Unit Outline

COMP3010 Machine Learning

Semester 1, 2022

Unit study package code:	COMP3010
Mode of study:	Internal
Tuition pattern summary:	Note: For any specific variations to this tuition pattern and for precise information refer to the Learning Activities section. Lecture: 1 x 2 Hours Weekly Tutorial: 1 x 1 Hours Weekly This unit does not have a fieldwork component.
Credit Value:	25.0
Pre-requisite units:	COMP1000 (v.0) Unix and C Programming or any previous version *OR* COMP1002 (v.0) Data Structures and Algorithms or any previous version *OR* 10163 (v.0) Unix and C Programming 120 or any previous version *OR* 1920 (v.0) Object Oriented Program Design 110 or any previous version
Co-requisite units:	Nil
Anti-requisite units:	Nil
Result type:	Grade/Mark
Approved incidental fees:	Information about approved incidental fees can be obtained from our website. Visit fees.curtin.edu.au/incidental_fees.cfm for details.

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Administrative contact:	**Name:**	EECMS Teaching Support
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Learning Management System: Blackboard (lms.curtin.edu.au)

Acknowledgement of Country

We respectfully acknowledge the Indigenous Elders, custodians, their descendants and kin of this land past and present. The Centre for Aboriginal Studies aspires to contribute to positive social change for Indigenous Australians through higher education and research.

Coronavirus (COVID-19) Update

Curtin University is committed to supporting all our students and staff whether they are on campus, working remotely or overseas. Your health, safety and wellbeing are our priority and the continuing COVID-19 pandemic may require changes to the unit schedule, learning activities, delivery modes and assessment to provide flexible and safe options to our community. Curtin will endeavour to keep changes and disruptions to a minimum at all times. For current advice and further information visit https://www.curtin.edu.au/novel-coronavirus/.

Syllabus

Machine learning, its formulation, main problems and approaches. Familiarity with the formulation of machine learning from data. Familiarity with fundamental machine learning approaches including linear regression, linear classifiers, support vector machines, decision tree methods, Bayesian networks. Familiarity with the fundamentals of advanced machine learning techniques including feedforward neural networks, convolutional neural networks, residual neural networks and their training techniques.

Introduction

Welcome to COMP3010 (Machine Learning). This unit will cover the underlying theory, implementation and applications of many algorithms used in machine learning .

It is important to be aware of updates to the delivery and assessments of this unit due to COVID-19 and social distancing restrictions.

Unit Learning Outcomes

All graduates of Curtin University achieve a set of six Graduate Capabilities during their course of study. These inform an employer that, through your studies, you have acquired discipline knowledge and a range of other skills and capabilities which employers would value in a professional setting. Each unit in your course addresses the Graduate Capabilities through a clearly identified set of learning outcomes. They form a vital part in the process referred to as assurance of learning. The learning outcomes notify you of what you are expected to know, understand or be able to do in order to be successful in this unit. Each assessment for this unit is carefully designed to test your knowledge of one or more of the unit learning outcomes. On successfully completing all of the assessments you will have achieved all of these learning outcomes.

Your course has been designed so that on graduating you will have achieved all of Curtin's Graduate Capabilities through the assurance of learning processes in each unit.

	On successful completion of this unit students can:	Graduate Capabilities addressed
1	Analyse and evaluate the main challenges and current approaches to machine learning	
2	Apply, design and test unsupervised learning methods for data analysis and feature extraction in machine learning	
3	Apply, design and test supervised learning methods for a given classification problem	
4	Analyse and evaluate statistical machine learning methods to address uncertainty in machine learning	
5	Apply, design and analyse deep learning architectures for classification problems	

Curtin's Graduate Capabilities

	Apply discipline knowledge, principles and concepts		Innovative, creative and entrepreneurial		Effective communicators with digital competency
	Globally engaged and responsive		Culturally competent to engage respectfully with local First Peoples and other diverse cultures		Industry connected and career capable

Find out more about Curtin's Graduate Capabilities at the Curtin Learning and Teaching website: clt.curtin.edu.au

Learning Activities

The lectures provide the theoretical foundations for achieving the unit learning outcomes. All interactive and collaborative activities will be in the in-person class. The tutorials further develop on the lectures to give students hands-on experience of the algorithms and the underlying theories. Note that students are expected to devote on average 10 quality hours a week to this unit. With only three contact hours, it is expected that to do well, students will spend, on average, an additional 7 quality hours a week in independent study to seek additional related materials that will extend and solidify their understanding of the topics covered in the contact hours. Simply memorising the materials presented during contact hours will not suffice. Be aware that the lecture slides alone are NOT a complete reference for this unit. Everything in the unit is subject to assessment, including what is said in the lectures, what is done in the tutorials, resources that are indicated during the lectures (verbally or on the slides) and resources that students are expected to find for themselves in the course of completing assignments and practicals. If you can't make it to a lecture, please watch the iLecture. Don't just look at the lecture slides and assume you've covered that lecture.

Learning Resources

Essential texts

The required textbook(s) for this unit are:

- *The Elements of Statistical Learning,* second edition, by Trevor Hastie, Robert Tibbshirani and Jerome Friedman.

  (ISBN/ISSN: 0387848576)
- *Dive into Deep Learning* by Aston Zhang, Zack C. Lipton, Mu Li and Alex J. Smola

  (ISBN/ISSN: N/A)

Online resources

- *The Elements of Statistical Learning,* second edition, by Trevor Hastie, Robert Tibbshirani and Jerome Friedman.

  (https://hastie.su.domains/ElemStatLearn/)

  (ISBN/ISSN: 0387848576)
- *Dive into Deep Learning* by Aston Zhang, Zack C. Lipton, Mu Li and Alex J. Smola

  (https://d2l.ai/)

  (ISBN/ISSN: N/A)

Assessment

Assessment policy exemptions

- There are no exemptions to the assessment policy

Assessment schedule

	Task	Value %	Date Due	Unit Learning Outcome(s) Assessed	Late Assessments Accepted?*	Assessment Extensions Considered?*
1	Practical Assignment	20%	**Week:** 11 **Day:** TBA **Time:** TBA	1,2,3	Yes	Yes
2	Mid Semester Test	30%	**Week:** 7 **Day:** TBA **Time:** TBA	1,2	No	No
3	Final Exam	50%	**Week:** Examination period **Day:** TBA **Time:** TBA	1,2,3,4,5	No	No

*Please refer to the Late Assessment and the Assessment Extension sections below for specific details and conditions.

Detailed information on assessment tasks

1. This assignment aims to test your ability to apply your knowledge on the contents of the lectures and tutorial sessions to practical applications. The assignment program, source code and electronic version of the written documentation/report will be submitted electronically by the due date. Details of the specific requirements will appear in the assignment specifications. To do well in this assessment, you need to understand the contents of the lecture notes AND the tutorial sessions. Remember that you are expected to devote an average of 10 quality hours a week to this unit; this implies an average of 7 hours a week on top of the contact time.

   This is an individual assignment. You should complete the assignment individually. Asking others (friends, family, tutors) for answers/solutions to questions/projects is contract cheating and not permitted. References are required for any content drawn from external sources. The written report will be checked through Turnitin and you may be requested to explain and/or demonstrate your solutions in your assignment.

2. This Test will be held during the lecture time of Week 7 and cover all material up to that point in the unit. NO MAKEUP (LATE/MISSED) MID-SEMESTER TEST WILL BE GIVEN. To pass the mid-semester test, you need to remember and understand the contents of the lecture notes AND the practical sessions. To do well in the mid-semester test you will also need to have done your own reading around the topic to gain an in-depth understanding. Remember that you are expected to devote an average of 10 quality hours a week to this unit; this implies an average of 7 hours a week on top of the contact time.
3. The examination covers all of the topics in this unit. You need to remember and understand the contents of the lecture notes AND the tutorial sessions. To do well you will also need to have done your own reading around the topic and your own experimentation and practice to gain an in-depth understanding. Remember that you are expected to devote an average of 10 quality hours a week to this unit; this implies an average of 7 hours a week on top of the contact time. It is expected that this time will be spent in selfguided study, using resources that you will be expected to locate yourself, both online and in printed form, to extend and solidify your understanding of the material.

Pass requirements

1. Gain a minimum of 20% of the marks of the assignment, AND
2. Gain a minimum of 40% in the final examination, AND
3. Gain an overall mark of 50% for the unit.

Note that the assessments contain detailed instructions. Accurately and precisely following these instructions constitute part of the assessment. Failure to follow these instructions precisely may result in a poor mark or no marks for sections of the assessment, or the assessment as a whole. Please ask for clarifications early.

Assessment Moderation

Fair assessment through moderation

Moderation describes a quality assurance process to ensure that assessments are appropriate to the learning outcomes, and that students work is evaluated consistently by assessors. Minimum standards for the moderation of assessments are described in the Assessment and Student Progression Manual, available from policies.curtin.edu.au/findapolicy/

Pre-marking moderation

This unit complies with moderation of assessments as described in the Assessment and Student Progression Manual, available from policies.curtin.edu.au/findapolicy/.

Intra-marking / Post-marking moderation

This unit complies with moderation of assessments as described in the Assessment and Student Progression Manual, available from policies.curtin.edu.au/findapolicy/.

Late assessment

Where the submission of a late assessment is permitted, late penalties will be consistently applied in this unit.

Where a late assessment **is** permitted for an assessment item or the entirety of the unit (refer to the Assessment Schedule table in this Unit Outline) and the student does not have an approved assessment extension:

1. For assessment items submitted within the first 24 hours after the due date/time, students will be penalised by a deduction of 5% of the total marks allocated for the assessment task;
2. For each additional 24 hour period commenced an additional penalty of 10% of the total marks allocated for the assessment item will be deducted; and
3. Assessment items submitted more than 168 hours late (7 calendar days) will receive a mark of zero.

Where late assessment **is NOT** permitted for an assessment item or the entirety of the unit (refer to the Assessment Schedule table in this Unit Outline) and the student does not have an approved assessment extension:

1. All assessment items submitted after the due date/time will receive a mark of zero.

Assessment extension

Where an application for an assessment extension **is** permitted for an assessment item(s) within this unit (refer to the Assessment Schedule table in this Unit Outline):

1. A student who is unable to complete an assessment item by/on the due date/time as a result of exceptional circumstances beyond the student's control, may apply for an assessment extension on the Assessment Extension Application Form as prescribed by the Academic Registrar. The form is available on the Forms page at https://students.curtin.edu.au/essentials/forms-documents/forms/ and also within the student's OASIS (My Studies tab – Quick Forms) account.
2. The student will be expected to submit their application for an Assessment Extension with supporting documentation via the online form.
3. Timely submission of this information supports the assessment process. For applications that are declined, delayed submission may have significant ramifications on the possible marks awarded.
4. An application may be accepted up to five working days after the due date/time of the assessment item where the student is able to provide a verifiable explanation as to why they were not able to submit the application prior to the assessment due date/time

Where an application for an assessment extension **is NOT** permitted for an assessment item(s) within this unit (refer to the Assessment Schedule table in this Unit Outline):

1. All assessment items submitted after the due date/time will be subject to late penalties or receive a mark of zero depending on the unit permitting late assessment submissions.

Deferred assessments

If your results show that you have been granted a deferred assessment you should immediately check OASIS for details.

Deferred examinations/tests will be held from 13/07/2022 to 22/07/2022 . Notification to students will be made after the Board of Examiners' meeting via the Official Communications Channel (OCC) in OASIS.

Further assessment

Further assessments, if granted by the Board of Examiners, will be held between 13/07/2022 and 22/07/2022 . Notification to students will be made after the Board of Examiners meeting via the Official Communications Channel in OASIS.

It is the responsibility of the student to be available to complete the requirements of a further assessment. If your results show that you have been granted a further assessment you should immediately check OASIS for details.

Reasonable adjustments for students with disabilities/health circumstances likely to impact on studies

A Curtin Access Plan (CAP) is a document that outlines the type and level of support required by a student with a disability or health condition to have equitable access to their studies at Curtin. Carers for people with disability may also be eligible for support. This support can include alternative exam or test arrangements, study materials in accessible formats, access to Curtin's facilities and services or other support as discussed with an advisor from AccessAbility Services.

Documentation is required from your treating Health Professional to confirm your health circumstances or carer responsibilities.

If you think you may be eligible for a CAP, please contact AccessAbility Services. If you already have a CAP please provide it to the Unit Coordinator in week 1 of each study period.

Referencing style

The referencing style for this unit is Chicago 17th B.

More information can be found on this style from the Library web site:
https://libguides.library.curtin.edu.au/uniskills/referencing/chicago17.

Privacy

As part of a learning or assessment activity, or class participation, your image or voice may be recorded or transmitted by equipment and systems operated by Curtin University. Transmission may be to other venues on campus or to others both in Australia and overseas.

Your image or voice may also be recorded by students on personal equipment for individual or group study or assessment purposes. Such recordings may not be reproduced or uploaded to a publicly accessible web environment. If you wish to make such recordings for study purposes as a courtesy you should always seek the permission of those who are impacted by the recording.

Recording of classes or course materials may not be exchanged or distributed for commercial purposes, for compensation, or for any other purpose other than personal study for the enrolled students in the unit. Breach of this may subject a student to disciplinary action under Statute No 10 – Student Disciplinary Statute.

If you wish to discuss this please talk to your Unit Coordinator.

Copyright

Academic Integrity (including plagiarism and cheating)

Academic Integrity

Curtin's Student Charter, Academic Integrity Program (AIP), and core Values guide expectations regarding student behaviour and responsibilities. Information on these topics can be found on the Academic Integrity Website.

Academic Integrity Warnings

An Academic Integrity Warning may be issued to a New-to-Curtin student in limited circumstances and only where misconduct is not involved.

Academic Misconduct

Staff members are required to report suspected misconduct. Academic Misconduct means conduct by a student that is dishonest or unfair in connection with any academic work. This includes all types of plagiarism, cheating, collusion, falsification or fabrication of content, and behaviours like falsifying medical certificates for extension. Contract cheating, the use of file sharing, translation services/apps, paraphrasing tools (text-spinners) and assignment help websites also may be considered academic misconduct. The longer term personal, social, and financial consequences of misconduct can be severe, so please ask for help if you are unsure.

If your work is the subject of an inquiry, you will be given an opportunity to respond and appropriate support will be provided. Academic work under inquiry will not be graded until the process has concluded. Penalties for misconduct may include a warning, a reduced or nil grade, a requirement to repeat the assessment, an annulled grade (ANN) or termination from the course. For more information refer to Statute No.10 Student Discipline and Academic Misconduct Rules.

Information and Communications Technology (ICT) Expectations

Curtin students are expected to have reliable internet access in order to connect to OASIS email and learning systems such as Blackboard and Library Services.

You may also require a computer or mobile device for preparing and submitting your work.

For general ICT assistance, in the first instance please contact OASIS Student Support: oasisapps.curtin.edu.au/help/general/support.cfm

For specific assistance with any of the items listed below, please contact The Learning Centre: life.curtin.edu.au/learning-support/learning_centre.htm

- Using Blackboard, the I Drive and Back-Up files
- Introduction to PowerPoint, Word and Excel

Additional information

Enrolment

It is your responsibility to ensure that your enrolment is correct - you can check your enrolment through the eStudent option on OASIS, where you can also print an Enrolment Advice.

Student Rights and Responsibilities

It is the responsibility of every student to be aware of all relevant legislation, policies and procedures relating to their rights and responsibilities as a student. These include:

- the Student Charter
- Values and Signature Behaviours
- the University's policy and statements on plagiarism and academic integrity
- copyright principles and responsibilities
- the University's policies on appropriate use of software and computer facilities

Information on all of the above is available through the University's "Student Rights and Responsibilities" website at: students.curtin.edu.au/rights.

Note: In Australia and other jurisdictions, students are required to complete a screening check prior to undertaking any activities that include children (e.g. surveying children at a school as part of a project). If this applies to you, start by contacting your unit coordinator for advice.

Student Equity

There are a number of factors that might disadvantage some students from participating in their studies or assessments to the best of their ability, under standard conditions. These factors may include a disability or medical condition (e.g. mental illness, chronic illness, physical or sensory disability, learning disability), significant caring responsibilities, pregnancy, religious practices, living in a remote location,or another reason. If you believe you may be unfairly disadvantaged on these or other grounds please contact the appropriate service below. It is important to note that the staff of the University may not be able to meet your needs if they are not informed of your individual circumstances, so please get in touch with the appropriate service if you require assistance.

To discuss your needs in relation to:

- Disability or medical conditions, contact AccessAbility Services: https://students.curtin.edu.au/personal-support/disability/
- Elite athletes, contact Elite Athlete Coordinator: https://stadium.curtin.edu.au/sport/academy/elite-athlete-program/
- All other grounds, contact the Student Wellbeing Advisory Service: https://students.curtin.edu.au/personal-support/counselling-guidance/wellbeing/

Recent unit changes

Students are encouraged to provide unit feedback through ***e*VALUate**, Curtin's online student feedback system. For more information about ***e*VALUate**, please refer to evaluate.curtin.edu.au/info/.

	To view previous student feedback about this unit, search for the Unit Summary Report at https://evaluate.curtin.edu.au/student/unit_search.cfm. See https://evaluate.curtin.edu.au/info/dates.cfm to find out when you can ***e*VALUate** this unit.

Recent changes to this unit include:

This is a new unit.

Program calendar

Program Calendar – Semester 1 2022

Week	Begin Date	Lecture	Tutorial	Assessment due
Orientation	21 February	Orientation Week		
1.	28 February	Introduction and Preliminaries	No Tutorial	
2.	7 March	Linear Regression and Classification	Tutorial 1	
3.	14 March	Multilayer Perceptions	Tutorial 2	
4.	21 March	Deep Learning Computation	Tutorial 3	
5.	28 March	Convolutional Neural Networks	Tutorial 4	
6.	4 April	Deep Learning Networks	Tutorial 5	
7.	11 April	Mid-Semester Test	Tutorial 6	Mid-Semester Test (30%)
8.	18 April	Tuition Free Week		
9.	25 April	Kernel Methods and Support Vector Machine	Tutorial 7	
10.	2 May	Decision Tree	Tutorial 8	
11.	9 May	Bayesian Networks	Tutorial 9	Assignment (20%)
12.	16 May	Unsupervised Learning	Tutorial 10	
13.	23 May	Revision	Demo of the Assignment	
14.	30 May	Study Week		
15.	6 June	Examinations		
16.	13 June	Examinations		

Note that this timetable is subject to change. Changes will be announced via Blackboard announcements and in the lectures (not necessarily at the same time or in that order).