

博弈论第八次作业

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[Title]:

Consider the two-player game where A is the utility matrix for Alice and B is the utility matrix for Bob. Note A_i (or B_j) is the utility of Alice (or Bob) when Alice plays strategy i and Bob plays strategy j . Please compute its Nash Equilibrium.

$$A = \begin{pmatrix} 3 & 1 \\ 2 & 3 \end{pmatrix}, B = \begin{pmatrix} 1 & 2 \\ 4 & 1 \end{pmatrix}$$

[答]:

Actions:Alice 2 actions (*strategy 1, strategy 2*)Bob 2 actions (*strategy 1, strategy 2*)**Support:**

We assume Alice choose action *strategy 1* with the probability of p , so Alice will choose action *strategy 2* with the probability of $1 - p$. Alice's support: $(p, 1 - p)$

We assume Bob choose action *strategy 1* with the probability of q , so Bob will choose action *strategy 2* with the probability of $1 - q$. Bob's support: $(q, 1 - q)$

Solution:Based matrix A and B :

We can know,

when Alice choose action *strategy 1*, her utility is $3 \times q + 1 \times (1 - q) = 1 + 2q$.when Alice choose action *strategy 2*, her utility is $2 \times q + 3 \times (1 - q) = 3 - q$.Based on Nash Equilibrium's requirement, we should let $1 + 2q = 3 - q$. Then, we get $q = \frac{2}{3}$ when Bob choose action *strategy 1*, his utility is $1 \times p + 4 \times (1 - p) = 4 - 3p$.when Bob choose action *strategy 2*, his utility is $2 \times p + 1 \times (1 - p) = 1 + p$.Based on Nash Equilibrium's requirement, we should let $4 - 3p = 1 + p$. Then, we get $p = \frac{3}{4}$ At last, we get the only one Nash Equilibrium Alice $\sim (\frac{3}{4}, \frac{1}{4})$, Bob $\sim (\frac{2}{3}, \frac{1}{3})$.