CS 6601:   Midterm study guide

Note: R&N = *AI, A Modern Approach*, by Russell & Norvig

- Adversarial search (R&N Chapter 5)

  - Observable games (e.g. isolation)
  - Minimax
  - Alpha-beta pruning

    - Performance improvement

  - Utility and evaluation functions

    - Sensitivity

  - Optimization tricks

    - Move-ordering
    - Symmetry

  - Iterative deepening
  - Multiplayer games
  - Probabilistic games
  - Partially observable games (e.g. poker)

- Search (R&N Chapter 3, uninformed and informed)

  - Uninformed

    - Breadth-first search
    - Depth-first search
    - Depth-limited search
    - Iterative deepening depth-first search
    - Uniform-cost search

  - Informed

    - Greedy search
    - A* search
    - Heuristics

      - Consistency/admissibility
      - Dominance
      - Derivation by relaxation

- Bidirectional
- Tridirectional
- Tree vs. graph search
- Completeness, space/time complexity, path optimality

- Agent design (R&N Chapter 2)

  - Rationality
  - PEAS

    - Performance
    - Environment

      - Observability
      - Deterministic/stochastic
      - Episodic/sequential
      - Static/dynamic
      - Discrete/continuous
      - Single/multi-agent

    - Actuators
    - Sensors

      - Uncertainty

  - Agent types

    - Reflex
    - Reflex with state
    - Goal-based
    - Utility-based
    - Learning

- Random algorithms (part of R&N Chapter 4)

  - Hill-climbing
  - Beam search
  - Iterative improvement
  - Simulated annealing
  - Genetic algorithms
  - Local vs. global maximum
  - Local stochastic search

- Constraint satisfaction problems (R&N Chapter 6)

  - Variables, domains, constraints

- Standard search
- Backtracking
- Heuristics

    - Minimum remaining values
    - Least constraining value

- Forward-checking
- Arc consistency
- Path consistency
- Problem re-structuring

- Probability (R&N Chapters 13 and 14a, 14b)

    - Independence/dependence
    - Discrete/continuous variables
    - Joint distribution
    - Central Limit Theorem
    - Conditional probabilities

        - Bayes' Rule
        - Chain Rule
        - Conditional independence

    - Bayesian networks

        - How to construct
        - Local independence
        - Inference

            - Exact (calculation)

                - Enumeration
                - Variable elimination

            - Inexact (sampling)

                - Rejection sampling
                - Stochastic simulation
                - MCMC simulation

    - Decision/utility theory

        - Expected value