VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wananga o te Upoko o te Ika a Maui

School of Engineering and Computer Science

Welcome to COMP 307

Introduction to Artificial Intelligence

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The COMP307 Team

- Course Coordinator and Lecturer: Prof Mengjie Zhang (Meng), CO355, x5654, mengjie.zhang@ecs.vuw.ac.nz
- Dr Bing Xue, Co-coordinator/Lecturer CO 352, x5542, bing.xue@ecs.vuw.ac.nz
- Dr Harith Al-Sahaf, Lecturer, CO 351, harith.al-sahaf@ecs.vuw.ac.nz
- Tutors: very experienced students
  - Harith Al-Sahaf (head tutor, organising marking, tutorials)
  - Qi Chen, Qi.Chen@ecs.vuw.ac.nz (co-head tutor)
  - John Park, John.Park@ecs.vuw.ac.nz
  - Hoai Bach Nguyen: bachbk1611@gmail.com
  - Andrew Lensen, Andrew.Lensen@ecs.vuw.ac.nz
  - Damien O'Neill, Damien.ONeill@ecs.vuw.ac.nz
  - Felix Longfei Yan, felixyan1990@gmail.com
- Meng's contacts:
  - Office Hours: Mondays and Thursdays 5:00-6:00pm
  - Email: using your *ecs email*, reply to you within 24 hours
  - Not available on Fridays.
- Student Representative?

Lectures, Tutorials, Helpdesks

- Lectures: Monday 11:00-11:50pm, KK LT301
- Lectures: Tuesday 11:00-11:50pm, KK LT301
- Tutorials: Thursday 12:00-12:50pm, KK LT301
- Helpdesks:
  - From Week 2
  - CO 241b
  - Timetable to be announced
- Helpdesks will be announced in lectures, on web page or by email.
- First week: no helpdesks, but will be a tutorial
- No scheduled labs

Course Objectives

- Understand fundamental concepts and techniques of artificial intelligence
- Apply these concepts and techniques to solve specific problems and build engineering and other applications
- Form a basis for further learning and research in AI
  - prerequisite of 400 AI courses (COMP 421, 422, 423, 473)
  - requirement for AI related summer research scholarships
  - requirement/preference for AI related Honours projects
- Many past students have applied AI techniques to their own applications: COMP, ECEN, NWEN and SWEN
- Not required by any major/specialisation, but the largest 300 level course for many years

Course Topics

- Course organisation and introduction: 1 lecture
- Search techniques: 2 lectuers
- Machine learning: 6 lectures
- Evolutionary computing: 3 lectures
- Reasoning under uncertainty: 6 lectures
- Planning and Scheduling: 4 lectures
- Other topics: Support Vector Machines, Knowledge based systems, Natural language processing, Data mining and web mining, Big Data, Deep Learning, Further AI Courses, Scholarships, etc.: 2 lectures
- Lecturers will do this course in a cooperative manner!!

Course Materials

- Course "Text Book": Stuart J. Russell and Peter Norvig, Artificial Intelligence. A Modern Approach, Prentice-Hall, NJ, 2nd edition 2002, 3rd edition 2009, or the 2014 (PNIE version), or a newer version
  – a lot of materials online
- Lectures and tutorials
- Course Website:

  `https://ecs.victoria.ac.nz/Courses/COMP307_2017T1/`

Check the course outline on the website for more detail.

Assessments

- Asignments: 4
  - Assignment 1: Machine Learning Basics (15%)
  - Assignment 2: Neural Networks and Evolutionary Computing (12%)
  - Assignment 3: Reasoning under uncertainty (Bayesian) (10%)
  - Assignment 4: Planning and Scheduling (8%)
- Final Exam: 55%, 2 hours
- To pass the course you must obtain a C- grade overall and meet the mandatory requirements:
  - achieve at least a D grade on exam, and
  - submit reasonable attempts for >= 3 out of 4 assignments

Workload

- Lectures and tutorials: 3 hours
- Reading, review/elaboration, assignments: >= 7 hours
- Note: assuming you have done
  – COMP103, (MATH 161),
  – (COMP261, NWEN 241, or SWEN221)
  – otherwise more time!
- READ the course outline

Rules and Policies

Plagiarism

- Claim other people's work as your own (main)
- Penalties:
  - zero mark for all parties
  - blacklist!
- Discussion with other students: mark clearly
- Claim your own previous work as your current work (self-plagiarism) — mainly for research, 400 level courses

Read the course outline!

What is AI?

- Programming computers to solve tasks that would require intelligence for people to solve.
- An approach to understanding the intelligence (human or in general) by building systems that exhibit intelligence.
- The study of how to make computers do things which, at the moment, people do better.
- Computing problems we don't know how to solve yet — the hard part of Computer Science — this course is **hard!**
- A computer passing the Turing Test.

Example AI Applications

- Speech recognition for ESL tutoring
- Image and signal processing
- Machine vision for security monitoring
- Robot landmine sweeping, robot vision
- Natural language queries for search engine
- Personalised Web search
- Opinion mining
- Bioinformatics, health informatics
- Medical diagnosis, biomarker detection (big dimensionality)
- Specialised medical test interpretation

Example AI Application

- Planning/Scheduling orders and deliveries from a warehouse
- Recourse allocation in Grid/Cloud Computing
- Vehicle assembly and manufacturing industry
- Web service composition and location allocation
- Complex social network optimisation (LinkedIn, facebook)
- Characterising gene function from experimental data
- Identifying customer categories from customer data
- Automatic programming and software testing
- Search based software engineering
- Network intrusion detection
- Credit Card fraud detection
- Personalised news/email filters

Views of AI

Several views:

Systems that **think** like *humans*	Systems that **think** *intelligently*
Systems that **act** like *humans*	Systems that **act** *intelligently*

AI: Engineering or Science?

Engineering:

- Building intelligent systems to solve problems in the world
- Understanding mechanisms, algorithms, representations for building intelligent systems

Science:

- Understanding nature of intelligence (human or otherwise)
- Implementing models of intelligence to evaluate and understand
- Exploring consequences of different algorithms and representations

Approaches to AI

Symbolic AI: Representation and Reasoning at an abstract level

- Representations and algorithms that manipulate symbols
- The physical symbol system hypothesis: A machine manipulating physical symbols has the necessary and sufficient means for general intelligence. (Newell and Simon)
- "Old" AI

Computational AI: The brain doesn't have symbols; use numbers

- Representation and reasoning using lower level mechanisms
- Probability based models and computation
- Neural Networks
- Genetic and Evolutionary Computation Algorithms
- Fuzzy systems
- "Modern" AI

Next

- Strong AI vs Weak AI
  More philosophy — later
- History of AI — come to the Tutorial this week

- Next lecture: search techniques
- Suggested reading: text book Chapters 1, 2