## Research Question

1. Reputation on fostering collaboration amongst decision makers
2. Effect of constrained communication in collaboration of decision makers utilising reputation.

Should be a 2-3 page project description to your supervisor. This should provide a brief description of the research project including motivation, aims, intended outcomes, proposed research methodology and an indicative timeline

## Overview

## Motivation

In order to understand our behaviour and our willingness and ability to cooperate with those around us in both small and large populations, it is vital that we can create detailed and accurate simulations based on proven mathematical models which explain and model how random populations reach states with a high rate of cooperation. The area of indirect reciprocity using reputation in prisoner’s dilemma games played between individuals in a larger population has been the focus of recent research in game theory. A number of papers have been published exploring the effect of strategies based on reputation in the prisoner’s dilemma game and a detailed look at those which foster cooperation in small populations. The main research paper on which this project will be based is “Social Norms of Cooperation in Small-Scale Societies” by Santos, Santos, and Pacheco.

## Aims

The primary aim of this project is to recreate the findings of Santos, Santos, and Pacheco (which will allow further exploration into more detailed models of the prisoner’s dilemma game within populations)\*\*. The paper outlines simulation parameters based on equations to model the process in which the prisoner’s dilemma game is played over time in a population. The simulation itself however is a simple probability based computer program operating on the defined population and each agent’s characteristics.

## Intended Outcomes

The goal of this project is to write a program utilising a number of equations detailed in Santos et al. (and the iterative rules detailed in ) to model a (spatial) prisoner’s dilemma game in a population.

## Proposed Research Methodology

The application to be developed in this project will be created in the Python programming language to allow for ease of prototype development. The majority of the work however lies in translating the equations used to model individual process dynamics into feasible iterative processes that can be executed in the program.

(In converting this program into a spatial prisoner’s dilemma game, the equations detailed by Santos et al. can be used for processes of individual agent interaction however the process by which the spatial prisoner’s dilemma game is executed requires iterative methods. )

## Timeline

The expected progression of the project should be as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Week:  Phase: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Initial Meeting | - | - |  |  |  |  |  |  |  |  |  |  |  |
| Review of Literature | - | - |  |  |  |  |  |  |  |  |  |  |  |
| Writing Proposal | - | - |  |  |  |  |  |  |  |  |  |  |  |
| \*\*\* Development of models and resources for outcome | - | - |  |  |  |  |  |  |  |  |  |  |  |
|  | - | - |  |  |  |  |  |  |  |  |  |  |  |
| Project Presentation | - | - |  |  |  |  |  |  |  |  |  |  |  |
| Final Report | - | - |  |  |  |  |  |  |  |  |  |  |  |