



# Formalizing Perfect Information Extensive Form Games

Game Theory Course:  
Jackson, Leyton-Brown & Shoham



# Introduction



- The normal form game representation does not incorporate any notion of sequence, or time, of the actions of the players
- The **extensive form** is an alternative representation that makes the temporal structure explicit.
- Two variants:
  - **perfect information** extensive-form games
  - **imperfect-information** extensive-form games



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# Definition

A (finite) **perfect-information game** (in extensive form) is defined by the tuple  $(N, A, H, Z, \chi, \rho, \sigma, u)$ , where:

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- **Actions:**  $A$
- Choice nodes and labels for these nodes:
  - **Choice nodes:**  $H$  is a set of non-terminal choice nodes



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  - **Action function:**  $\chi : H \rightarrow 2^A$  assigns to each choice node a set of possible actions



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  - **Action function:**  $\chi : H \rightarrow 2^A$
  - **Player function:**  $\rho : H \rightarrow N$  assigns to each non-terminal node  $h$  a player  $i \in N$  who chooses an action at  $h$



[illegible]

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  - **Action function:**  $\chi : H \rightarrow 2^A$
  - **Player function:**  $\rho : H \rightarrow N$
- **Terminal nodes:**  $Z$  is a set of terminal nodes, disjoint from  $H$



cooperative payoff utility rational decision paradox economic rational Bayesian Normal-form auctions repeated indifference tragedy of the commons Nash equilibrium class players rational extensive-form random math action strategies zero-sum probability Online predator game strategies

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## A word cloud with 'Game Theory' as the central, largest text. Other prominent words include 'Bayesian', 'Normal-form', 'equilibrium', 'Nash', 'predator', 'strategies', 'zero-sum', 'probability', 'Online', 'tragedy of the commons', 'class players', 'math', 'action', 'repeated', 'indifferent', 'paradox', 'cooperative', 'payoff', 'utility', 'rational', 'behavioral', 'paper', 'Extensive-form', 'random', 'game', 'status', 'rational', 'game', 'status', '1950'. The words are in various sizes, colors (black, grey, red), and orientations, creating a dynamic and thematic visual representation of the field of game theory.

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