



COMP8221

Advanced Machine Learning

Session 2, In person-scheduled-weekday, North Ryde 2026

School of Computing

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General Information

Unit convenor and teaching staff

Lecturer & Unit Convenor

Qiongkai Xu

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Lecturer

Zitai Qiu

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Credit points

10

Prerequisites

COMP6420 or Admission to the GradDipRes or GradCertRes

Corequisites

Co-badged status

Unit description

In contrast to other units focussing on foundations or applications of machine learning, this unit focusses on theoretical underpinnings of machine learning, and deep learning in particular, and the advanced techniques in machine learning that come from understanding them. The unit covers the theoretical properties of various kinds of machine learning approaches, and advanced techniques like autoencoders, representation learning, Generative Adversarial Networks and deep generative models.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals ([UNSDGs](#)) Industry, Innovation and Infrastructure

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: Explain the theoretical properties of a range of machine learning approaches.

ULO2: Explain various advanced techniques and architectures in machine learning, and

what kinds of problems they can be used to solve.

ULO3: Design and implement a solution to a problem requiring one of the advanced machine learning techniques.

General Assessment Information

Requirements to Pass this Unit

To pass this unit you must:

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

Release Dates

- Assignment 1 – To be released no later than 23rd Aug (by Week 4).
- Assignment 2 – To be released no later than 20th Sep (by Week 8).

Late submission Policy

- 5% penalty per day: If you submit your assessment late, 5% of the total possible marks will be deducted for each day (including weekends), up to 7 days.
 - Example 1 (out of 100): If you score 85/100 but submit 20 hours late, you will lose 5 marks and receive 80/100.
 - Example 2 (out of 30): If you score 27/30 but submit 1 day late, you will lose 1.5 marks and receive 25.5/30.
- After 7 days: Submissions more than 7 days late will receive a mark of 0.
- Extensions:
 - **Short Extension:** Some assessments are eligible for a short extension. You can only apply for a short extension before the due date.
 - **Special Consideration:** If you need more time due to serious issues and for any assessments that are not eligible for Short Extension, you must apply for Special Consideration.

Need help? Review the Special Consideration page [HERE](#)

Assessments where Late Submissions will be accepted

- Assignment 1 – YES, Standard Late Penalty applies
- Assignment 2 – YES, Standard Late Penalty applies
- Final exam – No, unless Special Consideration is Granted

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 <http://connect.mq.edu.au/>.

Generative AI

- **Open** These assessments do not restrict the application of AI tools. However, it is expected that the use of AI is acknowledged in an appropriate manner, similar to the expectation to provide references for other resources or tools that are used in producing your work. Any use of AI should comply with the University's [Responsible and Ethical Use of Artificial Intelligence Policy](#).

Details for each assignment will be available via iLearn

You are encouraged to:

- Set your personal deadline earlier than the actual one
- Keep backups of all your important files
- Ensure that no-one else picks up your printouts

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Assignment 1	30%	No	20/09/2026	Individual	Yes	Open
Assignment 2	30%	No	01/11/2026	Group	No	Open
Exam	40%	No	Exam Period	Individual	No	Observed

Assignment 1

Assessment Type [1](#): Experiential task

Indicative Time on Task [2](#): 30 hours

Due: **20/09/2026**

Weighting: **30%**

Groupwork/Individual: Individual

Short extension [3](#): Yes

AI Approach: Open

This assignment focuses on the design, implementation, and evaluation of a deep generative model. Students will choose one modeling approach and apply it to a relevant dataset. The project involves building the model, analyzing its performance, and presenting findings through visualizations and a written report.

On successful completion you will be able to:

- Explain the theoretical properties of a range of machine learning approaches.
- Design and implement a solution to a problem requiring one of the advanced machine learning techniques.

Assignment 2

Assessment Type ¹: Experiential task

Indicative Time on Task ²: 30 hours

Due: **01/11/2026**

Weighting: **30%**

Groupwork/Individual: Group

Short extension ³: No

AI Approach: Open

In this assignment, students will undertake an applied or research-based project in either Graph Neural Networks (GNNs) or Deep Reinforcement Learning (DRL). The project involves identifying a suitable problem or study, developing or adapting methods to address it, and documenting results in a comprehensive report supported by code.

On successful completion you will be able to:

- Explain the theoretical properties of a range of machine learning approaches.
- Design and implement a solution to a problem requiring one of the advanced machine learning techniques.

Exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 20 hours

Due: **Exam Period**

Weighting: **40%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

Demonstrate an understanding of a selection of topics covered in the unit.

On successful completion you will be able to:

- Explain the theoretical properties of a range of machine learning approaches.
- Explain various advanced techniques and architectures in machine learning, and what kinds of problems they can be used to solve.
- Design and implement a solution to a problem requiring one of the advanced machine learning techniques.

¹ 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
- [Academic Success](#) for academic skills support.

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

³ An automatic short extension is available for some assessments. Apply through the [Service Connect Portal](#).

Delivery and Resources

Classes

Basically, each week has two hours of lectures and two hours of workshops. Lectures will start in **week 1**. Workshops will start in **week 2**. For details of days, times and rooms see announcement in iLearn unit page.

Required and Recommended Texts

Most contents of the unit will be provided in lecture notes, workshop materials, and the following books:

- Jakub M. Tomczak, Deep Generative Modeling Mining of Massive Datasets. The book is available at [Deep Generative Modeling | Springer Nature Link](#).

Additional material including lecture notes will be made available during the semester. See the unit schedule for a listing of the most relevant reading for each week.

Unit Web Page

The unit web page will be hosted in iLearn, where you will need to log in using your Student One ID and password. The unit will make extensive use of discussion boards also hosted in iLearn. Please post questions there, they will be monitored by the staff on the unit.

Methods of Communication

We will communicate with you via your university email and through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to the unit convenor via the contact email on iLearn.

Unit Schedule

Week 1: Background for Machine Learning and Math.

Week 2-12: Lectures on Advanced Machine Learning.

Week 13: Review and Preparation for 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 or if you are a Global MBA student contact 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/>

Academic Success

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

- [Ask a Study Coach](#)
- [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 <https://students.mq.edu.au/support/technology/service-desk>.

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 since First Published

Date	Description
13/07/2026	Added terms for assessments where late submissions will be accepted (final exam) Added terms for Gen AI

Unit information based on version 2026.03 of the [Handbook](#)