

The Rational Choice Paradigm

Problem 1

GOING TO THE MOVIES

There are two movie theaters in your neighborhood: Cineclass, which is located one kilometer from your home, and Cineblast, located three kilometers from your home. Each is showing three films. Cineclass is showing *Casablanca*, *Gone with the Wind*, and *Dr. Strangelove*, while Cineblast is showing *The Matrix*, *Blade Runner*, and *Aliens*. Your problem is to decide which movie to go to.

- (a) Draw a decision tree that represents this problem without assigning payoff values.
- (b) Imagine that you don't care about distance and that your preferences for movies are alphabetic (i.e., you like Aliens the most and The Matrix the least). Using payoff values 1 through 6 complete the decision tree you drew in part (a). Which option would you choose?
- (c) Now imagine that your car is in the shop and that the cost of walking each kilometer is equal to one unit of payoff. Update the payoffs in the decision tree. Would your choice change?

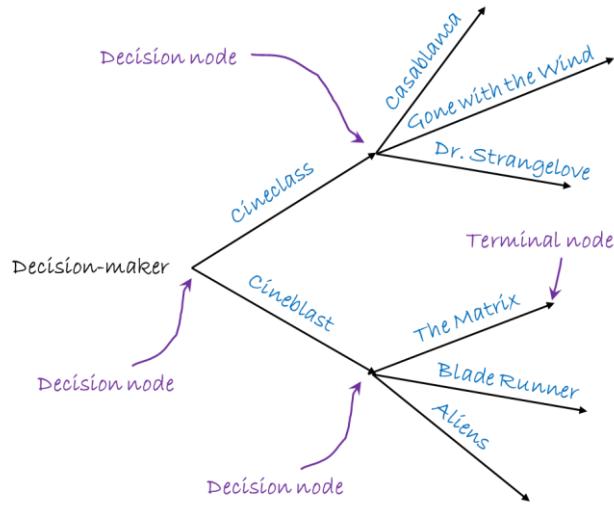
ANSWER (A). DECISION TREE WITHOUT PAYOFF VALUES

To represent the decision problem as a decision tree, we start by identifying the structure of the decisions. The decision-maker must make two sequential decisions: the first involves choosing a theater, and the second involves selecting a movie.

The decision tree begins with the root node, representing the decision-maker; this is also the first decision node. This node is associated with the action set $A = \{\text{Cineclass}, \text{Cineblast}\}$. Each of these two actions is represented as a branch emerging from the root node.

Each branch leads to another decision node, representing movie options available at the chosen theatre. Cineclass offers three movies with the action set $A_1 = \{\text{Casablanca}, \text{Gone with the Wind}, \text{Dr. Strangelove}\}$ while Cineblast offers three different movies with the action set $A_2 = \{\text{The Matrix}, \text{Blade Runner}, \text{Aliens}\}$. These action sets are shown as three branches emerging from their respective decision nodes.

Each branch ends in terminal nodes, representing the outcome of watching a specific movie at a specific theatre. At this stage, no payoff values are assigned to the outcomes. We're simply mapping the decision paths from the initial choice to the final outcomes.

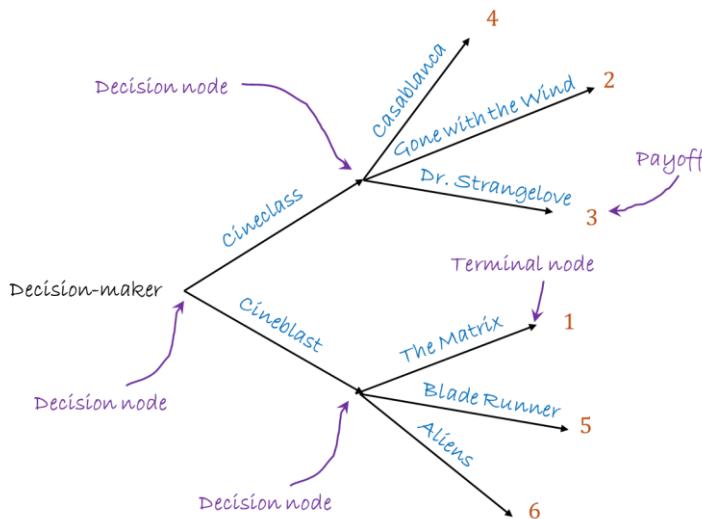


ANSWER (B). DECISION TREE WITH PAYOFF VALUES

In this part, we incorporate the decision-maker's preferences for the movies, assuming she does not care about the distance to the theater. Her preferences are alphabetic: she likes "Aliens" the most, followed by "Blade Runner," "Casablanca," "Dr. Strangelove," "Gone with the Wind," and finally, "The Matrix." We assign payoff values from 1 to 6, with 6 representing the most preferred movie ("Aliens") and 1 the least preferred ("The Matrix").

To complete the decision tree:

1. Start with the same structure drawn in part (a).
2. Next to each terminal node (representing the final outcomes), write the corresponding payoff values based on the decision-maker's preferences.
3. Evaluate the outcomes by comparing the payoffs and recommend the best option.



We assume that the decision-maker is rational. The optimal choice is determined by selecting the path (actions) that leads to the highest payoff. Since distance is irrelevant here, the choice will be based solely on movie preferences. The result is that the decision-maker should choose Cineblast at the first decision node and select Aliens at the second decision node. This path offers the highest payoff of 6.

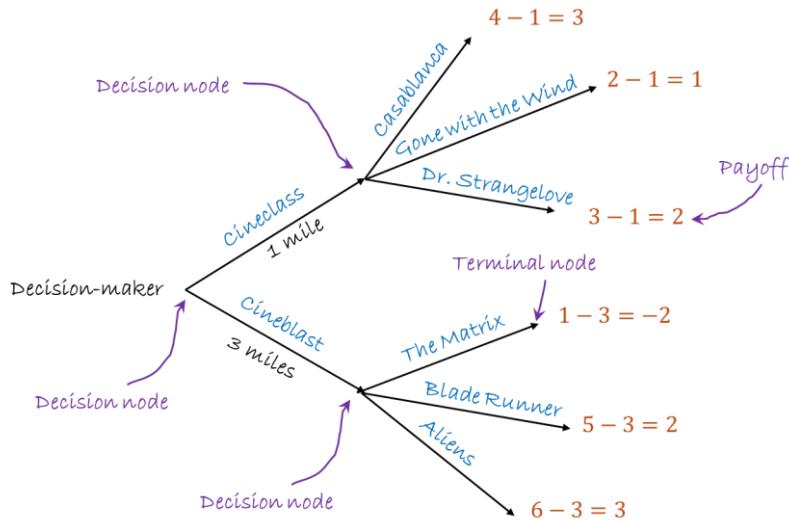
ANSWER (c). DECISION TREE WITH PAYOFFS ADJUSTED FOR DISTANCES

Now, in addition to the intrinsic preference that the decision-maker has for the six movies, there's an external factor that affects her well-being: the *walking distance* to the theaters. The cost of walking is one unit of payoff per kilometer. This adjustment modifies the total payoff for each option.

- Cineclass (1 km away): Subtract 1 payoff unit for each movie.
- Cineblast (3 km away): Subtract 3 payoff units for each movie.

To update the decision tree:

1. Begin with the structure and payoff values from part (b).
2. Subtract 1 unit from the payoff values of all movies shown at Cineclass.
3. Subtract 3 units from the payoff values of all movies shown at Cineblast.



With the revised payoff values, Casablanca (shown in Cineclass) and Aliens (shown in Cineblast) both offer the highest payoff of 3 units. Consequently, the decision-maker will be indifferent between Cineclass and Cineblast at the first decision node. At the second decision node, she'll select Casablanca if she picked Cineclass and select Aliens if she picked Cineblast.

KEY TAKEAWAYS

- **Decision Tree Representation.** Using decision trees to model decision problems, identifying the structure of decisions, representing action and outcome sets, and visualizing decision paths to final outcomes.

- **Sequential Decision-Making.** Decision problems involving multiple sequential decisions, where the outcome of one decision influences subsequent choices.
- **Incorporating Preferences.** Assigning different payoffs to represent varied preferences over the same outcomes.
- **Adjusting Payoffs for External Factors.** Determining payoffs based on external factors like distance, in addition to intrinsic preferences of the decision-maker.
- **The Rational Choice Paradigm.** Rational decision-makers aim to maximize payoffs, aligning their choices with optimal outcomes.
- **Knowing When Not to Play.** *At what distances should the two theaters be to make staying at home the best option?* When faced with a decision problem where all available actions result in negative payoffs, the best option may be inaction. *Strategic thinking also means knowing when not to play.*