

Fundamentals of Artificial Intelligence



VICTORIA UNIVERSITY OF
WELLINGTON
TE HERENGA WAKA

COMP307/AIML420

Introduction

Dr Heitor Murilo Gomes

Assoc. Prof. Dr Yi Mei

{heitor.gomes, yi.mei}@ecs.vuw.ac.nz

Team

- Course coordinator/lecturer: Heitor Murilo Gomes (heitor.gomes@vuw.ac.nz)
- Lecturer: Yi Mei (yi.mei@ecs.vuw.ac.nz)
- Tutors (very experienced students)
 - Kaan Demir
 - Hayden Andersen
 - Sean McGifford
 - Elliott Ramoo
 - Rhys Macdonald
 - Reilly Oldham
- Student representative? **Send emails to Heitor with your statements**

Lectures & Tutorials

Lectures

- Tuesday 11:00 - 11:50 – LT101, Maclaurin, Kelburn
- Thursday 13:10 - 14:00 – LT205, Hugh Mackenzie, Kelburn

Tutorials

- Friday 11:00 - 11:50 – LT101, Maclaurin, Kelburn

Helpdesks

Our helpdesks will be held in **CO242B**

- No helpdesk during public holidays
- No helpdesk in the first week
- No scheduled labs

- Monday: 3:00-4:00 PM
- Tuesday: 3:00-4:00 PM
- Wednesday: 3:00-4:00 PM
- Thursday: 3:00-4:00 PM
- Friday: 3:00-4:00 PM

- From the last Thursday to Wednesday of the week due: Helpdesk from 2:00 to 3:00 PM + normal helpdesk hours.

Paper structure

- The course is taught mainly in-person*
- Lectures and tutorials are given in person and recorded
- **All learning materials are available online**
- **AIML420 content is also shown in the COMP307 page**

https://ecs.wgtn.ac.nz/Courses/COMP307_2023T1/

- **Helpdesk/test will be in-person**
- Special cases will be handled case by case
 - Reach out to the course coordinator ASAP

Course Objectives

- Understand and apply fundamental concepts and techniques of Artificial Intelligence
- Form a basis for further learning and research in AI
 - part of **AI Specialization** in **COMP** and **SWEN** majors
 - prerequisite of 400 AI courses (AIML 425, 426, 428, partly 427, 429)
 - requirement for AI summer research scholarships
 - requirement/preference for AI related Honours projects
- Past students applied AI techniques to their applications: COMP, CGRA, CYBR, ECEN, NWEN, RESE and SWEN
- Not required by any major, but one of the most popular and largest 300 level courses for many years

Course Topics

- Course organisation and introduction: 1 lecture
- Search techniques: 2 lectures
- Basic Machine learning: 4 lectures
- Neural and evolutionary computing: 5 lectures
- Reasoning under uncertainty: 4 lectures
- Planning and Scheduling: 4 lectures
- Other topics: 2 lectures

- Lecturers will do this course in a **cooperative** manner!

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
 - Not required, but many course contents are from this book – A lot of materials online
- Lectures and tutorials
- Check the course outline on the website for more detail

Materials

- **Assignments: 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%)

3 late days to be used cross all the assignments

Further extension **ONLY** for special cases

- **Test 1** (Week 8): (15% COMP307, 10% AIML420)
- **Test 2** (Assessment week): (40% COMP307, 35% AIML420)
- ***Literature review essay*** (10% AIML420)

To pass the course you must obtain a C- grade overall

Workload

- Lectures and tutorials: 3 hours per week
- Reading, review, assignments: ~7 hours per week
- Assuming you have done
 - COMP103, MATH161, [MATH177/ STAT292]
 - COMP261, NWEN241, or SWEN221
 - More time might be required if you didn't

Rules and Policies

Plagiarism

- The University has clear rules for Plagiarism and what is considered Plagiarism
- You are encouraged to read “What is plagiarism?”

<https://www.wgtn.ac.nz/students/study/exams/academic-integrity/plagiarism>

1. Complete and near complete plagiarism
2. Patchwork plagiarism
3. Inadvertent or lazy plagiarism
4. Submitting the same work in more than one course

What about ChatGPT?

*“At this time, the use of artificial intelligence of any kind tools, such as ChatGPT, to write assessments is likely to be in breach of the [Academic Integrity Policy for Students \(PDF\)](#), **unless students are told explicitly by their lecturer that it is permissible to use them.**”*

*“The University is currently considering how artificial intelligence can best be used as an educational tool and will be releasing guidelines later in 2023. If you are unsure about the rules, **you need to check with your lecturer** or review the academic integrity policy for students.”*

Source (accessed on 24/02/23):

<https://www.wgtn.ac.nz/students/study/exams/academic-integrity/student-use-of-artificial-intelligence>

What is AI?

- Programming computers to **solve tasks that would require “intelligence”** 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 on which, at the moment, people do better
- Computing problems we don't know how to solve yet — the hard part of Computer Science

Some AI Applications

- Speech recognition
- Image and signal processing
- Monitoring crops
- Autonomous robots

- Natural language queries for search engines 🔥
- Personalised Web search
- Energy consumption prediction

- Bioinformatics, health informatics
- Medical diagnosis
- Specialised medical test interpretation

AI: Engineering or Science?

Engineering

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

Science

- Understanding nature of intelligence (human or otherwise)
- Implementing models of intelligence to evaluate and understand them

AI: Engineering or Science?

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)

("Classic") Not as popular as its counterpart

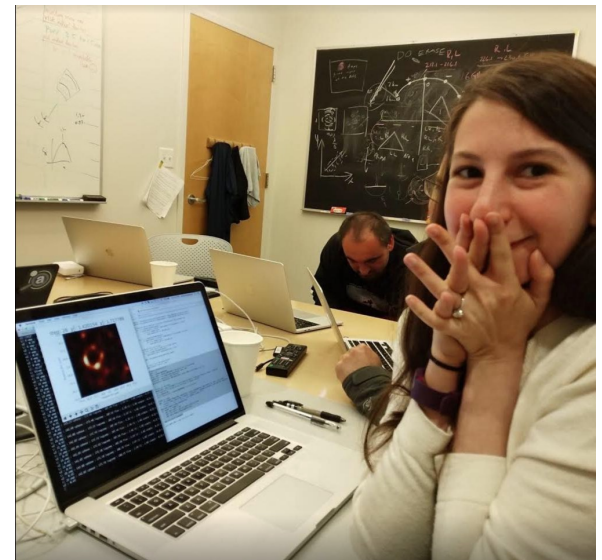
Computational AI: The brain doesn't have symbols; use numbers

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

("Modern") More popular nowadays

Why should you study AI ?!

- Career opportunities
 - Several jobs in technology requires proficiency with AI
- Understanding AI
 - AI influences virtually everyone's life
- Advancing technology
 - Important advances in a variety of fields rely on AI



Katherine Louise Bouman

<https://www.nytimes.com/2019/04/11/science/katie-bouman-black-hole.html>

Bouman, Katherine L., et al. "Computational imaging for VLBI image reconstruction." *IEEE CVPR*, 2016.

Coming up next...

- History/Ethics of AI (Tutorial this week)
- Search techniques (Next lecture)
- Suggested reading: “Text book” Chapters 1, 2