ReinforceGT: Game-Theoretic Extensions to Reinforced Learning.

Introduction to Game Theory (GT)

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Lecture 1.1

Introduction

- Basic Ideas of Game theory
  - Game Theory is the general theory of strategic behavior.
  - Generally depicted in mathematical form.
  - Plays an importat role in modern economics.

- Rules, Strategies, Payoffs, and Equilibrium
  - Say, Economics situations are treated as games.
  - The **rules** of the game state who can do what and when they can do it
  - A Player's **strategy** is a plan of actions in each possible situation in the game
  - A player's **payoff** is the amount that the player wins or loses in a particular situation in the game.
  - A player is said to have a **dominant strategy** if that player's best strategy does not what other player's do.

Strategic Game

More precisely, a strategic game is defined as follows. (The qualification "with ordinal preferences" distinguishes this notion of a strategic game from a more general notion studied in Chapter 4.)

- DEFINITION 11.1 (*Strategic game with ordinal preferences*) A **strategic game** (with ordinal preferences) consists of

  - a set of **players**
  - for each player, a set of **actions**
  - for each player, **preferences** over the set of action profiles.

Nash’s Equilibrium

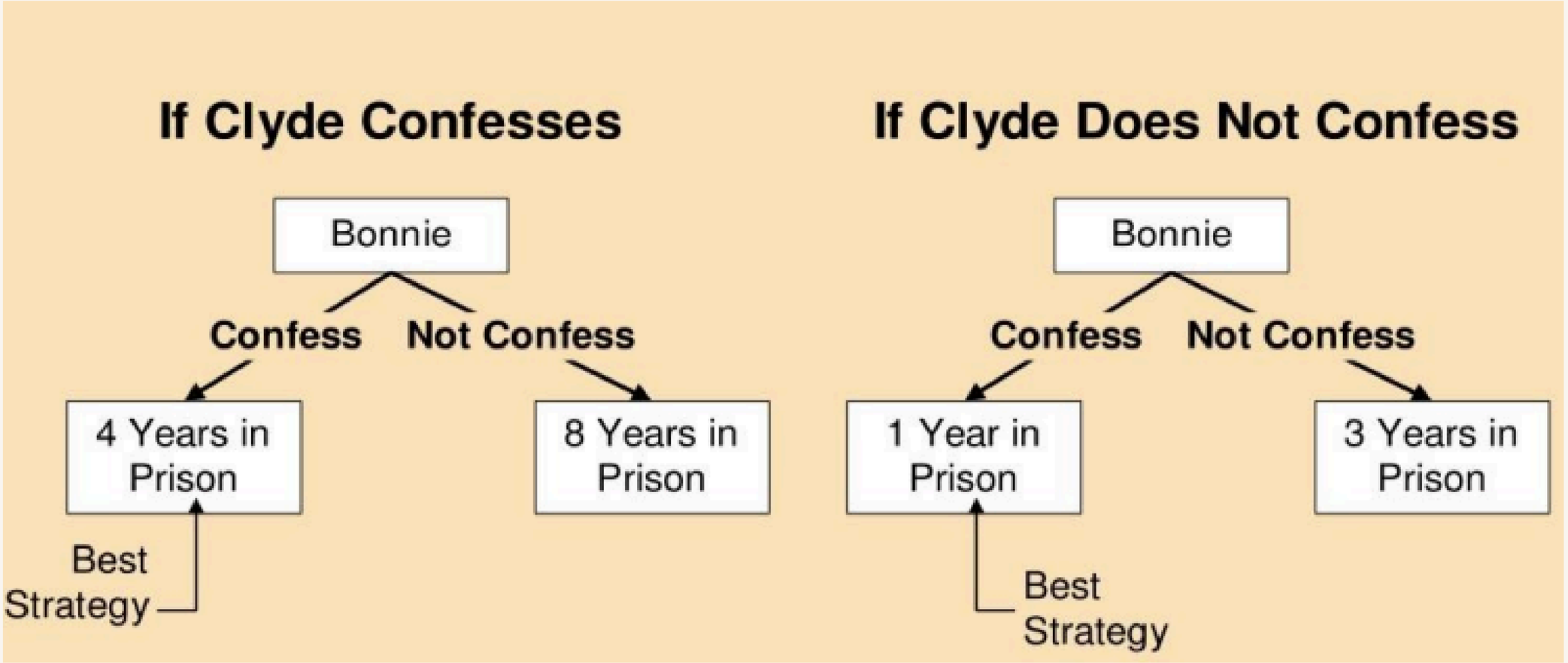
- Occurs when each player’s strategy is optimal, given the strategies of the other players.
- A player’s best response (or best strategy) is the strategy that maximizes that player’s payoff, given the strategies of other players.
- A Nash equilibrium is a situation in which each player makes his or her best response.

Prisoner’s Dilemma

- Most famous example of game theory
- Strategies must be undertaken without the full knowledge of what other player will do.
- Players adopt dominant strategies, but they will not necessarily lead to best outcomes.

		Clyde: Confess	Clyde: Not Confess
Bonnie	Confess	4 Years each	1 Year for Bonnie and 8 years for Clyde
	Not Confess	1 Year for Bonnie and 8 years for Clyde	3 Years Each

Bonnie's Decision Tree



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The End

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