



COMP8296

Artificial Intelligence and Machine Learning Techniques in IoT

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

School of Computing

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General Information

Unit convenor and teaching staff

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Credit points

10

Prerequisites

COMP6200

Corequisites

Co-badged status

Unit description

There has been a phenomenal increase in both the number of things connected to the internet of things and, data generated by these devices. The extensive volume of data that these devices generate, the diverse data that comes into an IoT system, and the velocity at which data is captured and collected by these devices create a unique set of challenges in terms of storage and processing requirements, and analytics for enterprises. This unit will discuss technologies and applications of how AI/ML techniques can be applied to augment the intelligence and the capabilities of IoT systems and applications. The unit will investigate various AI/ML algorithms and techniques that help to discover and demystify hidden patterns within large data sets in various levels of a large-scale IoT infrastructure. The unit will classify the different AI/ML algorithms used to handle IoT data in various IoT-based industry sectors such as health and manufacturing and will examine them in some detail. The unit will examine how resource constraints on small IoT devices affect the implementation of AI/ML algorithms.

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: Understand applications of Artificial Intelligence/Machine Learning techniques in IoT such as conserving bandwidth, conserving power, and increasing the intelligent capabilities of the IoT device.

ULO2: Design, implement, performance-test, and debug Artificial Intelligence/Machine Learning algorithms in the IoT domain.

ULO3: Apply data mining to intelligent processing and analysis of big data for optimization of IoT applications.

ULO4: Apply Artificial Intelligence/Machine Learning algorithms in the security and management of IoT devices.

ULO5: Apply Artificial Intelligence/Machine Learning in IoT from the cloud and edge down to the embedded device.

General Assessment Information

Requirements to Pass this Unit

In this unit, the final mark will be calculated by combining the marks for all assessment tasks according to the percentage weightings shown in the assessment summary. There are no hurdles in this unit. Concretely, in order to pass the unit, you must obtain an overall total mark of 50% or higher. Students obtaining a higher grade than a pass in this unit will (in addition to the above)

- have a total mark of 85% or higher to obtain High Distinction;
- have a total mark of 75% or higher to obtain Distinction;
- have a total mark of 65% or higher to obtain Credit.

This unit does not have hurdle assessments.

Late submission

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. The late submission rule was changed to align with the new Faculty policy.

For example, if the assignment is worth 8 marks (of the entire unit) and your submission is late by 19 hours (or 23 hours 59 minutes 59 seconds), 0.4 marks (5% of 8 marks) will be deducted. If your submission is late by 24 hours (or 47 hours 59 minutes 59 seconds), 0.8 marks (10% of 8

marks) will be deducted, and so on.

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](#).

Assessments where Late Submissions will be accepted

- Assignment 1 – YES, Standard Late Penalty applies
- Assignment 2 – YES, Standard Late Penalty applies
- Quizzes - YES, Standard Late Penalty applies

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.

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

Methods of Communication

The Unit Convenor / Lecturer will communicate with the Students via their respective Macquarie University's Email or through Announcements on iLearn. Queries may either be placed on the iLearn Discussion Board or be sent to the unit convenor via the contact email on iLearn.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	30%	No	Friday, Week 7 at 11:55 pm
Quizzes	30%	No	Lecture Quiz in Week 6 / Week 12 and Weekly Workshop Quiz
Assignment 2	40%	No	Friday, Week 11 at 11:55 pm

Assignment 1

Assessment Type ¹: Practice-based task

Indicative Time on Task ²: 30 hours

Due: **Friday, Week 7 at 11:55 pm**

Weighting: **30%**

Analysis and Problem Solving: The purpose of the problem solving assignment is to help the students to get accustomed to dealing with real world problem situations/issues. It is designed to help students analyse a particular problem and find its best solution

On successful completion you will be able to:

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- Design, implement, performance-test, and debug Artificial Intelligence/Machine Learning algorithms in the IoT domain.
- Apply data mining to intelligent processing and analysis of big data for optimization of IoT applications.
- Apply Artificial Intelligence/Machine Learning algorithms in the security and management of IoT devices.
- Apply Artificial Intelligence/Machine Learning in IoT from the cloud and edge down to the embedded device.

Quizzes

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 30 hours

Due: **Lecture Quiz in Week 6 / Week 12 and Weekly Workshop Quiz**

Weighting: **30%**

The Quiz is an in-class test. It is a formative assessment that can be used to measure students' knowledge and comprehension of unit materials. Quiz Question types include multiple choice, matching items, true/false, short answer and many more. Quizzes allow for formative assessment feedback on basic conceptual competence and therefore usually span multiple learning outcomes.

On successful completion you will be able to:

- Understand applications of Artificial Intelligence/Machine Learning techniques in IoT such as conserving bandwidth, conserving power, and increasing the intelligent capabilities of the IoT device.
- Apply Artificial Intelligence/Machine Learning algorithms in the security and management of IoT devices.
- Apply Artificial Intelligence/Machine Learning in IoT from the cloud and edge down to the embedded device.

Assignment 2

Assessment Type ¹: Practice-based task

Indicative Time on Task ²: 38 hours

Due: **Friday, Week 11 at 11:55 pm**

Weighting: **40%**

Design and implementation: Build a prototype using ML techniques to improve the IoT in real time.

On successful completion you will be able to:

- Understand applications of Artificial Intelligence/Machine Learning techniques in IoT such as conserving bandwidth, conserving power, and increasing the intelligent capabilities of the IoT device.
- Design, implement, performance-test, and debug Artificial Intelligence/Machine Learning algorithms in the IoT domain.
- Apply data mining to intelligent processing and analysis of big data for optimization of IoT applications.
- Apply Artificial Intelligence/Machine Learning in IoT from the cloud and edge down to the embedded device.

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

Lectures

On-campus (In-person) Lecture Sessions will be held from Week 1- 12. Lecture classes will be scheduled on Wednesdays from 3 PM to 5 PM, and the workshop classes will be scheduled on Thursdays from 5 PM to 7 PM.

The on-campus Lecture Sessions encourage students to engage in several brainstorming activities and discussions. Therefore, participation in these lecture sessions is of the essence and highly recommended.

Active engagement with the material is encouraged, supplementing understanding through provided lecture slides, personal notes, and suggested readings. This proactive approach is crucial for a robust comprehension of the syllabus topics and contributes to an enriched learning experience of using AI/ML in IoT.

Workshops

Workshops (In-person) commence from Week 2 and will offer students an opportunity to learn, develop, and subsequently practice concepts to the Unit's Content via Hands-on Tasks in a Lab Setting under the Supervision of the Demonstrator.

Each week you will be given several problems to work on; it is important that you keep up with these problems as doing so will help you understand the material in the unit and prepare you for the work in assignments. Workshops will also facilitate students to discuss their respective Problems effectively with the Peers and maximize the Feedback they get on their Work.

Assignments

Assignments will be made available on iLearn and will be submitted via Turnitin where students can see Turnitin similarity reports.

Two lecture quizzes will be given to contribute 20% to the overall score (10% for each one).

Weekly workshop quizzes will be given to contribute 10% to the overall score.

Recommended Text

Please be aware that there isn't a single textbook covering all the content for this unit. However, your lecturer will provide comprehensive reading materials and detailed notes corresponding to each week's lecture topics. These resources will be provided weekly for your convenience.

The Unit's Content has been drawn from the Research Papers, White Papers, and Standards' Documents. Students are, therefore, highly encouraged to read the recommended respective Weekly Reading List in a bid to gain a solid understanding of the Weekly Topics.

COVID Information

For latest information on the University's response to COVID-19, please refer to the Coronavirus Infection Page on the Macquarie University's [website](#). 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

Tentative Lecture Schedule

Week	Topic	Assessment Timelines
Week 1	Introduction to IoT and AI and ML	
Week 2	IoT and Data: Challenges	
Week 3	IoT Data Collection and Preprocessing	
Week 4	Fundamentals of AI/ML Techniques	
Week 5	Data Mining for IoT Optimization	
Week 6	AI/ML Algorithms for IoT Data Analytics	Lecture Quiz 1
Week 7	Advanced AI/ML Techniques for IoT- Part I	Assignment 1: Analysis and Problem Solving
Week 8	Advanced AI/ML techniques for IoT-II	
Week 9	AI/ML for Security and Management of IoT Devices	
Week 10	Ethical Considerations	
Week 11	Applications and Case Studies	Assignment 2: Design and implementation
Week 12	Advanced Topics on AI/ML Techniques in IoT Systems	Lecture Quiz 2
Week 13	Unit Review	

Note: We participate that there may be some shifting of material depending on class progress during the semester.

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.

Unit information based on version 2024.03 of the [Handbook](#)