

Assignment 2

CPSC 532L / CMPUT 654

Due February 24, 2022 (11:59pm Pacific Time)

Submit by email: shetroze@ualberta.ca

This assignment asks you to work in your project group to identify and analyze a variety of different games that capture strategic situations from your target domain. In particular, you'll be asked to find games that make use of each of the major game representations that we have described in the course, identify appropriate solution concepts, and make arguments about the realism of the corresponding behaviors in your domain.

Here are some key things to keep in mind.

- Your games do not all have to describe the same strategic interaction; they can be conceptually unrelated subproblems that arise in your domain.*
- We recognize that not every domain will lend itself naturally to each of the game representations. If you believe that it's not possible to identify a realistic game of a given type in your domain, please write something explaining why, but nevertheless identify and analyze some game of this type regardless. (Of course, if you're finding it consistently hard to identify games about your domain across a variety of representations, you might take this as a sign that your domain may not be a good fit for the course project.)*
- Below, we ask you for minimum numbers of games in each category. However, in some cases you may be able to identify more games than we have asked for. In these cases, we recommend that you identify and analyze all of the substantially distinct games that you think model interesting elements of your domain. While not required for this assignment, doing so will give you more options for Assignment 3 and your course project.*

Please submit a writeup with the following elements.

- Construct at least six games that represent strategic interactions in your domain:
 - Three normal form games (one zero-sum; one general-sum; one with strictly more than 2 players)
 - An extensive form game (perfect or imperfect information)
 - A repeated game
 - A Bayesian game
- For each game,
 - Explain how this game models an important strategic interaction in your domain, or why your domain doesn't give rise to interactions modeled by this game representation.
 - Compute two different Nash equilibria of the game. Prove that each is an equilibrium. If applicable, identify other game theoretic properties of the game (e.g., dominance) and of the equilibrium (e.g., subgame perfection; ex-post).

- (c) Argue that one equilibrium is a reasonable description of human behaviour, and that the other is not. Or, argue that neither equilibrium is a reasonable description of human behavior, and describe why you think people would reliably exhibit non-equilibrium behavior in this game.
3. For one of the Nash equilibria of your Bayesian game, supply the following additional calculations:
- (a) Compute the first player's *ex-ante* expected utility in this Nash equilibrium.
 - (b) Pick a type for this player and compute their *ex-interim* expected utility when they have this type.
 - (c) Pick a type for all of the other players and compute the first player's *ex-post* expected utility when all players have these types.