Artificial Intelligence: Course Recap

What you need to know for the exam
Search

• What are:
  – State Spaces
  – Search Trees
  – Graph based versus Tree based searches

• Basic search strategies:
  – How do they work?
  – When might they fail?

• What are, and how do they relate to a basic Greedy Hill Climb:
  – Greedy Hill Climb with Restarts
  – Simulated Annealing
  – Local Beam (See notes for the natural language lecture)
  – Stochastic Local Beam (See notes for the natural language lecture)

• Be ready to implement:
  – A* search
  – Basic Dynamic Programming algorithms for path finding
Natural Computation

• Be ready to explain:
  – What natural computation is
  – The major forms of learning
  – Neural networks, and what their parameters do
  – Population methods, and their relative merits to other approaches
  – Terminology

• Be prepared to give an examples of application that would be appropriate for natural computation methods, and to explain why.
Logic/Planning

• What are, and when are they used/why are they useful:
  – Definite Clauses
  – Conjunctive Normal Form
  – Planning Domain Definition Language
  – Situational Calculus
  – Database Semantics

• Be ready to execute:
  – Forward and Backward Chaining, using AND-OR graphs
  – Partial orderings of actions
  – Calculations of earliest and latest start times on partial orders of actions.
  – Planning graphs
Probability Theory

• Be prepared to define/use any basic notions from discrete probability theory:
  – Random Variables
  – Probability Functions
  – Bayes Theorem
  – Chain Rule of Probability
  – Independence
  – Conditional Independence
  – Proir and Posterior distributions
  – Expected Value and Expected Utility
  – Etc...
Probabilistic Models I

• What are, and, if appropriate, how are they related to basic notions in probability theory?
  – Markov Models
  – Hidden Markov Models
  – Bayesian Networks
  – Dynamic Bayesian Networks
  – The dynamics/transition and observation/sensor elements of a state model
  – Influence Diagrams/Decision theoretic Bayesian networks
  – Markov Random Fields *(See notes for the natural language lecture)*
  – The Naive Bayes Classifier *(See notes for the natural language lecture)*

• Regarding Bayesian networks, what are:
  – The Markov Blanket of a node?
  – The Markov condition?
  – Markov Equivalence?
Probabilistic Models II

• Be ready to execute:
  – Hidden or visible Markov Models to model particular systems.
  – Dynamic Programming algorithms to estimate state probabilities and most probable paths for (possibly hidden) Markov models.
  – Parameter learning for Bayesian networks using Dirichlet distributions

• Be able to explain:
  – Missing Data algorithms for Bayesian network parameter learning:
    • Expectation Maximization
    • Gibbs Sampler
  – The Gibbs Sampler algorithm for estimating probabilities in a Markov Random Field

• Be ready to discuss:
  – The basic idea behind Bayesian network structural learning
AI and Games

• Be prepared to discuss
  – Common features of AI in games.
  – How the goals of AI differ in gaming as opposed to academia and/or industry.
  – Common methods.
    • Pay particular attention to Minimax searches and their use. (Read the book for more depth on this.)
AI and Natural Language

• By prepared to explain:
  – The basic process of statistical based machine translation.
  – The basics of how (Hidden) Markov models might be applied to speech or text recognition.
Who to talk to

Mike:
Search, Logic/Planning, Probability Theory, Probabilistic Models, AI and Natural Language
Office 1320
mikeashcroft@inatas.com

Olle:
Natural Computation, AI and Computer Games
Office 1256
olle.gallmo@it.uu.se

Roland:
Course and Exam Administration
Office 1356
Roland.Bol@it.uu.se