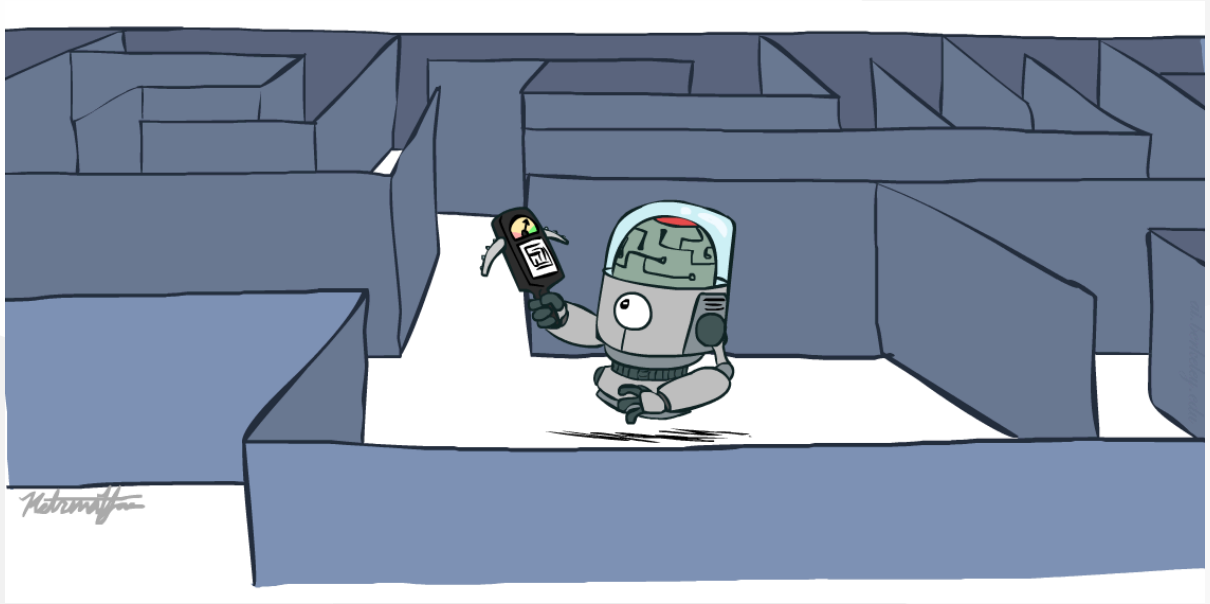
# CS 6460: Artificial Intelligence

## Informed Search



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Utah Valley University Spring 2025

[These slides adapted from Dan Klein and Pieter Abbeel at UC Berkley]

# Learning Outcomes

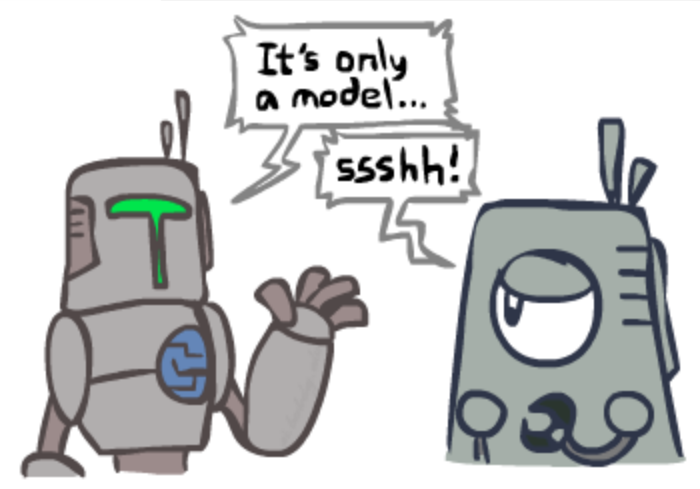
1. Solve Problems using Informed Searches

- Heuristics
- Greedy Search
- A* Search

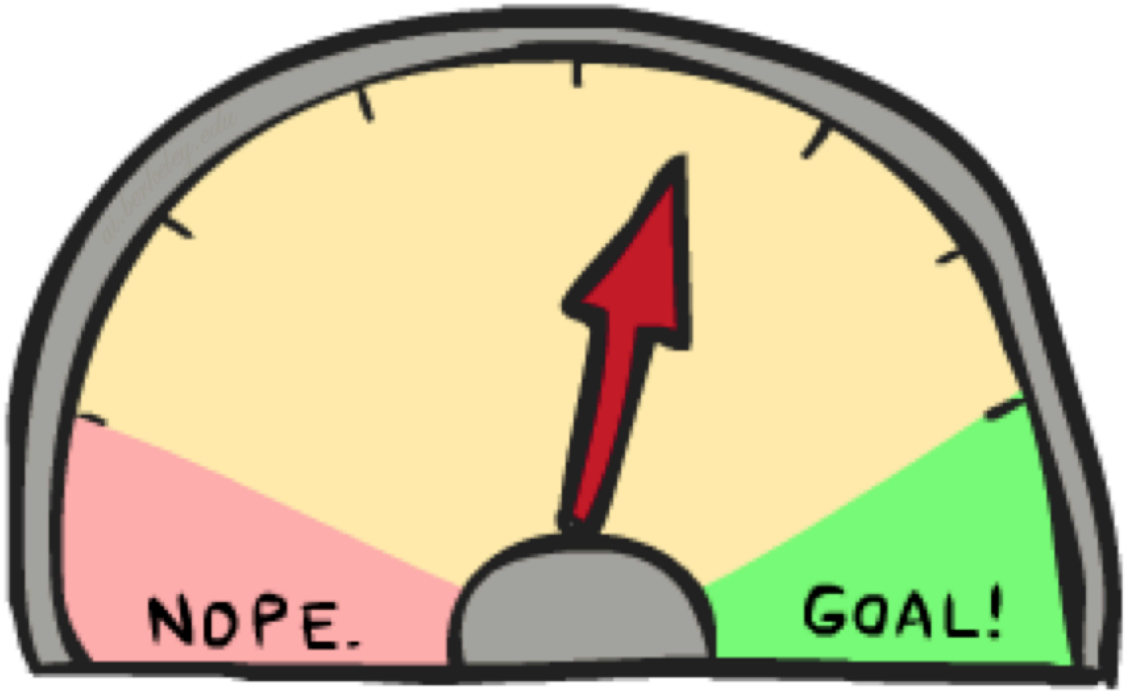
2. Model Problems as Graph Search

# Search and Models

- Search operates over models of the world
- The agent doesn't actually try all the plans out in the real world!
- Planning is all in simulation
- Your search is only as good as your models...



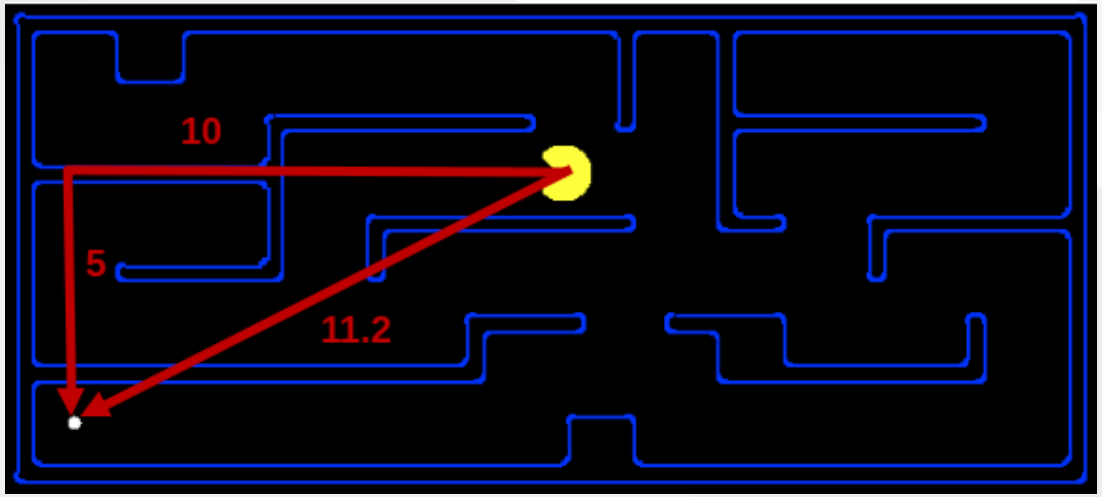
# Informed Search

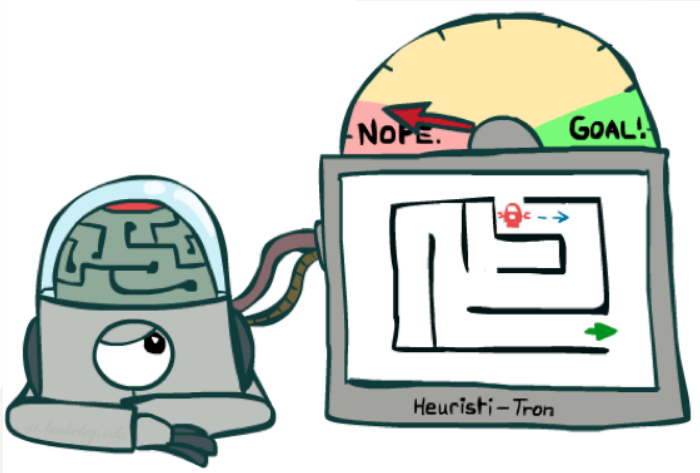


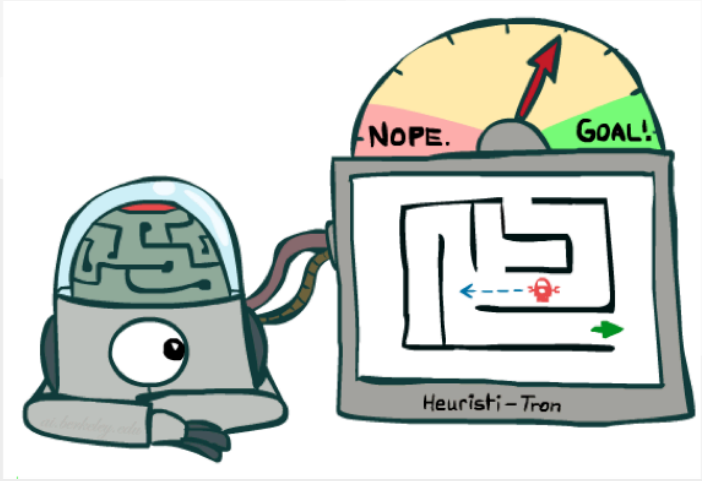
# Search Heuristics

A heuristic is:

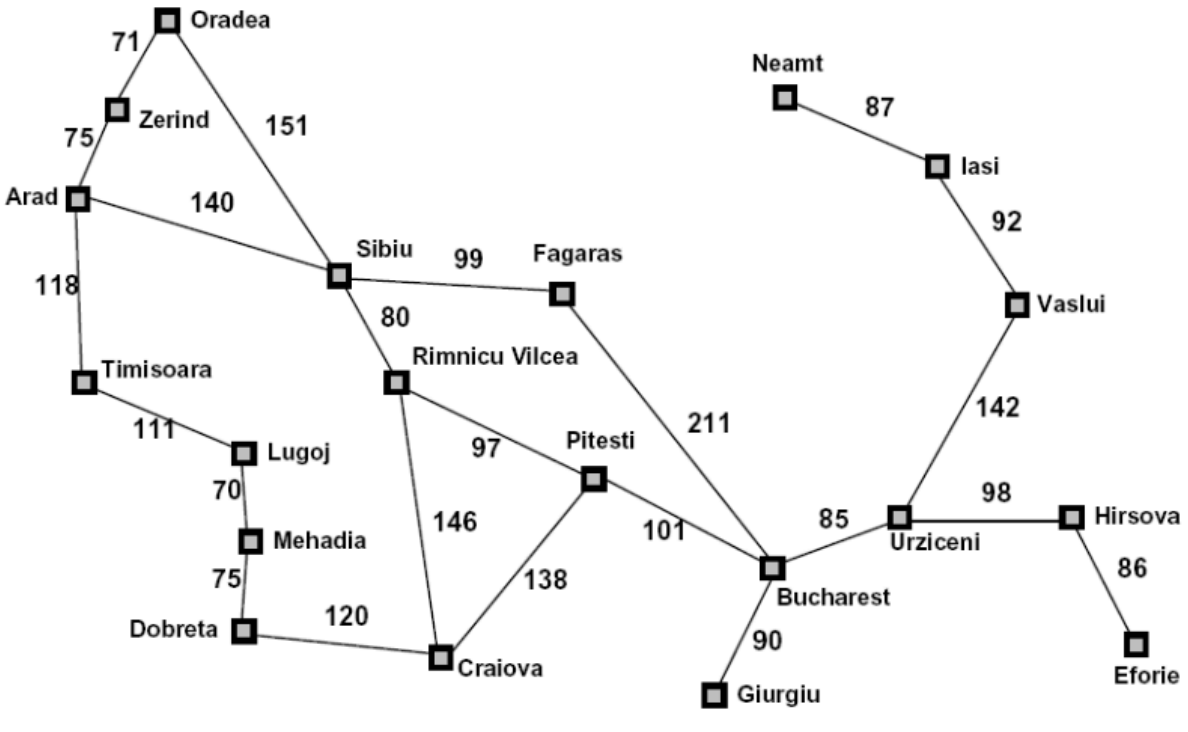
- A function that **estimates** how close a state is to a goal
- Designed for a **particular** search problem
- Examples: Manhattan distance, Euclidean distance



# Example: Heuristic Function

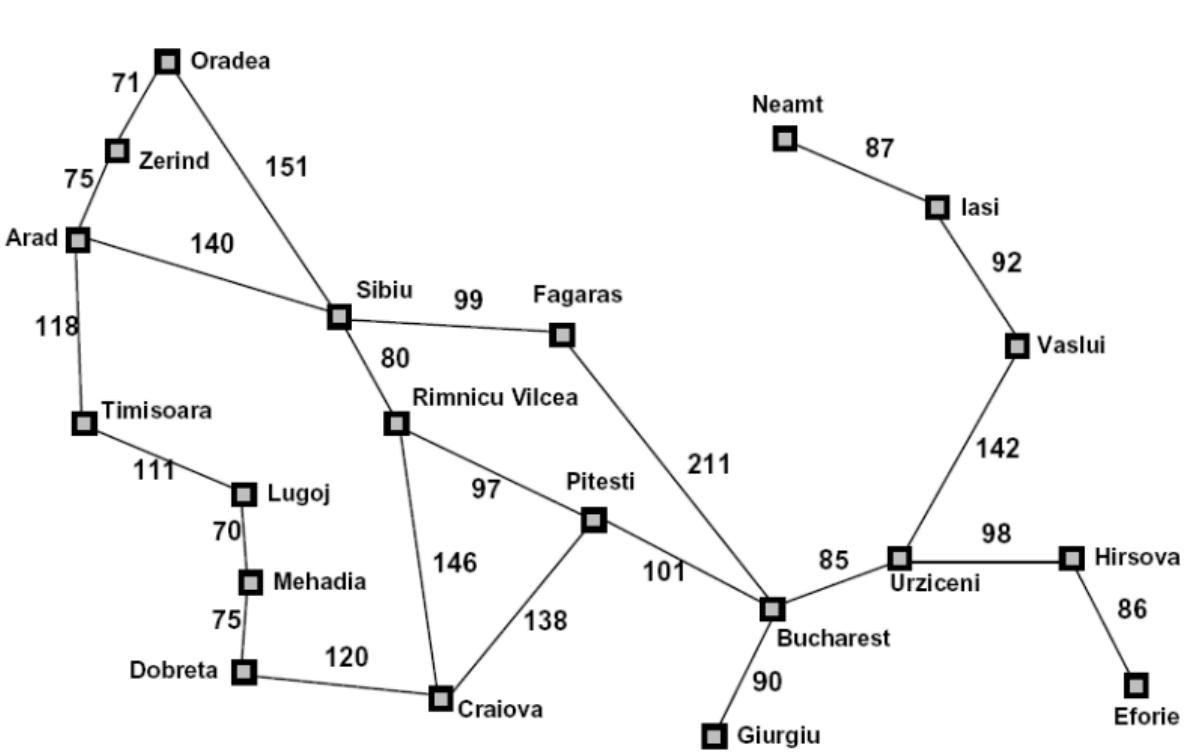



| Straight−line distance to Bucharest | |
|---|---|
| Arad | 366 |
| Bucharest | 0 |
| Craiova | 160 |
| Dobreta | 242 |
| Eforie | 161 |
| Fagaras | 178 |
| Giurgiu | 77 |
| Hirsova | 151 |
| Iasi | 226 |
| Lugoj | 244 |
| Mehadia | 241 |
| Neamt | 234 |
| Oradea | 380 |
| Pitesti | 98 |
| Rimnicu Vilcea | 193 |
| Sibiu | 253 |
| Timisoara | 329 |
| Urziceni | 80 |
| Vaslui | 199 |
| Zerind | 374 |

h(x)

# Greedy Search

# Example: Greedy Heuristic Function

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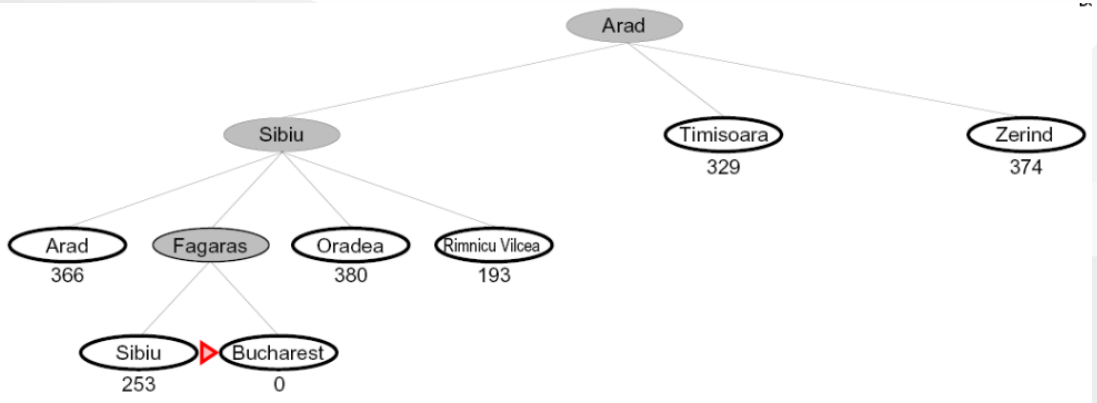
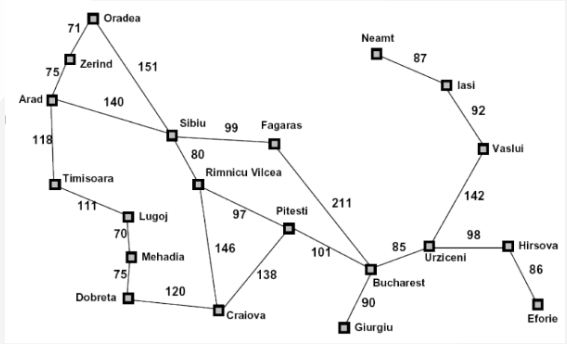
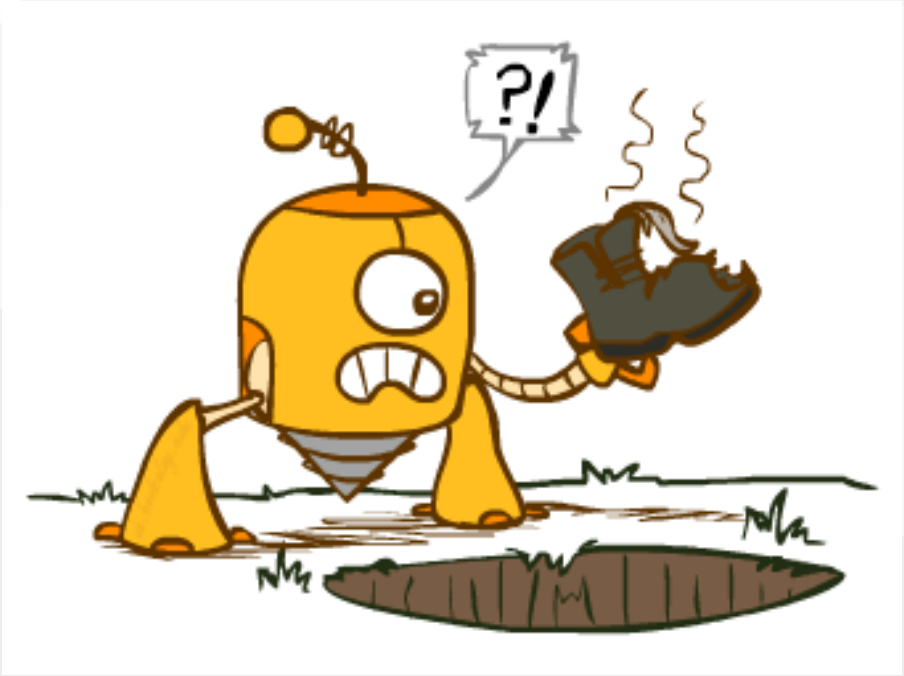
h(x)

# Greedy Search

- Expand the node that seems closest…
- What can go wrong?



# Greedy Search

- Strategy: expand a node that you think is closest to a goal state
  - Heuristic: estimate of distance to nearest goal for each state

A common case

- Best-first takes you straight to the (wrong) goal

Worst-case

- behaves like a badly-guided DFS