



COMP8221

Advanced Machine Learning

Session 1, In person-scheduled-weekday, North Ryde 2024

School of Computing

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	3
<u>General Assessment Information</u>	3
<u>Assessment Tasks</u>	4
<u>Delivery and Resources</u>	5
<u>Unit Schedule</u>	6
<u>Policies and Procedures</u>	6
<u>Changes from Previous Offering</u>	8

Disclaimer

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General Information

Unit convenor and teaching staff

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Credit points

10

Prerequisites

COMP6420

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.

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

Requirement to Pass this Unit

To pass this unit, you must achieve a total mark equal to or greater than 50%.

Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is 11:55 pm. A 1-hour grace period will be 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, please apply for [Special Consideration](#).

Assignments where Late Submissions will be accepted/ not 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 ask.mq.edu.au.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	30%	No	Weeks 7-8
Assignment 2	30%	No	Weeks 11-12
Exam	40%	No	3-21 June, 2024

Assignment 1

Assessment Type ¹: Project

Indicative Time on Task ²: 30 hours

Due: **Weeks 7-8**

Weighting: **30%**

This assignment will require the design and implementation of an advanced machine learning technique to solve a particular problem, along with answering some related theory questions.

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: Project

Indicative Time on Task ²: 30 hours

Due: **Weeks 11-12**

Weighting: **30%**

This assignment will require the design and implementation of an advanced machine learning technique to solve a particular problem, along with answering some related theory questions.

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: **3-21 June, 2024**

Weighting: **40%**

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
- the [Writing Centre](#) 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

Delivery and Resources

Classes

Each week has two hours of lectures and two hours of workshops. For details of days, times and rooms consult your timetable, by visiting **Class Finder** on the homepage of [eStudent](#)).

Required and Recommended Texts

All required and recommended readings will be provided as part of the lecture material.

Unit Web Page

The unit web page will be hosted in [iLearn](#). You will need to log in to iLearn 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 or through announcements in [iLearn](#). Questions to convenors can either be placed on the iLearn discussion board or sent to the unit convenor from your university email address.

Technology Used and Required

We will make use of a range of modules that are available via the [Anaconda Python](#) distribution. We will introduce the relevant modules in the workshops as required.

This software is installed in the labs; you may also want to ensure that you have working copies of all the above on your own machine. Note that some of this software requires Internet access.

Many packages come in various versions; to avoid potential incompatibilities, you should install versions as close as possible to those used in the labs.

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 the semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

Unit Schedule

Week	Topic	Reading
1 - 2	Mathematical foundations of machine learning	Lecturer Supplied
3 - 5	Deep generative models (Variational Auto-Encoder, GAN, Diffusion Models)	Lecturer Supplied
6 - 8	Graph neural networks	Lecturer Supplied
9 - 11	Deep reinforcement learning	Lecturer Supplied
12	Quantum machine learning	Lecturer Supplied
13	Revision	Lecturer Supplied

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 ask.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/>

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 [AskMQ](#), 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/.

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

This is a new unit and there is no previous offering.

However, please note that 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.

Unit information based on version 2024.02 of the [Handbook](#)