COMP329

Artificial Intelligence

S2 Day 2019

Dept of Computing

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General Information

Unit convenor and teaching staff

Convenor
Rolf Schwitter
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Tutor
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Credit points
3

Prerequisites
(39cp at 100 level or above) including (COMP225 or COMP229 or COMP249)

Corequisites

Co-badged status

Unit description
Artificial Intelligence (AI) is a well-established field that studies how computers and computer software capable of exhibiting intelligent behaviour can be designed. In this unit students will be exposed to fundamental concepts in AI such as agent architecture, knowledge representation, planning and search, as well as their application in some topical domains. Upon completion of this unit students will be able to apply problem-solving strategies that are required to build intelligent systems.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Describe the roles of various search techniques in AI and use appropriate tools to implement them.

Explain and implement basics of machine learning and neural networks.

Explain biologically inspired algorithms and their roles in AI, and implement some such algorithms in different contexts including adversarial games.

Describe the role that uncertainty plays in AI, and demonstrate ability for sound reasoning of different sorts from uncertain knowledge.

General Assessment Information

The assessment of this unit consists of one diagnostic test, two assignments and a final exam. The diagnostic test will be carried out online in iLearn. You will submit the solutions to the two assignments via iLearn by the due date. The final examination is a closed book examination, and will be taken in person on the appropriate date.

Late Submission

No extensions will be granted without an approved application for Special Consideration. There will be a deduction of 10% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission of the assignment is late. For example, 25 hours late in submission for an assignment worth 10 marks – 20% penalty or 2 marks deducted from the total. No submission will be accepted after solutions have been posted.

Supplementary Exam

If you receive Special Consideration for the final exam, a supplementary exam will be scheduled after the normal exam period, following the release of marks. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration

approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

Assessment Standards

COMP329 will be assessed and graded according to the University assessment and grading policies.

The following general standards of achievement will be used to assess each of the assessment tasks with respect to the letter grades.

Pass: Can correctly reproduce facts and definitions across a breadth of concepts, but lacks depth of understanding. Can describe and/or employ search techniques in ways that are close to those discussed in lectures or notes. Can employ AI techniques to build a basic learning machine. Has basic understanding of biologically inspired algorithms and adversarial games. Has demonstrated some ability for sound reasoning in an uncertain domain.

Credit/Distinction: As for Pass plus: Exhibits breadth and depth of understanding of concepts. Can proficiently describe and/or employ search techniques going beyond how they were discussed in lectures or notes. Can employ AI techniques to a build very good learning machine. Has excellent understanding of biologically inspired algorithms and adversarial games, and can easily employ the former to develop strategies for the latter. Has excellent understanding of the role uncertainty plays in AI and demonstrated excellence for sound reasoning in uncertain domains.

High Distinction: As for Credit/Distinction plus: Is aware of the context in which the concepts are developed and their limitations. Can cogently describe in their own words and efficiently employ search techniques, going well beyond how they were discussed in lectures or notes. Can employ AI techniques to build an excellent learning machine. Has outstanding understanding of biologically inspired algorithms and adversarial games, and can easily employ the former to develop and evaluate strategies for the latter. Has excellent understanding of the role uncertainty plays in AI and has outstanding ability for sound reasoning in uncertain domains.

Assessment Process

These assessment standards will be used to give a numeric mark to each assessment submission during marking. The mark will correspond to an appropriate letter grade when relevantly weighted. The final mark for the unit will be calculated by combining the marks for all assessment tasks according to the percentage weightings shown in the assessment summary.

Assessment Tasks

Name	Weighting	Hurdle	Due
Diagnostic Test	5%	No	Week 4
Assignment 1	20%	No	Week 8

Name	Weighting	Hurdle	Due
Assignment 2	20%	No	Week 13
Final Examination	55%	No	TBA

Diagnostic Test

Due: **Week 4**
Weighting: **5%**

This diagnostic test will give early feedback on students' understanding of basic AI concepts (in particular search) and Python programming skills (#1).

On successful completion you will be able to:

- Explain and implement basics of machine learning and neural networks.

Assignment 1

Due: **Week 8**
Weighting: **20%**

The first assignment will require students to demonstrate their skills in employing their knowledge of neural networks (#2), and programming in Python (#1).

On successful completion you will be able to:

- Explain and implement basics of machine learning and neural networks.

Assignment 2

Due: **Week 13**
Weighting: **20%**

This assignment will require students to demonstrate their skills in employing their knowledge of biologically inspired algorithms to develop strategies for adversarial games (#3), and programming in Python (#1).

On successful completion you will be able to:

- Explain biologically inspired algorithms and their roles in AI, and implement some such algorithms in different contexts including adversarial games.

Final Examination

Due: **TBA**
Weighting: **55%**

The final examination will assess all the four learning outcomes. With regards to learning

outcomes #1, #2 and #3, it allows to accurately assess the appreciation of good programming and problem solving skills. With regards to learning outcome #2, #3 and #4, it will assess students' understanding of fundamental concepts such as different types of search, games and inferences.

On successful completion you will be able to:

- Describe the roles of various search techniques in AI and use appropriate tools to implement them.
- Explain and implement basics of machine learning and neural networks.
- Explain biologically inspired algorithms and their roles in AI, and implement some such algorithms in different contexts including adversarial games.
- Describe the role that uncertainty plays in AI, and demonstrate ability for sound reasoning of different sorts from uncertain knowledge.

Delivery and Resources

Classes

Each week you should attend three hours of lectures, a tutorial class and a practical session. For details of days, times and rooms consult the timetables webpage. Students are urged to actively participate in the tutorials; this helps enhancing the understanding by students.

Note that practicals and tutorials commence in week 2. You should have selected a practical session and a tutorial session during enrolment. You should attend the sessions you are enrolled in.

Texts

There is no set textbook for the unit. The following are recommended readings. Lecturers may recommend other references.

S. Russell and P. Norvig. Artificial Intelligence: A Modern Approach, Prentice-Hall, 2009.

Poole, D. and Mackworth, AK. Artificial Intelligence - Foundations of Computational Agents. Cambridge University Press 2017. (Available free of charge at: https://artint.info/2e/html/ArtInt2e.html under a Creative Commons Attribution-Noncommercial-No Derivative Works 2.5 Canada License.)

For some parts of learning, the necessary reading (book chapters, software documentation, papers, etc.) will be made available on iLearn.

Unit Webpage and Technology Used and Required

COMP329 uses iLearn for delivery of class materials, discussion boards, submission of

assessment tasks and access to marks and comments. Students should check the iLearn site regularly for unit updates.

Questions that are of are of potential interest to other students in this unit, such as queries regarding the content of this unit, its tutorials or practicals, should be posted on discussion forum on iLearn.

The practical work in this unit mostly involves programming in Python3, and will require some packages purpose packages relevant to AI. Instructions will be provided on how to use Python3 and these packages on the laboratory machines and how to download them for use on your own machines

Unit Schedule

Tentative Schedule

Week	Topic	Reading Material
1	Unit Organisation and Introduction to AI	Lecturer Supplied
2-4	Search in AI	Lecturer Supplied
5-7	Learning Machines and Neural Networks	Lecturer Supplied
8	Evolutionary Algorithms	Lecturer Supplied
9-10	Adversarial Games and Multi-Agent Systems	Lecturer Supplied
11-12	Uncertainty in AI	Lecturer Supplied
13	Revision	

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public

- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Explain and implement basics of machine learning and neural networks.
- Explain biologically inspired algorithms and their roles in AI, and implement some such algorithms in different contexts including adversarial games.
- Describe the role that uncertainty plays in AI, and demonstrate ability for sound reasoning of different sorts from uncertain knowledge.

Assessment tasks

- Assignment 1
- Assignment 2

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Describe the roles of various search techniques in AI and use appropriate tools to implement them.
- Explain and implement basics of machine learning and neural networks.

- Explain biologically inspired algorithms and their roles in AI, and implement some such algorithms in different contexts including adversarial games.
- Describe the role that uncertainty plays in AI, and demonstrate ability for sound reasoning of different sorts from uncertain knowledge.

Assessment tasks

- Diagnostic Test
- Assignment 1
- Assignment 2
- Final Examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Describe the roles of various search techniques in AI and use appropriate tools to implement them.
- Explain biologically inspired algorithms and their roles in AI, and implement some such algorithms in different contexts including adversarial games.
- Describe the role that uncertainty plays in AI, and demonstrate ability for sound reasoning of different sorts from uncertain knowledge.

Assessment tasks

- Assignment 1
- Assignment 2
- Final Examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Describe the roles of various search techniques in AI and use appropriate tools to implement them.
- Explain and implement basics of machine learning and neural networks.
- Explain biologically inspired algorithms and their roles in AI, and implement some such algorithms in different contexts including adversarial games.
- Describe the role that uncertainty plays in AI, and demonstrate ability for sound reasoning of different sorts from uncertain knowledge.

Assessment tasks

- Diagnostic Test
- Assignment 1
- Assignment 2
- Final Examination

Changes from Previous Offering

In contrast to 2018, we restructured the first half of the unit. We now first teach universal search techniques for problem solving in AI with a stronger focus on Python programming (Week 2-4), followed by lectures on learning machines and neural networks (Week 5-7) (and not the other way around). We also re-introduced an early diagnostic test that will give students feedback on their understanding of search algorithms and their Python programming skills at the beginning of the semester. The diagnostic test is worth 5%, the two assignments 20% each, and the final exam 55%.