CS-540 Midterm Study Guide

March 13th, Chamberlin 2103
7:15pm to 9:15pm

For algorithms, expect to be tested in ways that require knowledge of state representations, runtime (where applicable), correctness, branching factor, and pseudocode.

Uninformed Search (3.1-3.4)

Algorithms: Breadth-first search, depth-first search, iterative deepening depth-first search, Dijkstra's/UCS, bidirectional search, depth-limited search

Concepts & Vocabulary: state space representation, backtracking, optimality and completeness of algorithms, solution representation, search tree, goal test, explored set

Informed Search (3.5, 3.6)

Algorithms: Greedy best first search, A-search, A* search

Concepts & Vocabulary: heuristic functions, consistent heuristics, admissible heuristics, learning heuristic functions from domain knowledge

Local Search (4.1)

Algorithms: hill-climbing search, stochastic hill-climbing search, random restart hill-climbing, simulated annealing, genetic algorithms

Concepts & Vocabulary: local search, neighborhood, operator function, local optimum, greedy search, genetic algorithm populations, mutations, and crossover

Game-Playing (5.1-5.5, *5.7 interesting but not testable)

Algorithms: Minimax search, minimax with alpha-beta pruning, iterative deepening depth first search combined with minimax, beam search, expectiminax

Concepts & Vocabulary: single-agent vs multi-agent, deterministic vs stochastic, and perfect information vs hidden information in the context of

gameplaying, term, utility functions, static board evaluation functions, horizon effect, quiescence search, chance nodes, Monte Carlo tree search

Constraint Satisfaction (6.1-6.4)

Algorithms: minimum conflicts local search, arc-consistency (AC3 algorithm), backtracking depth-first search with forward-checking

Concepts & Vocabulary: constraint satisfaction problem, constraints, variables + domain values, binary + unary constraints, arc consistency, node consistency, constraint propagation,

Machine Learning (18.1-18.3, 18.7.2, textbook excerpts)

Unsupervised

Algorithms: Hierarchical Agglomerative Clustering, K-Means clustering

Concepts & Vocabulary: unsupervised learning, feature vectors, training set, categorical vs. real/continuous features, clustering, distance metrics, single vs. complete vs. average linkage

Supervised

Algorithms: K-Nearest Neighbor classification algorithm, ID3 (decision tree learning) algorithm, Perceptron learning algorithm

Concepts & Vocabulary: supervised learning, hypothesis space, inductive bias: hypothesis bias + preference bias, test set, tuning set, decision trees, information gain, entropy + conditional entropy, overfitting, k-fold cross validation, random forests, ensemble learning, perceptrons, machine learning workflow