Today

• Admin and module info
• Introduction to AI

Module Outline

• The module consists of
  – 28 lectures
  – 4 labs (exercises not assessed)
  – Enough self study to understand the material

• Assessment
  – 2 class tests
  – A two hour exam

• Module information page:
  http://www.fransoliehoek.net/comp219/
Module Delivery

Lecturer: Dr. Frans Oliehoek
Room 222, Ashton Building
Email: frans.oliehoek@liverpool.ac.uk

I am available to answer short queries after lectures and will be happy to schedule an appointment to discuss any more detailed queries.

Demonstrators:
- Joe Collenette – sgjcolle@student.liverpool.ac.uk
- Gregory Palmer – G.J.Palmer@liverpool.ac.uk
- Pavithra Rajendran – Pavithra.Rajendran@liverpool.ac.uk

Timetable

Lectures
- Monday, 16:00-17:00, CTH-LTB.
- Tuesday, 10:00-11:00, REN-LT6.
- Friday, 11:00-12:00, CHAD-CHAD.

There will be no lectures on:
- 2-10-2017
- 9-10-2017

(Due to changes in lab times...) there will be a lecture on 6-10-2017

Module Assessment

• Non-assessed lab exercises
  – You should have been assigned to one of the lab classes; check time and allocation on your online timetable.
  – Labs start in week 3

• 2 class tests each worth 10% of the final mark for the module

• Exam in January, which will last 2 hours and is worth 80% of the final mark for the module
  – Multiple choice exam

Feedback

• Both continual assessment components will take the form of class tests.

• Results of the class tests will be returned within two working weeks (the departmental guideline).

• Feedback will be in the form of comments and suggestions noting where you went wrong (if applicable) and what you could have done differently.

• You can also receive feedback on the non-assessed lab exercises by submitting your answer sheets to the demonstrators.

• I will run through the solutions to the first class test during a lecture
Notes

• Lecture note will be available for download from the COMP219 website.

• You should supplement with your own notes.

• IMPORTANT:
In some lectures I will set exercises that DO NOT appear in the notes – if you miss the lecture it is up to you to catch up on missed exercises.

Reading

• Good AI books include:

• The following is a (cheap) text (not as comprehensive as the above) which covers standard material

Prolog Books

• Comprehensive books:

• Straightforward book

Module Content

• Introduction to artificial intelligence
• Prolog - an AI programming language
• Search
• Knowledge representation
• Logic
• Planning
• Learning
• AI applications
Module Aims

• To provide an introduction to the topic of artificial intelligence through studying problem solving, knowledge representation, planning and learning in intelligent systems.

• To provide a grounding in the AI programming language Prolog.

Learning Outcomes

At the end of this module, students should be able to:

• identify or describe the characteristics of intelligent agents and the environments that they can inhabit;
• identify, contrast and apply to simple examples the major search techniques that have been developed for problem-solving in AI;
• distinguish the characteristics, and advantages and disadvantages, of the major knowledge representation paradigms that have been used in AI, such as production rules, semantic networks, propositional logic and first-order logic;
• solve simple knowledge-based problems using the AI representations studied;
• identify or describe approaches used to solve planning problems in AI and apply these to simple examples;
• identify or describe the major approaches to learning in AI and apply these to simple examples;
• identify or describe some of the major applications of AI;
• understand and write Prolog code to solve simple knowledge-based problems.

Please ensure that you...

• Switch off all mobile phones during lectures and practical classes.
• Do not scan/sign the register on behalf of other people.
• Attend lectures but do not talk during them or distract others.
  – A major distraction for me and others is laptops: please do not use these during lectures unless you have a valid reason that you have first discussed with me.
• Attempt the laboratory exercises.
• Do whatever reading and self study that is required to understand the material.
• Ask questions if there is anything that you do not understand.
• Sit the class tests!

Credits

• This set of slides contains material provided by people who have previously taught this module in the University of Liverpool
  – John Fearnley
  – Katie Atkinson
  – Annabel Latham
  – Adam Wyner
  – Boris Konev
  – Clare Dixon
  – Simon Parsons
  – Trevor Bench-Capon
• Russell & Norvig “AlaMA” supplement slides
Introduction to Artificial Intelligence

What is AI?

• AI attempts to build intelligent entities
  – What is intelligence...?
  – Not a clear cut answer!
  – E.g.:
    • must relate to tasks involving “higher mental processes”: so not simple response to some stimulus (e.g. a thermostat)
    • not mechanical performance of some algorithm

What is AI?

• "Hard" AI view
  – “The ultimate goal of AI research ... is to build a person, or more humbly an animal” – *Charniak and McDermott*

• "Soft" AI view
  – “AI is the study of how to make computers do things, at which, at the moment, people are better” - *Elaine Rich*

AI is both science and engineering

• the *science* of understanding intelligent entities – of developing theories which attempt to explain and predict the nature of such entities

• the *engineering* of intelligent entities
Four views of AI

• Systems that think like humans
  – cognitive science, expert systems

• Systems that act like humans
  – The Turing Test, chess programs

• Systems that think rationally
  – Approaches based on logic and mathematics

• Systems that act rationally
  – Contemporary agent-based approaches

Acting Humanly

• Emphasis on how to tell if a machine is intelligent, not on how to make it intelligent

• When can we count a machine as being intelligent?

• “Can machines think?” → “Can machines behave intelligently?”

• Most famous response due to Alan Turing, British mathematician and computing pioneer

The Turing Test

• System passes if the questioner cannot tell the difference

• No program has yet passed the test: most successful ones rely on tricks rather than intelligence

• But can obtain human level performance (or better) in some specific areas like chess

Thinking Humanly

• Try to understand how the mind works - how do we think?

• Two possible routes to find answers:
  – by introspection - we figure it out ourselves!
  – by experiment - draw upon techniques of psychology (or neuroscience) to conduct controlled experiments

• The discipline of cognitive science: at one time influential in vision, natural language processing, and learning.
Human vs Machine Thinking

- **Expert systems** – “AI success story in early 80s”
  - Human expert’s knowledge and experience is represented as a computer program
  - Rule-based representation of knowledge
  - Typical domains are:
    - medicine (INTERNIST, MYCIN, . . .)
    - geology (PROSPECTOR)
    - chemical analysis (DENDRAL)
    - configuration of computers (R1)
    - law (British Nationality Act)
- Thinking humanly *can* work (sometimes)

Thinking Rationally

- Trying to understand how we *actually* think is one route to AI – but how about how we *should* think?
- Use logic to capture the laws of rational thought as symbols
- Reasoning involves shifting symbols according to well-defined rules (like algebra)
- Result is *idealised* reasoning

Logic and AI

- Logical approach theoretically attractive
- Lots of problems:
  - **Transduction** - how to map the environment to symbolic representation
  - **Representation** - how to represent real world phenomena (time, space, . . .) symbolically
  - **Reasoning** - how to do symbolic manipulation tractably
Acting Rationally

• Acting rationally = acting to achieve one’s goals, given one’s beliefs
• An agent is a system that perceives and acts; an intelligent agent is one that acts rationally w.r.t. the goals we delegate to it
• Emphasis shifts from designing theoretically best decision making procedure to the best decision making procedure possible in circumstances
• Logic may be used in the service of finding the best action – not as an end in itself

Summary

• Today
  – General module information
  – Overview of what AI is
    • The science of understanding intelligent entities, and engineering them

• Next time
  – Overview of some common AI techniques we will study during the module
  – Typical AI applications

• Achieving perfect rationality – making the best decision theoretically possible – is not usually achievable because of
  – limited resources
  – limited time
  – limited computational power
  – limited memory
  – limited or uncertain information about environment

• The aim is to do the best with what you’ve got