Nash equilibria as saddle points

Recall that a Nash equilibrium in a game is an outcome in which the row player’s payoff is greater than all other payoffs in that column, and the column player’s payoff is greater than all other payoffs in that row. In many cases, the game will be zero-sum, so only row payoffs will be shown. In a zero-sum game, the (row) payoff in an equilibrium outcome will be simultaneously the largest payoff in its column as well as the smallest payoff in its row.

If we were to model the game by building towers over each cell whose height equals the row payoff, we would see the equilibrium geometrically as the lowpoint along its row and high point along its column. Consequently, we also call these equilibria saddle points.

A saddle point outcome provides stability to the players (neither player regrets their play since they could not unilaterally improve their payoff). It also represents a conservative outlook on obtaining payoffs from the game. By playing a saddle point strategy, the row player ensures herself of obtaining a payoff at least as good as the saddle point payoff; similarly, the column player ensures himself of obtaining a payoff at least as good as the saddle point payoff.