



# COMP6410

## Knowledge, Planning and Decision Making under Uncertainty

Session 2, In person-scheduled-weekday, North Ryde 2024

*School of Computing*

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#### Disclaimer

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## General Information

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Credit points

10

Prerequisites

COMP6400

Corequisites

Co-badged status

COMP3410

### Unit description

Solution to many interesting problems in the real world involves decision making under uncertainty, since intelligent agents often have to choose actions based on information that is incomplete, and whose outcomes are unknown. In this unit students will be exposed to fundamental concepts in AI such as intelligent agents, knowledge representation, and planning as well as the problem of dealing with uncertainty about the state of the world from a computational perspective. Upon completion of this unit students will be able to apply problem-solving strategies that are required to build intelligent decision support systems in various contexts.

## 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:

**ULO1:** Describe the roles of various search techniques in AI and use appropriate tools to implement them.

**ULO2:** Demonstrate an understanding of the capabilities of different knowledge representation formalisms for optimal decision making.

**ULO3:** Explain biologically inspired algorithms and their roles in AI, and implement such algorithms in different contexts including adversarial games.

**ULO4:** 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 two quizzes, two individual assignments and a final exam. The quizzes will be carried out online in iLearn. You will submit the solutions to the two assignments via iLearn by the due date. Details will be in iLearn. The form and date of the final examination will be announced later in the semester.

## Late Assessment Submission Penalty

**From 1 July 2022, Students enrolled in Session based units with written assessments will have the following late penalty applied. Please see <https://students.mq.edu.au/study/assessment-exams/assessments> for more information.**

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7<sup>th</sup> day (including weekends). After the 7<sup>th</sup> day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at **11:55 pm**. A

1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

In this unit, late submissions will be accepted as follows:

- Quiz 1: NO, unless Special Consideration is granted
- Quiz 2: NO, unless Special Consideration is granted
- Assignment 1: YES, Standard Late Penalty applies
- Assignment 2: YES, Standard Late Penalty applies

## Supplementary Exam

In general, 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.

## Requirements to Pass this Unit

To pass this unit you must:

- Achieve a total mark equal to or greater than 50%

## Assessment Standards

This unit will be assessed and graded according to the University assessment and grading policies. There is no hurdle assessment in this unit. The final grade is determined by the total mark the student obtains in all the assessment tasks they completed as follows:

- HD (High Distinction): 85-100
- D (Distinction): 75-84
- CR (Credit): 65-74
- P (Pass): 50-64
- F (Fail): 0-49

## Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through [ask.mq.edu.au](mailto:ask.mq.edu.au).

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Quiz 1</a>	10%	No	11:55 pm Friday Week 5
<a href="#">Assignment 1</a>	20%	No	11:55 pm Friday Week 8
<a href="#">Quiz 2</a>	10%	No	11:55 pm Friday Week 10
<a href="#">Assignment 2</a>	20%	No	11:55 pm Friday Week 13
<a href="#">Final exam</a>	40%	No	On-campus written exam

### Quiz 1

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **11:55 pm Friday Week 5**

Weighting: **10%**

This quiz serves as preparation for Assignment 1

On successful completion you will be able to:

- Describe the roles of various search techniques in AI and use appropriate tools to implement them.
- Demonstrate an understanding of the capabilities of different knowledge representation formalisms for optimal decision making.

### Assignment 1

Assessment Type <sup>1</sup>: Programming Task

Indicative Time on Task <sup>2</sup>: 20 hours

Due: **11:55 pm Friday Week 8**

Weighting: **20%**

This assignment will require students to demonstrate their skills in employing their skills in a knowledge representation task, and programming in Python.

On successful completion you will be able to:

- Describe the roles of various search techniques in AI and use appropriate tools to implement them.
- Demonstrate an understanding of the capabilities of different knowledge representation formalisms for optimal decision making.

## Quiz 2

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **11:55 pm Friday Week 10**

Weighting: **10%**

This quiz serves as preparation for Assignment 2.

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

## Assignment 2

Assessment Type <sup>1</sup>: Programming Task

Indicative Time on Task <sup>2</sup>: 20 hours

Due: **11:55 pm Friday 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, and programming in Python.

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

## Final exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 40 hours

Due: **On-campus written exam**

Weighting: **40%**

The final exam will focus on the theoretical aspects of the unit. There will be few questions about implementation issues.

On successful completion you will be able to:

- Describe the roles of various search techniques in AI and use appropriate tools to implement them.
- Demonstrate an understanding of the capabilities of different knowledge representation formalisms for optimal decision making.
- Explain biologically inspired algorithms and their roles in AI, and implement 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.

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<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Classes

Each week you should attend two hours of lectures, and starting with the second week a SGTA class and a practical session. For details of days, times and rooms consult the [timetables webpage](#). Students are urged to actively participate in the SGTAs; this helps enhancing their understanding of the material.

Note that practicals and SGTAs commence in week 2. You should have selected a practical session and a SGTA 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, 2020.

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

This unit 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 potential interest to other students in this unit, such as queries regarding the content of this unit, its SGTAs 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 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.

## Methods of Communication

We will communicate with you via your university email or through announcements on iLearn. Queries to teaching staffs can either be placed on the iLearn discussion board or sent emails from your university email address.

## COVID Information

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirus-faqs>. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

## Unit Schedule

Week	Topic	Reading Material
1-4	Search and Planning in AI	Lecturer Supplied
5-6	Knowledge Representation	Lecturer Supplied



Week	Topic	Reading Material
7-8	Adversarial Games and Multi-Agent Systems	Lecturer Supplied
Recess		
9	Adversarial Games and Multi-Agent Systems (cont'd)	
10-12	Uncertainty in AI	Lecturer Supplied
13	Revision and Exam Preparation	
Exam		

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). 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](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

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

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/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 [connect.mq.edu.au](https://connect.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

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

### The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support](#) including information about finances, tenancy and legal issues
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

## Student Enquiries

Got a question? Ask us via the [Service Connect Portal](#), or contact [Service Connect](#).

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](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.

## Changes from Previous Offering

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

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Unit information based on version 2024.01R of the [Handbook](#)