 & p_2(-q_3+1) & q_3(-p_2+1) & (-p_2+1)(-q_3+1) \\ p_3q_2 & p_3(-q_2+1) & q_2(-p_3+1) & (-p_3+1)(-q_2+1) \\ p_4q_4 & p_4(-q_4+1) & q_4(-p_4+1) & (-p_4+1)(-q_4+1) \end{bmatrix}$$

W. H. Press and F. J. Dyson. **Iterated Prisoner's Dilemma contains strategies that dominate any evolutionary opponent** PNAS 2012. Introducing the zero determinant strategies:

$$p^* \rightarrow \text{ manipulates } \rightarrow q$$

This work considers an optimisation approach to identify:

$$p^* \rightarrow \text{ best response } \rightarrow q$$

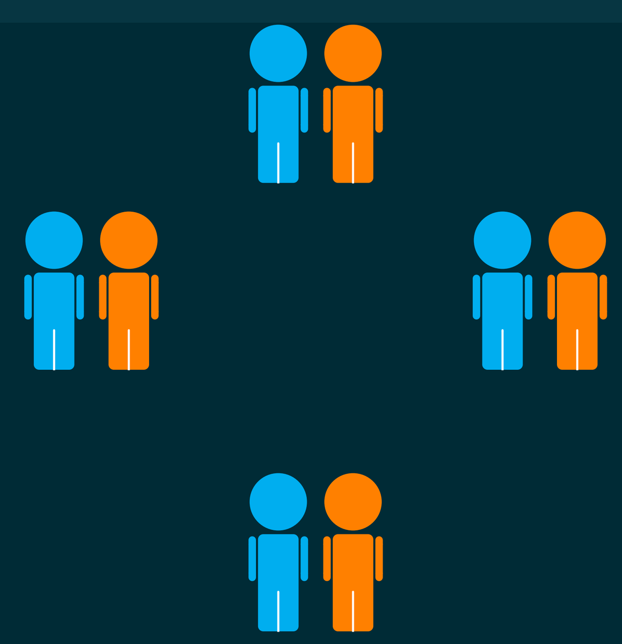
PURELY RANDOM STRATEGIES $p = (p, p, p, p)$

AGAINST A SINGLE OPPONENT

$$p^* = \text{argmax}(u_q(p)), \ \ p \in S_q,$$

where the set S_q is defined as,

$$S_q = \left\{ 0, p_{\pm}, 1 \ \middle| \ \begin{array}{l} 0 < p_{\pm} < 1, \\ p_{\pm} \neq \frac{-d_0}{d_1} \end{array} \right\}$$



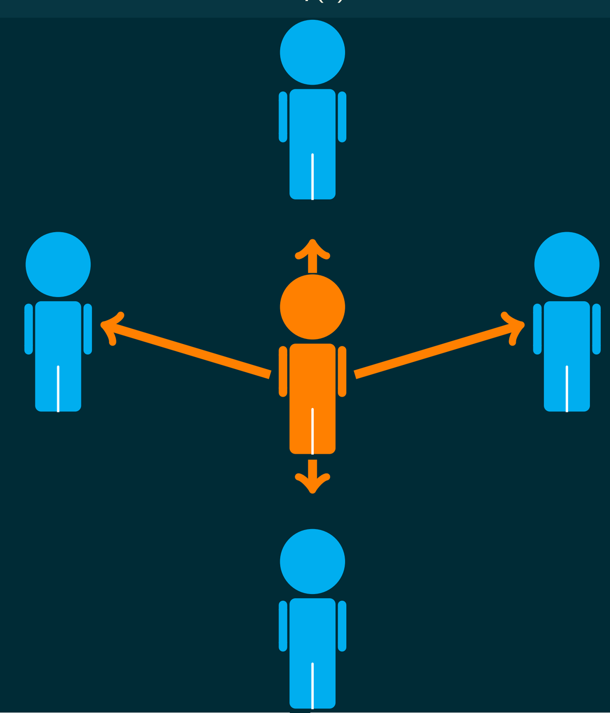
AGAINST MULTIPLE OPPONENTS

$$p^* = \text{argmax}(\sum_{i=1}^{N} {u_q}^{(i)}(p)), \ \ p \in S_{q(i)},$$

where the set $S_{q(i)}$ is defined as:

$$S_{q(i)} = \bigcup_{\substack{i=1 \\ \lambda_i \neq \frac{d_{0_i}}{d_{1_i}}}}^{2N} \lambda_i \cup \{0, 1\}$$

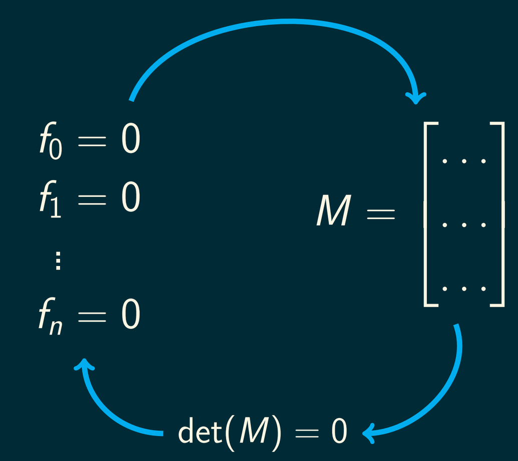
Note the size of candidate solutions is $1 \leq |S_{q(i)}| \leq 2N + 2$.



RESULTS

1. The first
2. The second
3. The third

FUTURE WORK



NikoletaGlyn **In case you missed me:** `nikoleta-v3.github.io/blog/2017/08/23/grudges-war-GoT.html` **Nikoleta-v3**