Artificial Intelligence – Exam II Outline – Fall 2018

The following topics will be covered on the exam. The exam will be closed-book and closed-notes. No electronic devices are allowed, except your own calculator.

Logic

- Knowledge-based agent
- Syntax, semantics, model, entailment, soundness, completeness
- Propositional logic
    - Syntax and semantics
    - Inference, validity, satisfiability
    - Proof by refutation
    - Logical equivalences
    - Inference rules
    - Clause
    - Conversion to CNF
    - Unit and full resolution
    - PL-Resolution (know algorithm, soundness, completeness, time complexity)
    - Frame problem and frame axiom
- First-order logic
    - Syntax and semantics
    - Properties of quantifiers
    - Closed-world assumption
    - Translate word problems to first-order logic
- Inference in first-order logic
    - Unification
        - Most general unifier
        - Unify (know algorithm, time complexity)
    - Conversion to CNF
    - Propositionalization
    - Generalized Modus Ponens
    - Forward chaining (know algorithm, soundness, completeness)
    - Backward chaining (know algorithm, soundness, completeness)
    - Resolution proof by refutation (know algorithm, soundness, completeness)
- Application to Wumpus World

Planning

- Nothing on planning

Uncertainty

- Rational agent maximizes expected utility
- Probability
    - Axioms
    - Unconditional (prior) or conditional (posterior)
    - Random variable
    - Distribution
- Probabilistic inference (be able to execute all below)
    - Using full joint probability distribution
    - Normalization
    - Independence and conditional independence
    - Bayes rule
    - Naïve Bayes
- Application to Wumpus World

Probabilistic Reasoning

- Bayesian networks
    - Node, link, conditional probability table
    - Construction
    - Polytree
    - Exact inference (execute)
    - Approximate inference
        - Direct sampling
        - Markov chain sampling
- Application to Wumpus World