

# state-based models for decision problems

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## models

- describe a state (**representation**)
- identify special states & the problem space
- describe & validate transitions
- specify a search strategy

## uninformed search strategies

these have no distinction between states

- random
- BFS (and Uniform Cost)
  - search states in order of distance from start
  - finds optimal solution
- DFS (and Iterative Deepening, IDS)
  - go as far as possible as fast as possible
  - go back from dead ends and try something else
- backtracking
- bidirectional
  - start from both the start state and end state, meet in the middle

## informed search strategies

use heuristics to help distinguish between states

- greedy
  - best-first
- hill-climbing
  - select a local state that's at least as good as the current one
  - easily fooled by local maxima
- simulated annealing
  - has a chance to choose a worse state
  - chance gradually gets lower over time
- A\* (and IDA\*)
  - informed IDDFS
  - IDDFS explores nodes by distance from initial state
  - A\* explores nodes by  $d(S) + h(S)$ 
    - $d(S)$  - distance from initial state
    - $h(S)$  - estimated distance from final state
  - optimization: consistent heuristic
    - $h(A) \leq h(A,B) + h(B)$  if B reachable from A