Computational Game Theory

Implementation Exercises on Nash Equilibrium in Mixed-Strategies for nxm games.

1. Zero-Sum Games

Consider the following payoff matrix:

1\2	Left	Middle	Right
Top	30,-30	-10,10	20,-20
Bottom	-10,10	20,-20	-20,20

a) Use Linear Programming to compute the Nash equilibrium.
   {Solution: (4/7, 3/7), (0, 4/7, 3/7).}
b) Implement a function to compute the Nash equilibrium of a Zero-Sum game.

2. General-Sum Games

Consider the following payoff matrix:

		Player 2	
		4	5
Player 1	1	3, 3	3, 2
	2	2, 2	5, 6
	3	0, 3	6, 1

Use Linear Programming to search for a Nash equilibrium with the following supports:

a) X={1,2,3}, Y={4,5}.
b) X={1,2}, Y={4,5}.
c) X={1,3}, Y={4,5}.

3. Enumeration method for nondegenerate games

Consider a nondegenerate General-Sum *nxm* game.

a) Implement a function to compute all equal-sized mixed strategy supports ordered by size.
b) Implement a function that given a mixed strategy support computes the respective Nash equilibrium (or proves that there is no such equilibrium with that support).
c) Use the above functions to implement the enumeration method for nondegenerate games.
d) Consider the game in question 2. Use the enumeration method to find **one** Nash equilibrium.
e) Consider the game in question 2. Use the enumeration method to find **all** Nash equilibria.