Machine Learning and Mixed Strategy Games

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1 Introduction

1.1 Mixed Strategy Games

A Mixed Strategy Game within this paper refers to a subset of strategic games within game theory. A game is defined to have P players and M moves per player. Each player can play any one of their M moves every round, and scores for each player are calculated by accessing the payoff matrix with the results of all their opponents. The payoff matrix is represented by a P-dimensional hypercube matrix with side length M. Players can be conceptualized as being arranged in a circle, each player is the first in their perspective, which increments for player to their right. Thus, player P_i's' $(1 \leq i \leq P)$ score is calculated by accessing the payoff matrix with the coordinates $(P_i, P_{i+1}, \cdots, P_P, P_1, P_2, \cdots, P_{i-1})$. Figure 1 shows an example of how payoffs could be calculated for each player. Players 1 and 2 make moves P_1 and P_2, respectively. Thus, the players will recieve scores $M_{<1,2>} = 3$ and $M_{<2,1>} = 3$, respectively

1.2 Neural Networks

2 Methods and Procedure

Figure 1: Example 2×2 payoff matrix with sample moves and resulting scores.

Payoff Matrix	(P_1, P_2)	Payoffs
$M = \begin{bmatrix} 2 & 1 \\ 3 & 0 \end{bmatrix}$	$(1, 2)$	$(1, 3)$