Game Theory Report

2018080108 计 83 李天勤

1 Abstraction

As so far in our lectures, we have covered several instances of applications of game theory across various movies and real life situations. Understanding these instances allowed us to better understand game theory principals and concepts. For example, the movie 趙氏孤兒 and the Battle of Bismark reflected dominant strategies, while the movie 公主新娘 reflected common knowledge. In this paper, I want to further explore game theory in movies.

2 Game Theory in Movies

2.1 In the Name of Father

Produced in 1993, this film takes place in the seventies, during the peak of IRA conflicts. It is a story about Gerry Conlon, the ringleader of the Guildford Four, who are wrongfully imprisoned for 1974 IRA bombing in Guildford, England, that killed five people. Their self-proclaimed innocence is rejected by the police who pressured them to sign a statement of guilt. As a result, him and this three co-accused individuals, as well as Conlon's father, are not only accused of being members of the IRA, but also sentenced to imprisonment. Influenced by the climate of terror during this era, the police and legal system looked for a scapegoat. Conlon just happened to be at the wrong place, at the wrong time, with the wrong nationality.

Even though the police had little evidence against them, Conlon and his friend Paul Hill are subjected to this scapegoating. In effect, these two individuals are subjected to an extreme version of the prisoner's dilemma, with the police hoping to make them confess. If Hill does not confess, he will subjected to capital punishment. If Paul confesses and blames Gerry, they both get to undergo a trial. The same occurs for Gerry. If Gerry remains silent, his family will be subjected to capital punishment. The payoff matrix is shown as below:

		Paul	
		Confess	Don't Confess
Gerry	Confess	(T, T)	(T, K)
	Don't Confess	(K, T)	(K, K)

Where T represents trial, and K represents receiving capital punishment or imprisonment. In the movie, Hill confesses due to fear, forcing Gerry to do the same. As a result, both parties undergo a roller coaster of wrong accusations while facing a biased legal system.

2.2   Rebel Without a Cause

Produced in 1995, this film takes place in the 1950s, highlighting the era's youth culture, consisting of teenage rebellion and loose family ties. Jim Stark, the new kid with a troubled past, is a teenager hoping to find his place in this new town. He befriends an awkward boy named Pluto and falls for a girl named Judy. He is bullied by the local "gang" has direct conflict with Buzz, the gang leader and Judy's boyfriend. At the height of the conflict, Buzz and Jim compete in a variation of the game of chicken called the "chicken run".

In this game, both parties, Jim and Buzz, must simultaneously drive towards the edge of a cliff, and whoever chickens out, or jumps out of the car first, loses. Although Jim and Buzz admitted that they actually liked each other, they felt compelled to compete due influence from their peer groups. The game is simple, if one participant "chicken's out" and jumps out of their car, while the other participant continues, the competitor that stays in the car the longest wins. The payoff is shown below:

		Buzz	
		Swerve	Don't Swerve
Jim	Swerve	(S, S)	(S, D)
	Don't Swerve	(D, S)	(D, D)

Where S represents jumping out of the car, and D represents staying in it and eventually driving off the cliff. Buzz's jacket gets stuck in the car door, and thus does not swerve. he falls off the cliff, plunging to his death. This game is a strong symbolic element, where as the competition is not strictly with each other, but with themselves and society. Buzz and Jim rush enthusiastically towards a life threatening situation, of which is not meaningful. The winner isn't simply the one who is the most courageous, but the one who is willing to lose face for something much more important, life. Buzz and his attitude makes him the loser.

2.3   A Beautiful Mind

Produced in 2001, this film is about John Nash, a brilliant mathematician on a journey of self-discovery and overcoming tragedy. In the film, the bar scene, with his three friends, one blonde, and four brunettes, and the game to win the the favour of the blonde, is supposed to illustrate the concept of Nash equilibrium. However, I believe that the solution that the character gives is not a Nash Equilibrium. In scene, all of Nash's friends prefers to pair with the blonde over the brunettes, but also prefer to pair with the brunettes over being alone. In the scene, Nash explains that if all the men approach the blonde, they will all be rejected. And if they then turn to the brunettes, they will also be rejected, because no women wants to be a second pick. If each man approaches each brunette, they won't be alone. If one man approaches the blonde, and the others approach a brunette, then they won't be alone either. A possible game matrix with two players is as shown:

		Boy 2	
		Blonde (q)	Brunette (1-q)
Boy 1	Blonde (p)	$(0, 0)$	$(2, 1)$
	Brunette (1-p)	$(1, 2)$	$(1, 1)$

For this game, there are three strategic equilibrium, two pure and one mixed. The results are as such.

SE	P1	(0.5, 0.5)	EP = 1.0	P2	(0.5, 0.5)	EP = 1.0
SE	P1	(1.0, 0.0)	EP = 2.0	P2	(0.0, 1.0)	EP = 1.0
SE	P1	(0.0, 1.0)	EP = 1.0	P2	(1.0, 0.0)	EP = 2.0

The two pure SE's are the same, while the mixed-strategy is not a sufficient equilibrium.

This scene is not a simultaneous game. A simultaneous game is a game in which players make their decisions at the same time. This scene would be simultaneous game if all the boys approach each brunette or blonde at exactly the same time. But, this scene contains one player, at a time, having an individual incentive to deviate from the all brunette strategy given that the other players are going to or have approached a brunette.

The main problem is that there are multiple equilibrium in this scene. For example, the four boys might agree that one of them has to end up with the blonde, and thus cooperating and coordinating their actions. They might argue or simple flip a coin to decide who will take the blonde home.

3 Conclusion

Game theory is everywhere. Every decision we make can be viewed as a game, with our decisions represented by payoff matrices, game trees, and so on. In essence, it is a tool to help make the best possible decision with the information at hand.