Fall 2024
14.12 Game Theory
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Problem Set 1

Due: Wednesday, September 18 (10:00am EST)

You are encouraged to work together on the problem sets, but you must write up your own solutions. Consulting solutions from previous semesters (released by the instructor or written by other students) is prohibited. Problem sets must be submitted electronically through Canvas. If you use generative artificial intelligence on a problem set, you must disclose this on your problem set.

Some problems are exercises from the lecture notes. In this case, the first number indicates the chapter (e.g., Exercise 2.10 is in Chapter 2).

Problem 1 (Work or shirk)**.** Exercise 2.10. (You should read Exercise 2.9 to understand the setting, but you don't need to solve Exercise 2.9.)

Problem 2 (Profit maximization)**.** Exercise 2.12.

Problem 3 (Game show)**.** Exercise 2.13.

Problem 4 (Guessing someone else's coin)**.** Alice and Bob are held in separate prison cells. The warden proposes the following game between Alice and Bob. First, the warden will go to Alice's cell and flip a fair coin so that Alice sees the result. Alice is then asked to guess the outcome of a coin flip that the warden is about to perform in Bob's cell. Next, the warden goes to Bob's cell and flips a fair coin so that Bob sees the result. Bob is then asked to guess the outcome of the coin flip that the warden performed in Alice's cell.

Both prisoners will be released if at least one correctly guesses the outcome of the coin flip performed in the other's cell. Otherwise, neither prisoner will be released. Each prisoner gets utility 1 from being released and utility 0 otherwise.

(a) Write this as an extensive-form game.

(b) Write this as a strategic-form game.

(c) Which strategy profiles result in the highest probability of release? Which strategy profiles result in the lowest probability of release? Do you find this result surprising?