SIT718 Real World Analytics

School of Information Technology

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Prac. 9 Problems

2-Person 0-Sum Game: Pure Strategies

Does the following game have an optimal pure strategy pair? If yes, identify the optimal pure strategies for each of the players, and if not, present the optimal mixed strategies.

	A_1	A_2	A_3	A_4
a_1	5	2	1	3
a_2	3	3	-2	4
a_3	-1	3	-1	-3
a_4	2	-4	1	-2

2-Person 0-Sum Game: Pure Strategies

Vicky and David each have two cards, an ace and a two. They each select one of their cards, with their choices unknown to the opponent, and then they will compare the cards.
Before they compare the cards, however, Vicky gets to call "even" or "odd". Vicky wins if the sum of the face values of the selected cards is of the parity she has called, and if not, David wins. Model the game as 2-person zero-sum game, if:

1. (a) a "win" scores a single point.
2. (b) a "win" scores the face values of the selected cards.

2-Person 0-Sum Game: Mixed Strategies

Consider the following 2-person zero-sum game. Does the game have a pure strategy? If not, what is the range of possible values for the value of the game, v?

$$V = \begin{bmatrix} 3 & -1 \\ -2 & 4 \end{bmatrix}$$

Solve the game for both players using the graphic method.

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Prac. 9 Solutions

2-Person 0-Sum Game: Pure Strategies

	A_1	A_2	A_3	A_4	Row Min
a_1	5	2	1	3	1
a_2	3	3	-2	4	-2
a_3	-1	3	-1	-3	-3
a_4	2	-4	1	-2	-4
Col Max	5	3	1	4	L=U=1

Since min col max = max row min = 1, the game has an optimal pure strategy at strategy pair (a_1, A_3).

2-Person 0-Sum Game: Pure Strategies

There are only 2 strategies for David, select either the "one" or the "two". Vicky, however, has 4 strategies. (1) Select the "one" and call "even". (2) Select the "two" and call "even". (3) Select the "one" and call "odd". (4) Select the "two" and call "odd". Hence, the payoff matrix is as follows.

	"One"	"Two"	s_i
(Even, 1)	1	-1	-1
(Even, 2)	-1	1	-1
(Odd, 1)	-1	1	-1
(Odd, 2)	1	-1	-1
t_j	1	1	$L < U$

Since $L < U$, there is no saddle point for the game.

2-Person 0-Sum Game: Pure Strategies

Alternatively, if by ``winning'', one considered the amount won is the sum of face values, it is accepted correct too, and the payoff matrix is as follows.

	"One"	"Two"	s_i
(Even, 1)	2	-3	-3
(Even, 2)	-3	4	-3
(Odd, 1)	-2	3	**-2**
(Odd, 2)	3	-4	-4
t_j	**3**	4	$L < U$

Since $L < U$, there is no saddle point for the game.

2-Person 0-Sum Game: Mixed Strategies

Player I's expected payoff if Player II uses Strategy B1 is given by:

x1(3)+(1−x1)(-2)=5x1-2

Player I's expected payoff if Player II uses Strategy B2 is given by:

x1(-1)+(1−x1)(4)=4-5x1

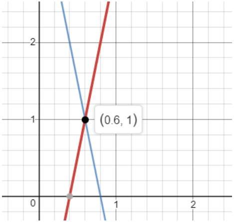
Player II's expected payoff if Player I uses Strategy A1 is given by:

y1(3)+(1−y1)(-1)= 4y1-1

Player II's expected payoff if Player I uses Strategy A2 is given by:

y1(-2)+(1−y1)(4)=4-6y1

Player I



Player II