Wrapping Up

Exam

♢ Worth 70 marks: 7 questions, 10 marks each

♢ 3 hours, 30 mark hurdle, will be run in Gradescope and accessible via the subject LMS

♢ Open book, but no consultation with others

♢ 2 – 3 sentences sufficient for when **brief** descriptive answer requested

♢ Detailed exam instructions, consultation times, and a practice exam with solutions should be available in the next week

♢ Solutions for tutorial questions from later weeks will be available soon

♢ Feedback quiz is another source of example questions

♢ Roughly half of subject on "symbolic" AI, and half on "probabilistic" AI

♢ Here are some examples of the types of skills required (not exhaustive)

Week 1: What is AI? Intelligent Agents

- ♢ Explain different approaches to defining AI
- ♢ Describe the operation of the Turing test
- ♢ Characterise the difficulty of different common tasks
- ♢ Characterise requirements for an agent in terms of its percepts, actions, environment and performance measure
- ♢ Choose and justify choice of agent type for a given problem
- ♢ Characterise the environment for a given problem

Week 2: Problem Solving and Search

- ♢ Formulate single-state search problem
- ♢ Apply a search strategy to solve problem
- ♢ Analyse complexity of a search strategy

Week 3: Informed Search Algorithms

- ♢ Demonstrate operation of search algorithms
- ♢ Discuss and evaluate the properties of search algorithms
  - don't forget about iterative improvement algorithms
- ♢ Derive and compare heuristics for a problem
  e.g., is a given heuristic h_1 admissible;
  for given heuristics h_1 and h_2, does h_1 dominate h_2

Week 4: Game Playing and Adversarial Search

- ♢ Demonstrate operation of game search algorithms
  e.g., which nodes will be pruned under given node order
  or optimal node ordering in a given search tree
- ♢ Discuss and evaluate the properties of game search algorithms
- ♢ Design suitable evaluation functions for a game
- ♢ Explain how to search in nondeterministic games
  e.g., demonstrate operation of ExpectiMinimax

Week 5: Machine Learning in Game Search

♢ Discuss opportunities for learning in game playing

♢ Explain differences between supervised and temporal difference learning

♢ Not expected to derive or memorise the TDLeaf(λ) weight update rule, but if given this rule may ask you to explain what the main terms mean

Week 6: Constraint Satisfaction Problems

♢ Model a given problem as a CSP

♢ Demonstrate operation of CSP search algorithms
e.g., in what order are variables or values chosen using
minimum remaining values, degree heuristic, least constraining value
e.g., show how the domain of values of each variable
are updated by forward checking, or arc consistency,
where $X \rightarrow Y$ means using arc consistency to update domain of X
so that for every value $x \in X$ there is some allowed value $y \in Y$

♢ Discuss and evaluate the properties of different
constraint satisfaction techniques

Week 7: Guest Lecture

♢ No examinable material

Week 8: Uncertainty

- ♢ Calculate conditional probabilities using inference by enumeration
- ♢ Use conditional independence to simplify probability calculations
- ♢ Use Bayes' rule for solving diagnostic problems
- ♢ Note: if the arithmetic is too complex to compute the exact final value then simplify the expression as best you can

Week 9: Bayesian Networks

- ♢ Formulate a belief network for a given problem domain
- ♢ Derive expression for joint probability distribution for given belief network
- ♢ Use inference by enumeration to answer a query
  about simple or conjunctive queries on a given belief network

Week 10: Making Complex Decisions

- ♢ Compare and contrast different types of auctions
- ♢ Describe the properties of a given type of auction
- ♢ Select the most appropriate type of auction for a given application

Week 11: Robotics

- ♢ Determine the number of degrees of freedom of a robot, and whether it is holonomic
- ♢ Characterise sources of uncertainty in a robot application scenario
- ♢ Explain the basic concepts of localisation and mapping
- ♢ Formulate an application problem using incremental Bayes, and calculate posterior probabilities
- ♢ Model the configuration space for a simple robot
- ♢ Compare different approaches to motion planning given a particular configuration space

Week 12: Future of AI

♢ No examinable material

Exam

♢ Would you like to see the exam...

Wrapping Up

- I hope you enjoyed this introduction to AI
- Maybe we'll see you in the Master's level subjects
- Thank you for your patient attention
- Stay safe! Good luck with your exams and future studies