

Game Theory And Its Applications

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1 Preface

Welcome to my Summer Of Science report on Game Theory And Its Applications. This is an attempt to summarise all the sub-topics I cover in this journey. I would mostly follow the book **An Introduction To Game Theory** by **Levent Koçkesen** and **Efe A. Ok**. Also, I would be referring to Game Theory course on Coursera for additional knowledge. I hope this report would be helpful to gain a decent understanding of Game Theory.

2 Introduction

2.1 Game Theory

In a game as simple as Rock, Paper, Scissors, when two people play their respective moves at a time, they hope to play the move that is in favour of them and eventually win the game. The strategy applied by both the users, like looking for a pattern in their opponents' previous moves to predict their next move, is what makes up a part of this topic. Largely popularised by the famous movie *A Beautiful Mind*, based on the life of Nobel winning laureate **John Nash**, Game Theory is essentially the science of strategy, or at least the optimal decision-making of independent and competing actors in a strategic setting.

2.2 Basic Terminologies

- **Players:**
The strategic decision-makers in the context of the game. These can be as small as individuals and as large as governments or multi-national companies.
- **Rational:**
An individual is considered *rational* if she has well defined objectives (or preferences) over the set of possible outcomes and she implements the best available *strategy* to pursue them. In reality, assumption of rationality might be an unrealistic one. These limitations is what gives birth to the concept of *bounded rationality* which is an active area of research currently.
- **Strategy:**
A proper set of action plans chosen by a player in a certain setting, whose outcome depends not only on her action, but on others' too.
- **Rules:**
A set of statements that clarifies, demarcates and/or interprets the proceedings of a game.
- **Actions:**
These are the choices available to the player from which she has to choose.
- **Payoff:**
Sounds like a reward, it acts as a motivating factor behind the actions of the players and the reason for their participation.
- **Common Knowledge:**
As we consider all players in the game to be *rational*, everyone of the players knows about the model, everybody knows that everybody knows about the model, everybody knows that everybody knows that everybody knows it, and so on.