

Assignment 4

Thursday, February 2, 2023 4:02 PM

Exercise 1: Game Theory [50 points]

Find the Nash equilibria of this game:

	Player B forward	Player B backward	Player B rotate
Player A forward	6, 6	7, 0	3, 1
Player A backward	4, 4	1, 1	1, 1
Player A rotate	5, 5	1, 1	0, 0

S1: Player A fho: Player B bho $\rightarrow 7$
 S2: Player A bho: Player B fho $\rightarrow 7$
 S3: Player A rotate: Player B fho $\rightarrow 5$

S4: Player B fho: Player A bho $\rightarrow 7$
 S5: Player B bho: Player A fho $\rightarrow 7$
 S6: Player B rotate: Player A fho $\rightarrow 5$

Two Nash Equilibria: A bho, B fho (7, 7)
 & A fho, B bho (7, 7)

Exercise 2: Game Theory [50 points]

Consider the two-player game described by the payoff matrix below.

	Player B L	Player B R
Player A U	3, 5	0, 0
Player A D	0, 3	1, 1

- [20 points] Find all pure-strategy Nash equilibria for this game.
- [30 points] This game also has a mixed-strategy Nash equilibrium; find the probabilities the players use in this equilibrium, together with an explanation for your answer.

① S1: Player A U: Player B L $\rightarrow 3$
 S2: Player A D: Player B R $\rightarrow 1$

S3: Player B L: Player A U $\rightarrow 3$
 S4: Player B R: Player A D $\rightarrow 1$

Nash Equilibria: AU, BL $\rightarrow (3, 5)$
 due to higher rewards than AD, BR

② The expected pay-off for player A:
 $A-U \Rightarrow 3(q) + 0(1-q) = 3q$
 $A-D \Rightarrow 0(q) + 1(1-q) = 1-q$
 $3q = 1-q \Rightarrow 4q = 1$
 $q = 1/4$

Expected Payoff for Player B:

$B-L \Rightarrow 3(p) + 0(1-p) = 3p$
 $B-R \Rightarrow 0(p) + 1(1-p) = 1-p$
 $3p = 1-p \Rightarrow 4p = 1$
 $p = 1/4$

Mixed Strategy that corresponds to Nash Equ is
 $p = 1/4, q = 1/4$

$1/4 \rightarrow A-U$ $3/4 \rightarrow A-D$
 $1/4 \rightarrow B-L$ $3/4 \rightarrow B-R$