# CITS3001 Report: Resistance Agent

## Introduction

Resistance is a game of 5-10 players in which each player is designated a role as either a resistance member or a spy. The goal of resistance members is to ensure missions go ahead and that they succeed. The goal of spies is to either prevent missions from going ahead by voting against them or by ensuring that enough spies are on the mission and can betray it causing it to fail. For the resistance the game is one of imperfect information, they do no know who the spies and therefore who the real resistance members are. For the spies the game is still one of imperfect information yet the they know who the other spies are and therefore who the resistance members are.

The purpose of this project is to use Bayesian Opponent Modelling to create resistance agents that can improve on a baseline agent performance. The baseline agent was designed using lessons learned from game play as well as various tactics and techniques found while undertaking the literature review. Specifically, it was developed using deterministic knowledge about the game state. Such rules include deciding a player is a spy only when we know with one hundred percent certainty that a player is a spy. number of betrayals is equal to the number of agents on a mission.

In addition to the normal simultaneous game play simplistic rules for cooperation between spies have been built which can be switched on an off. These rules allow the spies to lower exposure by minimising the betrayals where multiple spies are on a single mission by having a pre-configured understanding about who will betray missions an under which circumstances.

## Literature Review

Resistance is a game of imperfect where players make moves simultaneously and must balance all possible outcomes on when making a decision.

* Finitely repeated game of five rounds where spies must weigh the prospect of immediate gain by sabotaging a mission vs the long term game preventing three missions from succeeding.
* Information Asymmetry

Learning is acquired through experience.

* There is limited scope for cooperation other than in the voting round. Even then agents do not know who they are meant to be cooperating with.

Internal policy of the game is based on parameters.

Dutta, P.K. (1999). Strategies and Games: Theory and Practice. Cambridge, MA, The MIT Press. Chapters 14-15 for Repeated Games. Chapter 20 for Games with Incomplete Information.

[We are using a model of another agent to predict it’s goals and beliefs.](https://www.cs.utexas.edu/~larg/ijcai17_tutorial/multiagent_learning.pdf)

The side goal of this is to be suitable for ad hoc team work with other agents during the competition round

“Game Strategies and Decision Making” (Harrington)

Test against the baseline. Test against random to make sure it is not modelled specifically for the baseline. Test the baseline against random to compare

## Design Description

“AGENT\_NAME” uses Bayesian Opponent Modelling to extend the Baseline Agent’s understanding of the world in order to create a more successful player. The focus of “AGENT\_NAME” is on playing a better resistance character rather than creating a superior spy. That said, understanding how suspect a player, whether spy or resistance, appears to resistance players can help a spy make better choices about how they should act.

### Baseline Agent Design

During design of the model agent the baseline agent was continuously reviewed for improvements that could be made based on certainty rather than inference so is somewhat more sophisticated than the initial baseline agent.

## Validation of Agent Performance

## Bibliography

Young, H.Peyton (2007) ‘The Possible and Impossible in Multi-Agent Learning’, Artifical Intelligence (AIJ), Vol 171, pp. 429-433