# Artificial Intelligence

## COMP9414

# Lecturers



- Dr Francisco Cruz (LiC – Lecturer in Charge)
  - https://www.unsw.edu.au/staff/francisco-cruz-naranjo



- Dr Armin Chitizadeh (Guest Video-lecture in Week 2)
  - https://www.sydney.edu.au/engineering/about/our-people/academic-staff/armin-chitizadeh.html



- Dr Maryam Hashemi (Guest Lecturer in Week 7)
  - https://scholar.google.com/citations?user=PcZblrsAAAAJ&hl=en
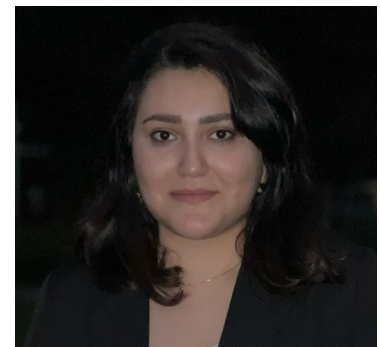
# Admin Team

- Dr Maryam Hashemi (Course admin)
  - https://maryamhashemi1995.github.io/index3.html

- John Chen (Forums monitoring)

# Tutors

- Dr. Jingying Gao, jingying.gao@unsw.edu.au

- Kiran Jeet Kaur, kiran_jeet.kaur@unsw.edu.au

- Leman Kirme, l.kirme@unsw.edu.au

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- Joffrey Ji, joffrey.ji@student.unsw.edu.au

- Abhishek Pradeep, abhishek.pradeep@student.unsw.edu.au


- Session will be BYOD. Alternatively, you can borrow a laptop.
  See https://taggi.cse.unsw.edu.au/FAQ/Borrow_A_Laptop/

# Artificial Intelligence (AI)

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  - Artificial intelligence (AI) is intelligence demonstrated by machines, as opposed to intelligence displayed by humans or by other animals [Wikipedia].

- Can you give some examples?
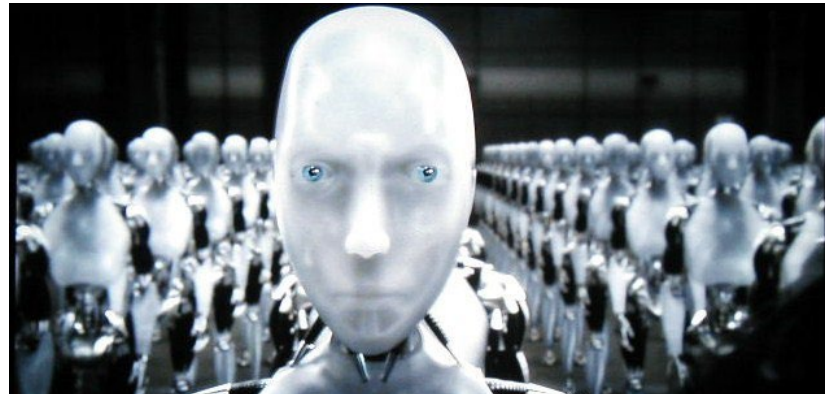
# AI is not ML is not ANN
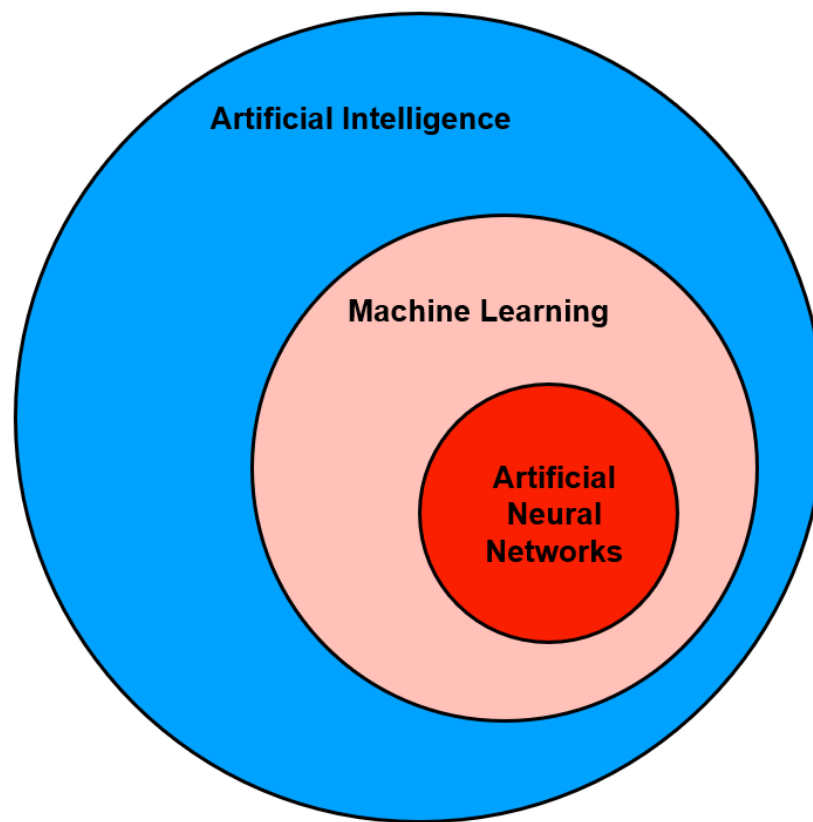
AI is not Python

# Current (mis)understanding of AI
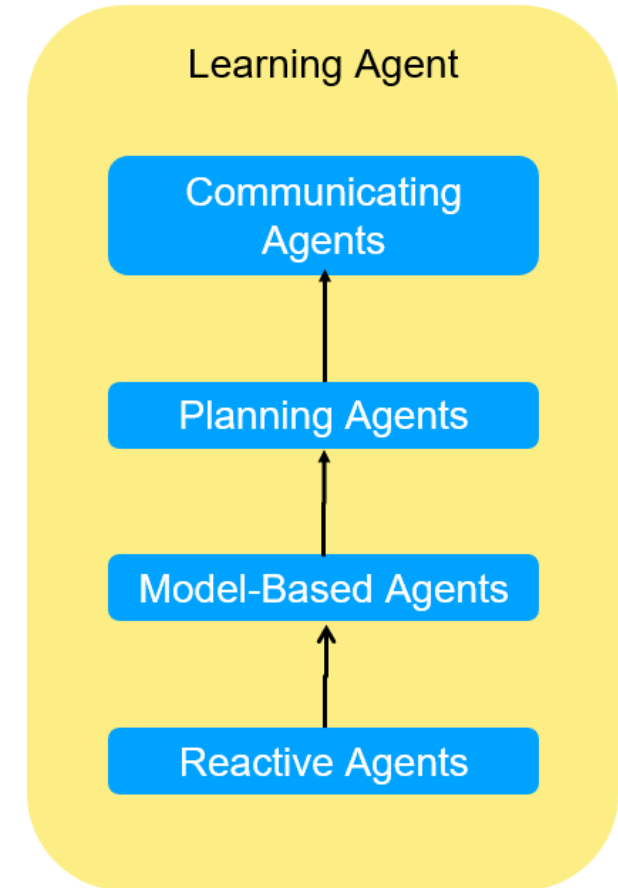
How are currently perceived AI-based systems?

# Current (mis)understanding of AI

But in reality, it's still an open problem

# Course Plan

- Introduce AI concepts through intelligent agents
- Start with very simple reactive agents
- Progress by adding more capabilities
- End with agents that learn, reason and communicate

# Course Plan

**Week 1**
1 Introduction
1.1 History of AI
1.2 Agents
1.3 Knowledge representation
1.3.1 Feature-based vs iconic representations
1.3.2 Logic
1.3.3 Learning rules

**Week 2**
2 Search
2.1 Uninformed search
2.2 Informed search
2.3 Informed vs uninformed

**Week 3**
3 Neural Networks
3.1 Neurons - biological and artificial
3.2 Single-layer perceptron
3.3 Linear separability
3.4 Multi-layer networks
3.5 Backpropagation
3.6 Neural engineering methodology

**Week 4**
4 Rewards instead of goals
4.1 Elements of reinforcement learning
4.2 Exploration vs exploitation
4.3 The agent-environment interface
4.4 Values functions
4.5 Temporal-difference prediction

**Week 5**
5 Metaheuristics
5.1 Asymptotic complexity
5.2 Classes of problems
5.3 Linear programming
5.4 Search space
5.5 Metaheuristics with and without memory
5.6 Population-based methods

**Week 6**
Recap and consultation

**Week 7**
7 Computer vision
7.1 Image processing
7.2 Scene analysis
7.3 Cognitive vision

**Week 8**
8 Language processing
8.1 Formal languages
8.1.1 Chomsky's hierarchy
8.1.2 Grammars
8.2 Regular expressions
8.3. Minimum edit distance and words
8.4 Natural languages: N-gram models

**Week 9**
9 Reasoning with uncertain information
9.1 Confidence factors
9.1 Probability and probabilistic inference
9.2 Bayes nets
9.3 Fuzzy logic

**Week 10**
10 Human-aligned intelligent robotics
10.1 Human interaction and human-in-the-loop robot learning
10.2 Explainability and interpretability
10.3 Safe robot exploration
10.4 Ethics

# Related Course

- COMP3431 Robot Software Architectures
- COMP4418 Knowledge Representation and Reasoning
- COMP9417 Machine Learning and Data Mining
- COMP9444 Neural Networks and Deep Learning
- COMP9491 Applied Artificial Intelligence
- COMP9517 Computer Vision
- COMP6713 Natural Language Processing
- COMP9418 Advance Machine Learning
- COMP9727 Recommender Systems

# Timetable

- Lecture:
  - Mon 6:00 – 9:00pm Mathews Theatre A (K-D23-201)

- Tutorials:

| Section | Class ID | Time | Location | Tutor | Email |
|---------|----------|------|----------|-------|-------|
| F18A | 4374 | Fri 18:00 - 20:00 (Weeks:1-10) | Quadrangle G027 (K-E15-G027) | Jingying Gao | z5234895@ad.unsw.edu.au |
| H09A | 4375 | Thu 09:00 - 11:00 (Weeks:1-10) | Mathews 226 (K-F23-226) | Kiran Jeet Kaur | z5434806@ad.unsw.edu.au |
| H11A | 4376 | Thu 11:00 - 13:00 (Weeks:1-10) | Mathews 226 (K-F23-226) | Kiran Jeet Kaur | z5434806@ad.unsw.edu.au |
| H16A | 4377 | Thu 16:00 - 18:00 (Weeks:1-10) | Webster 250 (K-G14-250) | Leman | z5410109@ad.unsw.edu.au |
| H16B | 4378 | Thu 16:00 - 18:00 (Weeks:1-10) | Webster 251 (K-G14-251) | Xinyi Li | z5508701@ad.unsw.edu.au |
| H16C | 4379 | Thu 16:00 - 18:00 (Weeks:1-10) | **Online** | John Chen | xin.chen9@student.unsw.edu.au |
| H16D | 4380 | Thu 16:00 - 18:00 (Weeks:1-10) | Mathews 226 (K-F23-226) | Abhishek Pradeep | z5454612@ad.unsw.edu.au |
| H18A | 4381 | Thu 18:00 - 20:00 (Weeks:1-10) | Webster 250 (K-G14-250) | Leman Kirme | z5410109@ad.unsw.edu.au |
| H18B | 4382 | Thu 18:00 - 20:00 (Weeks:1-10) | Webster 251 (K-G14-251) | Janhavi Jain | z5431064@ad.unsw.edu.au |
| H18C | 4383 | Thu 18:00 - 20:00 (Weeks:1-10) | Webster 302 (K-G14-302) | Jingying Gao | z5234895@ad.unsw.edu.au |
| H18D | 4384 | Thu 18:00 - 20:00 (Weeks:1-10) | Mathews 306 (K-F23-306) | Maher Mesto | m.mesto@unsw.edu.au |
| H18E | 4385 | Thu 18:00 - 20:00 (Weeks:1-10) | Mathews 226 (K-F23-226) | John Chen | xin.chen9@student.unsw.edu.au |
| T09A | 4386 | Tue 09:00 - 11:00 (Weeks:1-10) | H13 Lawrence West 2035 (K-H13-2035) | Peter Ho | peter.ho2@student.unsw.edu.au |
| T11A | 4387 | Tue 11:00 - 13:00 (Weeks:1-10) | H13 Lawrence West 2035 (K-H13-2035) | Yixin Kang | z5542052@ad.unsw.edu.au |
| T16A | 4388 | Tue 16:00 - 18:00 (Weeks:1-10) | Rupert Myers 440 (K-M15-440) | Jonas Macken | z5208799@ad.unsw.edu.au |
| T16B | 4389 | Tue 16:00 - 18:00 (Weeks:1-10) | Rupert Myers 540 (K-M15-540) | Xinyi Li | z5508701@ad.unsw.edu.au |
| T16C | 4390 | Tue 16:00 - 18:00 (Weeks:1-10) | Rupert Myers 560 (K-M15-560) | Yixin Kang | z5542052@ad.unsw.edu.au |
| T16D | 4391 | Tue 16:00 - 18:00 (Weeks:1-10) | Rupert Myers 420 (K-M15-420) | Peter Ho | peter.ho2@student.unsw.edu.au |
| T18A | 4392 | Tue 18:00 - 20:00 (Weeks:1-10) | Quadrangle 1046 (K-E15-1046) | Malher Patel | malhar.patel@unsw.edu.au |
| T18B | 4393 | Tue 18:00 - 20:00 (Weeks:1-10) | Quadrangle 1047 (K-E15-1047) | Maher Mesto | m.mesto@unsw.edu.au |
| T18C | 4394 | Tue 18:00 - 20:00 (Weeks:1-10) | Quadrangle G047 (K-E15-G047) | Janhavi Jain | z5431064@ad.unsw.edu.au |
| T18D | 4395 | Tue 18:00 - 20:00 (Weeks:1-10) | **Online or Quadrangle G046 (K-E15-G046)** | Ramya Kumar | z5427178@ad.unsw.edu.au |
| T18E | 4396 | Tue 18:00 - 20:00 (Weeks:1-10) | Quadrangle G040 (K-E15-G040) | Abhishek Pradeep | z5454612@ad.unsw.edu.au |
| W16A | 4397 | Wed 16:00 - 18:00 (Weeks:1-10) | Law Building 202 (K-F8-202) | Jonas Macken | z5208799@ad.unsw.edu.au |
| W16B | 4398 | Wed 16:00 - 18:00 (Weeks:1-10) | Law Building 275 (K-F8-275) | Zahra Donyavi | z.donyavi@unsw.edu.au |
| W16C | 4399 | Wed 16:00 - 18:00 (Weeks:1-10) | Law Building 276 (K-F8-276) | Hadha Afrisal | hadha.afrisal@unsw.edu.au |
| W16D | 4400 | Wed 16:00 - 18:00 (Weeks:1-10) | Law Building 201 (K-F8-201) | Joffrey Ji | z5450981@ad.unsw.edu.au |
| W18A | 4401 | Wed 18:00 - 20:00 (Weeks:1-10) | Law Building 202 (K-F8-202) | Ramya Kumar | z5427178@ad.unsw.edu.au |
| W18B | 4402 | Wed 18:00 - 20:00 (Weeks:1-10) | Law Building 275 (K-F8-275) | Zahra Donyavi | z.donyavi@unsw.edu.au |
| W18C | 4403 | Wed 18:00 - 20:00 (Weeks:1-10) | Law Building 276 (K-F8-276) | Hadha Afrisal | hadha.afrisal@unsw.edu.au |
| W18D | 4404 | Wed 18:00 - 20:00 (Weeks:1-10) | Law Building 201 (K-F8-201) | Joffrey Ji | z5450981@ad.unsw.edu.au |
| W18E | 4405 | Wed 18:00 - 20:00 (Weeks:1-10) | Law Building 101 (K-F8-101) | Malher Patel | malhar.patel@unsw.edu.au |

# Important dates

- **First lecture:** Monday 2nd June 2025
- **Public holyday:** Monday 9th June 2025 – Guest video-lecture
- **Last lecture:** Monday 4th August 2025
- **Guest lecture:** Week 7, Monday 14th July 2025
- **Assignment 1:** open by Week 2, deadline Week 5 (discussion in week 6)
- **Assignment 2:** open by Week 6, deadline Week 9 (discussion in week 10)
- **Exam:** Exams period

# Assessment

- Assessment will consist of:
  - Assignment 1: 25%.
  - Assignment 2: 25%.
  - Final exam 50%.
- To pass, you must score:
  - A combined mark of at least 50/100.
  - At least 20/50 for the exam (or 40%).

# Student Conduct

- Assignments will be done individually.
  - Students must participate in the discussion.
- Late deliveries will be accepted subject to 5% discount per day from the results (including weekends and public holidays), for up to 5 days, after which mark is 0.
- It's students' responsibility to have code discussions with tutors in time.
- Plagiarism is academic misconduct.

# Contact
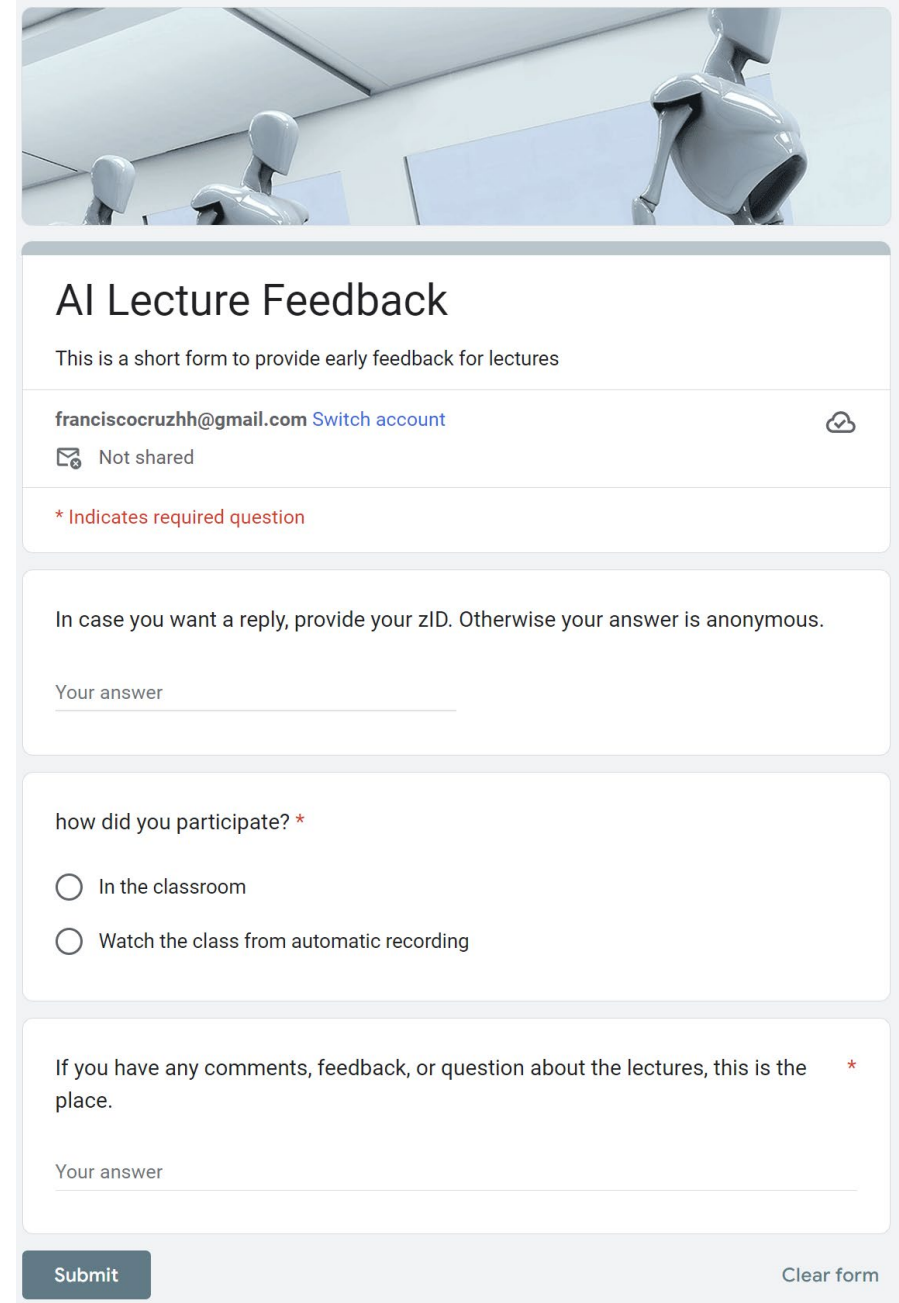
- The first contact should be the forums.
- In special circumstances you could also email to the lecturing team (cs9414@cse.unsw.edu.au)

# Texts & References

- Poole, D.L. & Mackworth, A. Artificial Intelligence: Foundations of Computational Agents. Second Edition. Cambridge University Press, Cambridge, 2017.

- Russell, S.J. & Norvig, P. Artificial Intelligence: A Modern Approach. Fourth Edition, Pearson Education, Hoboken, NJ, 2021.

- Sutton, R. & Barto, A. Reinforcement Learning: An Introduction. MIT press. 2018.

- Jurafsky, D. & Martin, J. H. Speech and Language Processing. Stanford. 2023.

# Feedback

- In case you want to provide anonymous feedback on these lectures, please visit:

- https://forms.gle/KBkN744QuffuAZLF8



## AI Lecture Feedback

This is a short form to provide early feedback for lectures

franciscocruzhh@gmail.com  Switch account

Not shared

* Indicates required question

In case you want a reply, provide your zID. Otherwise your answer is anonymous.

Your answer

how did you participate? *

○ In the classroom

○ Watch the class from automatic recording

If you have any comments, feedback, or question about the lectures, this is the place. *

Your answer

Submit                                    Clear form