Extensive-Form Games

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Previously … on multi-agent systems.

Construct a Mathematical Program for Other Equilibria

Correlated Equilibrium (2 players)

Given a 2-player game $G = (N, A, u)$, a *Correlated Equilibrium* is a tuple (v, π, σ), where v is a couple of random variables $v = (v_1, v_2)$ with respective domains $D = (D_1, D_2)$, π is a joint distribution over v, $\sigma = (\sigma_1, \sigma_2)$ is a vector of mappings $\sigma_i : D_i \to A_i$, and for each agent i and every mapping $\sigma_i' : D_i \to A_i$ it is the case that

$$\sum_{d \in D} \pi(d) u_i(\sigma_i(d_i), \sigma_{-i}(d_{-i})) \geq \sum_{d \in D} \pi(d) u_i(\sigma_i'(d_i), \sigma_{-i}(d_{-i}))$$
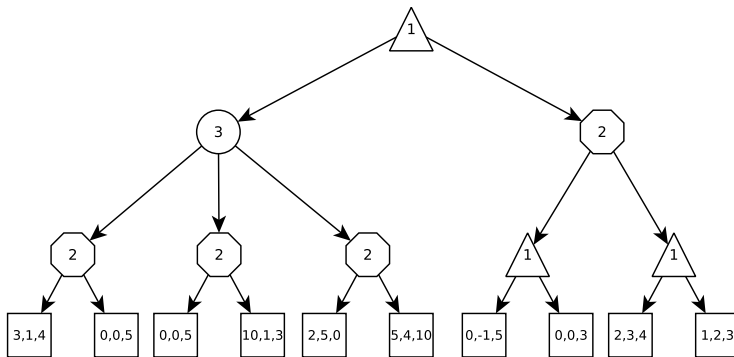
Stackelberg Equilibrium (2 players)

Given a 2-player game $G = (N, A, u)$, a *Stackelberg Equilibrium* is a tuple (s_1, s_2) such that

$$(s_1, s_2) = \operatorname*{arg\,max}_{s_1' \in S_1, s_2' \in BR_2(s_1')} u_1(s_1', s_2')$$

where $BR_2(s_1)$ is a set of pure strategies that are the best response of player 2 to strategy s_1.

And now ...

Strategies and Induced Normal Form in Perfect Information EFGs

Find a Subgame Perfect Equilibrium
Transform this game into the normal form representation
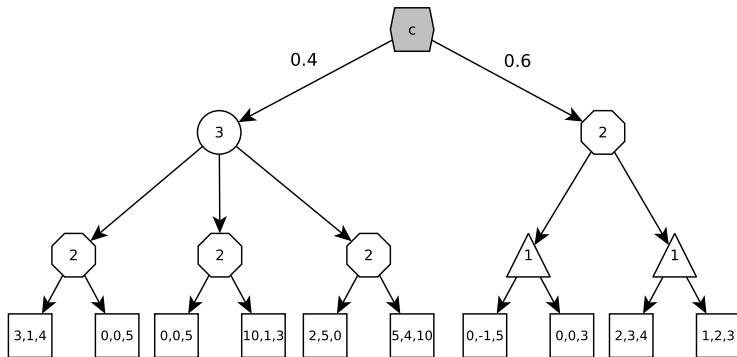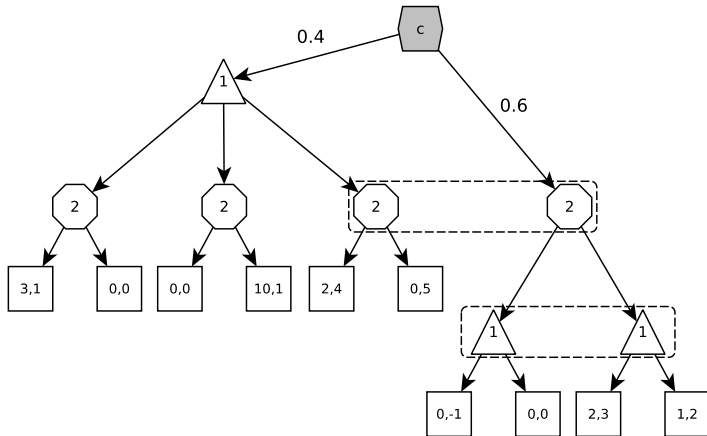Find all pure Nash Equilibria

Find a Subgame Perfect Equilibrium
Transform this game into the normal form representation
Find all pure Nash Equilibria

Strategies and Induced Normal Form in Imperfect Information EFGs

Transform this game into the normal form representation
Find all pure Nash Equilibria

Construct a Game

Kuhn Poker

Kuhn Poker is a zero-sum two player card game, a simplified variant of poker. The deck includes only three playing cards, a King, Queen, and Jack. One card is randomly dealt to each player and the betting round begins. The first player decides whether he is going to *bet* or *pass* the turn to the second player. If any player chooses to bet the opposing player must *call* the bet in order to stay in the round, or *fold* and lose the game. Players cannot bet more than once. After the betting round ends, the player with the highest card wins the pot.

Write down a game tree visualization of this game.

Write down a normal form representation of this game.