

# Artificial Intelligence

COMP9414

# Lecturers

- Dr. Francisco Cruz (LiC – Lecturer in Charge)
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- Dr. Armin Chitizadeh (Guest Lecturer in week 3)
  - <https://www.unsw.edu.au/staff/armin-chitizadeh>



# Course admin

- Maryam Hashemi
  - <https://maryamhashemi1995.github.io/index3.html>



# Tutors

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  - Ramya Kumar, [ramya.kumar1@student.unsw.edu.au](mailto:ramya.kumar1@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/](https://taggi.cse.unsw.edu.au/FAQ/Borrow_A_Laptop/)

# Artificial Intelligence (AI)

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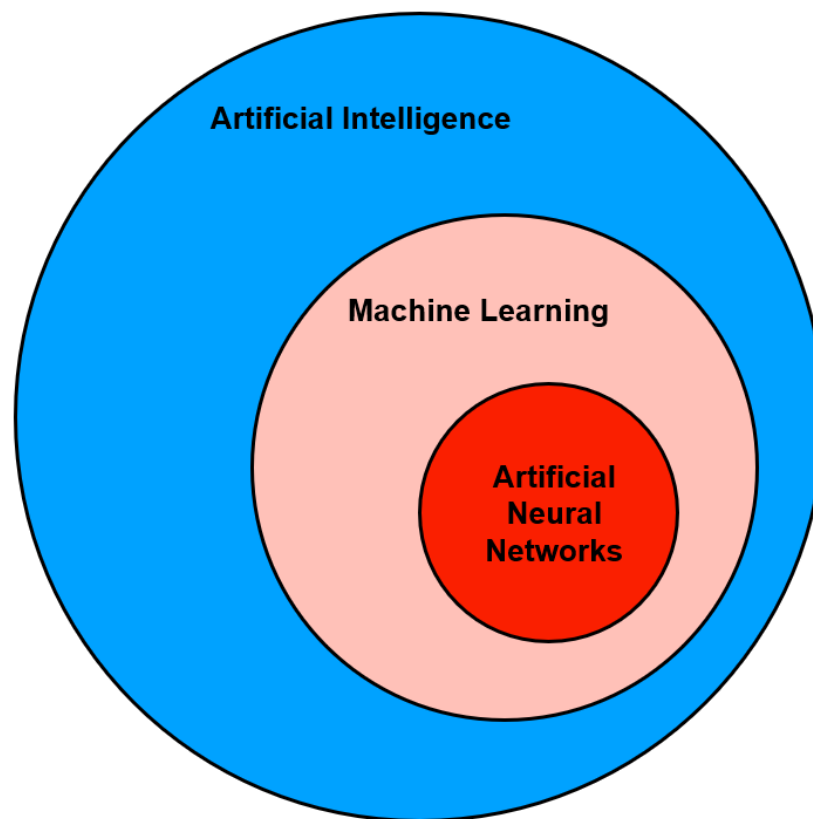
- What is intelligence?
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- What is artificial intelligence?
  - Artificial intelligence (AI) is intelligence demonstrated by machines, as opposed to intelligence displayed by humans or by other animals [Wikipedia].



# Artificial Intelligence (AI)

- What is intelligence?
  - it can be described as the ability to perceive or infer information, and to retain it as knowledge to be applied towards adaptive behaviours within an environment or context [Wikipedia].
- What is artificial intelligence?
  - 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

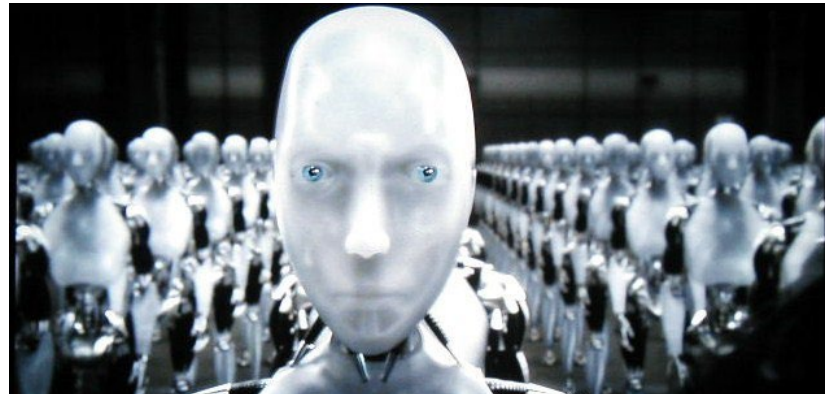




AI is not Python

# Current (mis)understanding of AI

How are currently perceived AI-based systems?



# Current (mis)understanding of AI

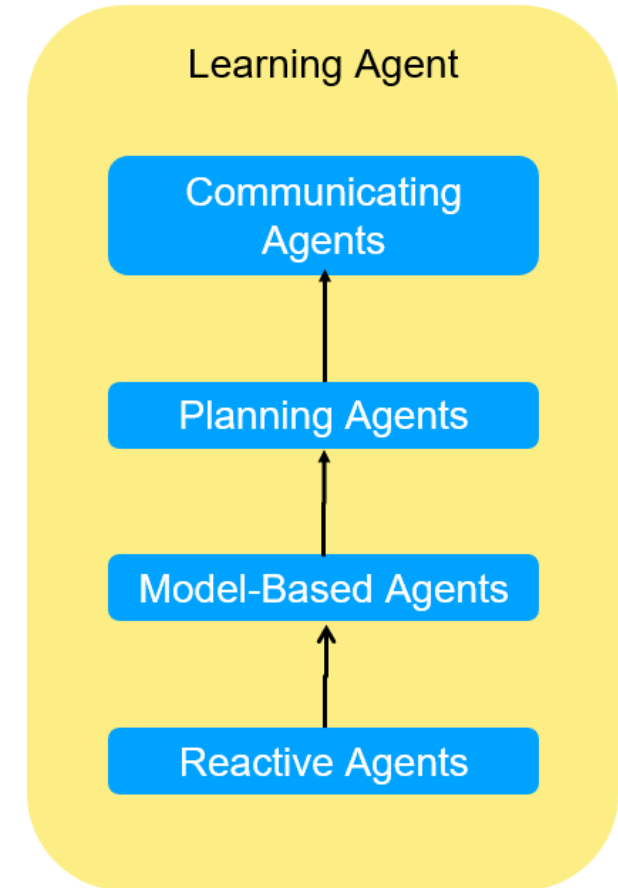
But in reality, it's still an open problem





# 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 Neural Networks

#### 2.1 Neurons - biological and artificial

#### 2.2 Single-layer perceptron

#### 2.3 Linear separability

#### 2.4 Multi-layer networks

#### 2.5 Backpropagation

#### 2.6 Neural engineering methodology

## Week 3

### 3 Search

#### 3.1 Uninformed search

#### 3.2 Informed search

#### 3.3 Informed vs uninformed

## 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 4:00 – 7:00pm  
(E19 Patricia O'Shane 109)
- Consultation time:
  - Thu 1:00 – 2:00pm  
(J17 Lv 5 Rm 510J)
- Tutorials:

Nr.	Class	Section	Room	Day/Time	Name
1	<a href="#">4210</a>	<a href="#">F12A</a>	Colombo LG01 (K-B16-LG01)	Fri 12:00 - 14:00 (Weeks:1-10)	Siti Mariyah
2	<a href="#">4211</a>	<a href="#">F12B</a>	Goldstein G01 (K-D16-G01)	Fri 12:00 - 14:00 (Weeks:1-10)	Malhar Patel
3	<a href="#">4212</a>	<a href="#">F14A</a>	Webster 302 (K-G14-302)	Fri 14:00 - 16:00 (Weeks:1-10)	Stefano Mezza
4	<a href="#">4213</a>	<a href="#">F14B</a>	Quadrangle G046 (K-E15-G046)	Fri 14:00 - 16:00 (Weeks:1-10)	Janhavi Jain
5	<a href="#">4214</a>	<a href="#">F14C</a>	Goldstein G01 (K-D16-G01)	Fri 14:00 - 16:00 (Weeks:1-10)	Adam Stucci
6	<a href="#">4215</a>	<a href="#">F16A</a>	Quadrangle G046 (K-E15-G046)	Fri 16:00 - 18:00 (Weeks:1-10)	Janhavi Jain
7	<a href="#">4216</a>	<a href="#">F18A</a>	Online (ONLINE)	Fri 18:00 - 20:00 (Weeks:1-10)	Jingying Gao
8	<a href="#">4217</a>	<a href="#">H14A</a>	Quadrangle G032 (K-E15-G032)	Thu 14:00 - 16:00 (Weeks:1-10)	Shengyuan Xie
9	<a href="#">4218</a>	<a href="#">H14B</a>	Webster 256 (K-G14-256)	Thu 14:00 - 16:00 (Weeks:1-10)	Adam Stucci
10	<a href="#">4219</a>	<a href="#">H14C</a>	Quadrangle G031 (K-E15-G031)	Thu 14:00 - 16:00 (Weeks:1-10)	Malhar Patel
11	<a href="#">4220</a>	<a href="#">H16A</a>	Blockhouse G6 (K-G6-G6)	Thu 16:00 - 18:00 (Weeks:1-10)	Siti Mariyah
12	<a href="#">4221</a>	<a href="#">H18A</a>	Law Building 163 (K-F8-163)	Thu 18:00 - 20:00 (Weeks:1-10)	Jingying Gao
13	<a href="#">4223</a>	<a href="#">T09A</a>	Quadrangle G047 (K-E15-G047)	Tue 09:00 - 11:00 (Weeks:1-10)	Zahra Donyavi
14	<a href="#">4224</a>	<a href="#">T12A</a>	Colombo LG01 (K-B16-LG01)	Tue 12:00 - 14:00 (Weeks:1-10)	Maher Mesto
15	<a href="#">4225</a>	<a href="#">T12B</a>	Old Main Building 229 (K-K15-229)	Tue 12:00 - 14:00 (Weeks:1-10)	Raktim Kumar Mondol
16	<a href="#">4226</a>	<a href="#">T12C</a>	Webster 302 (K-G14-302)	Tue 12:00 - 14:00 (Weeks:1-10)	Stefano Mezza
17	<a href="#">4227</a>	<a href="#">T16A</a>	Quadrangle G044 (K-E15-G044)	Tue 16:00 - 18:00 (Weeks:1-10)	Shengyuan Xie
18	<a href="#">4228</a>	<a href="#">T16B</a>	Quadrangle G045 (K-E15-G045)	Tue 16:00 - 18:00 (Weeks:1-10)	Zahra Donyavi
19	<a href="#">4229</a>	<a href="#">T16C</a>	Quadrangle G031 (K-E15-G031)	Tue 16:00 - 18:00 (Weeks:1-10)	Raktim Kumar Mondol
20	<a href="#">4230</a>	<a href="#">T16D</a>	Quadrangle G032 (K-E15-G032)	Tue 16:00 - 18:00 (Weeks:1-10)	Aayush Gupta
21	<a href="#">4231</a>	<a href="#">T18A</a>	Webster 302 (K-G14-302)	Tue 18:00 - 20:00 (Weeks:1-10)	Aayush Gupta
22	<a href="#">4232</a>	<a href="#">W09A</a>	Goldstein G02 (K-D16-G02)	Wed 09:00 - 11:00 (Weeks:1-10)	Kiran Jeet Kaur
23	<a href="#">4233</a>	<a href="#">W13A</a>	Online (ONLINE)	Wed 13:00 - 15:00 (Weeks:1-10)	Stefano Mezza
24	<a href="#">4234</a>	<a href="#">W13B</a>	Quadrangle G032 (K-E15-G032)	Wed 13:00 - 15:00 (Weeks:1-10)	Kiran Jeet Kaur
25	<a href="#">12564</a>	<a href="#">W12A</a>	Online (ONLINE)	Wed 12:00 - 14:00 (Weeks:1-10)	Lina Phaijit
26	<a href="#">12565</a>	<a href="#">T16E</a>	Online (ONLINE)	Tue 16:00 - 18:00 (Weeks:1-10)	Zhijin Meng
27	<a href="#">12696</a>	<a href="#">H18B</a>	Mathews 106 (K-F23-106)	Thu 18:00 - 20:00 (Weeks:1-10)	Ramya Kumar
28	<a href="#">12695</a>	<a href="#">T18B</a>	Ainsworth 101 (K-J17-101)	Tue 18:00 - 20:00 (Weeks:1-10)	Maher Mesto
29	<a href="#">12693</a>	<a href="#">W18A</a>	Ainsworth 201 (K-J17-201)	Wed 18:00 - 20:00 (Weeks:1-10)	Zhijin Meng
30	<a href="#">12694</a>	<a href="#">W18B</a>	Mathews 108 (K-F23-108)	Wed 18:00 - 20:00 (Weeks:1-10)	Ramya Kumar

# Important dates

- **First lecture:** Monday 27th May 2024
- **Last lecture:** Monday 29th July 2024
- **Guest lecture:** Friday 7th June 2024, 9am-12pm (online)
- **Assignment 1 open:** Week 2
- **Assignment 1 deadline:** Week 5 (discussion in week 6)
- **Assignment 2 open:** Week 6
- **Assignment 2 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.

# 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.
- Additionally, a consultation time is scheduled every week.
- In special circumstances you could also email to the lecturing team ([cs9414@cse.unsw.edu.au](mailto: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