

CS 2710 Foundations of AI Lecture 8

Adversarial search

Milos Hauskrecht

milos@cs.pitt.edu

5329 Sennott Square

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Game search

- Game-playing programs developed by AI researchers since the beginning of the modern AI era
 - Programs playing chess, checkers, etc (1950s)
- **Specifics of the game search:**
 - Sequences of player's decisions **we control**
 - Decisions of other player(s) **we do not control**
- **Contingency problem:** many possible opponent's moves must be "covered" by the solution
 - Opponent's behavior introduces an uncertainty in to the game
 - We do not know exactly what the response is going to be
- **Rational opponent** – maximizes its own **utility (payoff) function**

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Types of game problems

- **Types of game problems:**
 - **Adversarial games:**
 - win of one player is a loss of the other
 - **Cooperative games:**
 - players have common interests and utility function
 - **A spectrum of game problems in between the two:**

Adversarial games

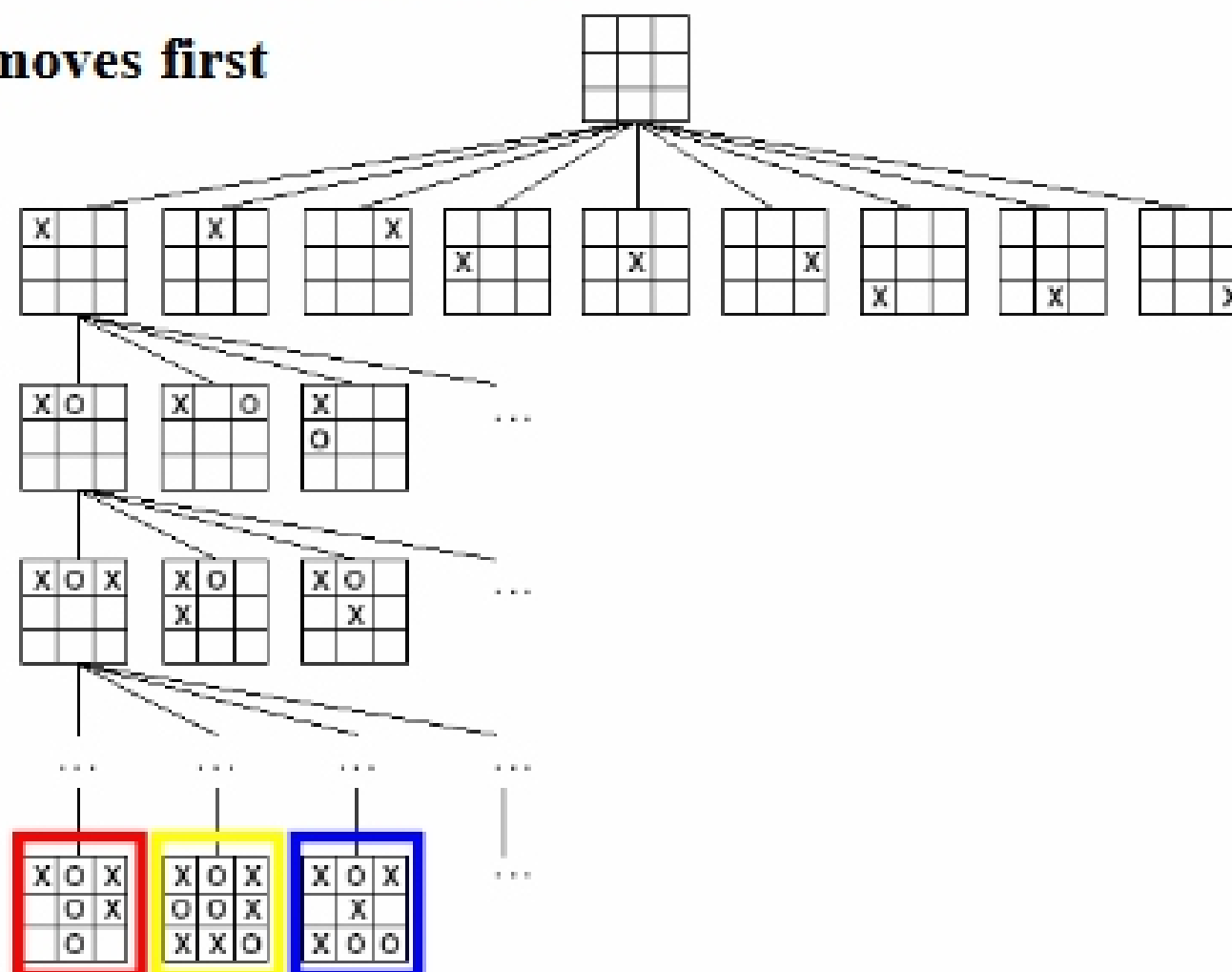
Fully cooperative games



we focus on adversarial games only!!

Example of an adversarial 2 person game: Tic-tac-toe

- **Player 1 (x) moves first**



Loss Draw Win

Game search problem

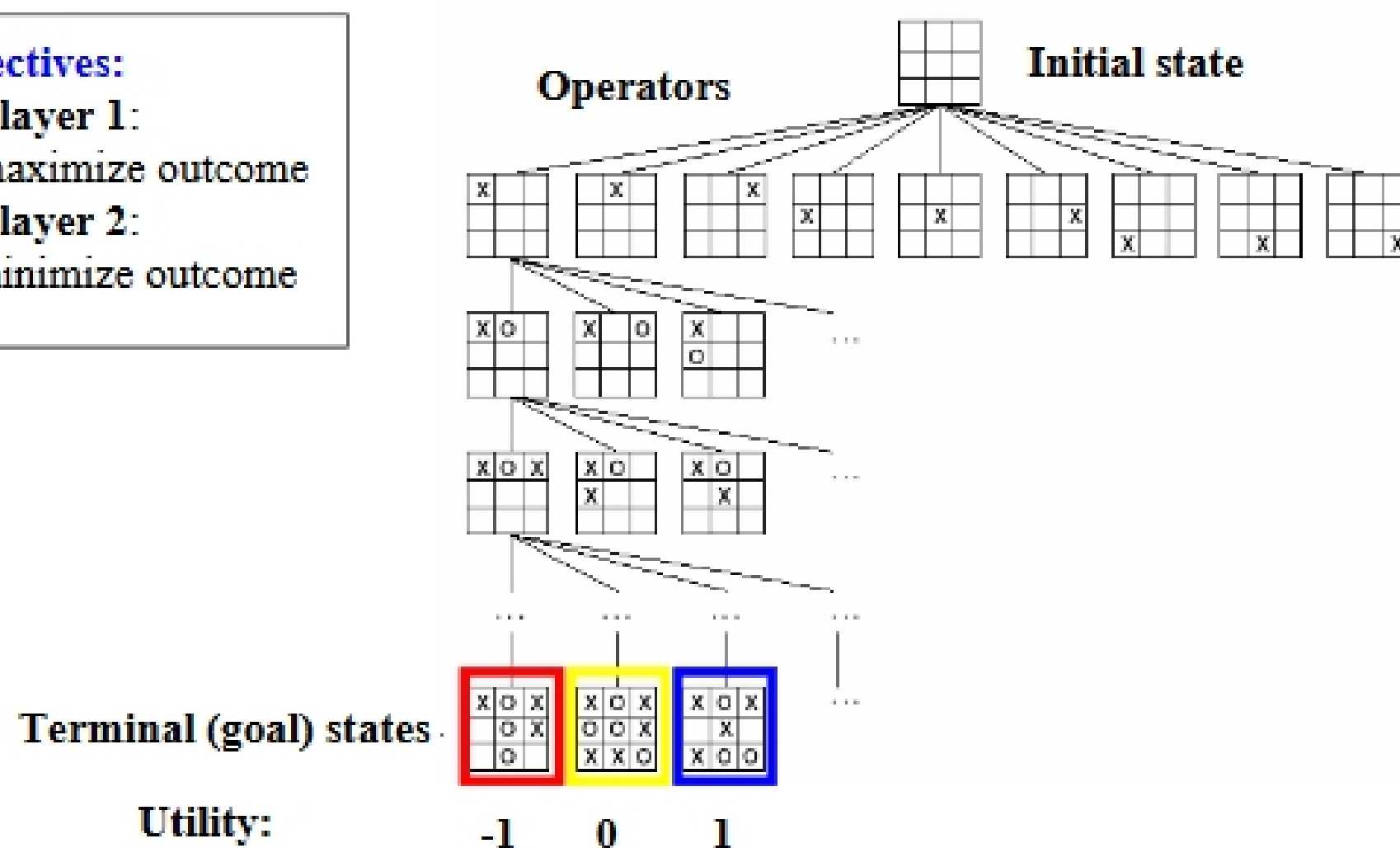
- **Game problem formulation:**
 - **Initial state:** initial board position + info whose move it is
 - **Operators:** legal moves a player can make
 - **Goal (terminal test):** determines when the game is over
 - **Utility (payoff) function:** measures the outcome of the game and its desirability
- **Search objective:**
 - find the sequence of player's decisions (moves) maximizing its utility (payoff)
 - Consider the opponent's moves and their utility

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Game problem formulation (Tic-tac-toe)

Objectives:

- **Player 1:** maximize outcome
- **Player 2:** minimize outcome



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