

An open reproducible framework for the study of the iterated prisoner's dilemma

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1 Introduction

As stated in [4]: “*few works in social science have had the general impact of [Axelrod’s study of the evolution of cooperation]*”. In 1980, Axelrod wrote two papers: [1, 2] which described a computer tournament that has been at the origin of a majority of game theoretic work [3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20]. As described in [4] this work has not only had mathematical impact but has also led to insights in biology (for example in [6], a real tournament where Blu Jays are the participants is described) and in particular to the study of evolution.

The tournament is based on an iterated game (see [14] or similar for details) where two players repeatedly play the normal form game of (1) in full knowledge of each others playing history to date. An excellent description of the *one shot* game is given in [10] which is paraphrased below:

Two players must choose between *Cooperate* (C) and *Defect* (D):

- If both choose C , they receive a payoff of R (**R**eward);
- If both choose D , they receive a payoff of P (**P**unishment);
- If one chooses C and the other D , the defector receives a payoff of T (**T**emptation) and the cooperator a payoff of S (**S**ucker).

$$\begin{pmatrix} R, R & S, T \\ S, S & P, P \end{pmatrix} \quad \text{such that } T > R > P > S \text{ and } 2R > T + S \quad (1)$$

The game of (1) is called the Prisoner’s Dilemma. Numerical values of $(R, S, T, P) = (3, 0, 5, 1)$ are often used in the literature.

Axelrod’s tournaments (and further implementations of these) are sometimes referred to as Iterated Prisoner’s Dilemma tournaments.

- Review of the tournament itself; Original paper by Axelrod and Hamilton [**1981-Axelrod-Hamilton**]. Some recent discussion of memory one strategies [**press2012iterated**, **stewart2012extortion**].
- Discussion about open reproducible science (there are some reference around) (Python, git, github etc...)
- Overview of the library (what it can do, what has been done with it)
- Point at Sections 2 and 3.

2 Reproducing previous tournaments

3 New strategies, tournaments and implications

4 Conclusion

References

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