IGT Assignment 1

Spring 2020

You may use any programming language to write code for one of the following problems. This is a team assignment. Your team is the same as that of the scribes. The problem assigned to you can be found by **(Team Number)%3 + 1**.

Problem 1) Given a two player zero sum game, Find a mini-max equilibrium for the game. Also, find **all** possible pure strategy nash equilibria for the game.

Note: You need to find at least one mixed strategy equilibrium if it exists.

Problem 2) Find **all** dominant strategy equilibria for an n-person game

Problem 3) Find **all** pure strategy nash equilibria for an n-person game

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Input Format
- Use nfg file formatted files (http://www.gambit-project.org/gambit14/formats.html#the-strategic-game-nfg-file-format-payoff-version) from the command line to generate games. You may use the Gambit library to parse the file

Output Format

Q2,Q3:

First line contains a number N which is the total number of equilibria.

Next N lines describe one equilibrium each. Each line consists of P (number of players) space separated integers where ith integer represents the strategy chosen by the ith player. Print all equilibria in lexicographical order.

Example (For a 3 player game where each player has 3 strategies):

3

0 0 0

0 1 0

2 2 2

Q1:

Print pure strategies as described above. After that print one mixed strategy as follows:

Print P(number of player) lines where ith line describes strategy for the ith player. Each line consists of S space separated values where jth number equals probability with which ith player plays strategy j.

Example (For a 2 player game where each player has 3 strategies):

3

0 0

0 1

2 2

0.5 0.5 0

0.1 0.5 0.4

Time Complexity

You are not expected to use any concepts not already taught in class. There is no strict time limit. Still, especially inefficient solutions might be penalised.

Memory Limit

There is no memory limit other than that your program should not hang on a reasonable personal computer.

Instructions
- You may use a library for solving LP
- The code should run on any games inputted by TAs. (e.g. for minimax, if the game is not two players zero-sum, it should output the same)
- Expect bigger games such as 5 players, 10 actions each or 2 players with 1000 actions each as inputs during evaluation
- Any form of plagiarism will be severely punished

Submission Instructions

- Your submission should include a script to run your code
  - ./run <input file> <output file>
  - If you need to compile before running, it should be included in the same script
- If your program has any library requirements, include those in a readme file
- Write your solution approach and time complexity in the readme file.
- Submission Format: Assignment1_ProblemNo_TeamNo.zip
- **Deadline**: 25 March 2020, 11:59 PM