School of Information and Physical Sciences

COMP3330: Machine Intelligence

Callaghan
Semester 1 - 2024

COURSE OUTLINE

OVERVIEW

Course Description

This course provides an introduction and overview of important concepts and applications in the fields of Machine Learning and Artificial Intelligence (AI). With the availability of fast computers, machine intelligence methods have found widespread applications in areas such as in Big Data and Autonomous Robots. This course will explore some of them, including systems where machine intelligence methods led to significant advancements, often surprising solutions, and sometimes triumphal success.

Academic Progress Requirements

Nil

Assumed Knowledge

The assumed knowledge is equivalent to that of a completed 2nd year Bachelor of Computer Science or a similar degree and should include: basic statistics and mathematics, including mean, standard deviation, vectors, dot product, hyperplanes, basic multivariable calculus, sets and basic first order logic. It also includes some basic programming skills in a language such as Python, Matlab, Java, C# or C/C++. The course will provide a brief mathematics workshop and a quick introduction to Python to refresh some of the assumed knowledge.

Contact Hours

Callaghan
Computer Lab
Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1

Lecture
Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1

Unit Weighting Workload

10
Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator

Callaghan
Prof Stephan Chalup
Stephan.Chalup@newcastle.edu.au
(02) 492 16080
Consultation:

Teaching Staff

Other teaching staff will be advised on the course Canvas site.

School Office

School of Information and Physical Sciences
SR233, Social Sciences Building
Callaghan
CESE-SIPS-Admin@newcastle.edu.au
+61 2 4921 5513
9am-5pm (Mon-Fri)

SYLLABUS

Course Content

1. Artificial Neural Networks and Deep Learning
2. Support Vector Machines
3. Autonomous Robots
4. Search and Prediction in Games
5. Evolutionary Algorithms
6. Automated Reasoning and Logic
7. Aspects of Advanced Machine Learning

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Critically reflect on ethics, opportunities and risks of current and future developments of Machine Learning and AI.

2. Explain central concepts of Machine Learning and AI.

3. Analyse a given task or data and select suitable Machine Learning and AI methods for processing.

4. Implement relevant code or apply standard libraries for Machine Learning and AI to selected tasks.

5. Produce detailed reports and presentations suitable to support research or business decision-making.

Course Materials

Recommended Reading:

- Russell, S. and Norvig, P.: Artificial Intelligence - A Modern Approach. Fourth Edition, Prentice Hall 2021.
- An extended list of recommended texts is provided on Canvas.

Required Reading:

- Required weekly readings are listed on Canvas.
- Lecture Materials: Lecture materials will be posted on Canvas.

COMPULSORY REQUIREMENTS

In order to pass this course, each student must complete ALL of the following compulsory requirements:

Contact Hour Requirements:

-

Course Assessment Requirements:

- Assessment 3 - (multi component): Pass requirement 40% - Must obtain 40% in this assessment item to pass the course.

Compulsory Placement and WHS Requirements:

-

SCHEDULE

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Project (multi component)	Part A: 27 May 2024, 5pm; Part B: Each team presents in a different week during class time (schedule will be available on Canvas).	Group	35%	1, 2, 3, 4, 5
2	Written Assessment (multi component)	11 April, 5 pm	Individual	25%	1, 2, 3
3	Quiz (multi component)*	Quiz 1: 22 March 2024, Quiz 2: 12 April 2024, Quiz 3: 17 May 2024, Quiz 4: 7 June 2024. Each quiz to be completed during first hour of allocated lab time; 60 minutes to complete once started.	Individual	40%	1, 2, 3

* This assessment has a compulsory requirement.

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Project (multi component)

Assessment Type Project

Purpose The project will assess your capacity to work in a team with other students to undertake planning, data preparation, running of computer simulation experiments, as well as their evaluation, critical analysis, and documentation. You will also be given the opportunity to be involved in a presentation.

Description This assessment has two parts as follows:
Part A (team project, 25%): You will work on an advanced machine learning project, demonstrate the outcomes, evaluate the results and discuss them critically. You are expected to produce and submit a group report based on the experimentation and evaluation of your project solutions. It is expected that you work on the project in a group of 2-5 students. Details will be provided on Canvas.

	Part B (team presentation, 10%): Your team will give a brief in-class presentation about a topic of your choice related to the history and philosophy of AI (HiPhi assignment).
Weighting	35%
Due Date	Part A: 27 May 2024, 5pm; Part B: Each team presents in a different week during class time (schedule will be available on Canvas).
Submission Method	Online
Assessment Criteria	See Canvas
Return Method	Not Returned
Feedback Provided	Online - .
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Written Assessment (multi component)

Assessment Type	Written Assignment
Purpose	The written assignment will assess your capacity to work on an introductory machine learning problem and produce and articulate concise documents which convey evidence-based understanding of the concepts and topics involved.
Description	You will work on an introductory machine learning project that performs classification with ANNs and SVMs on selected tasks in computer simulation experiments. You will be required to document the experiments and record your experimental findings in the style of a technical report or paper. This is an individual assignment to be completed by yourself. Details will be provided on Canvas.
Weighting	25%
Length	4-8 pages excluding Appendix
Due Date	11 April (5 pm)
Submission Method	Online
Assessment Criteria	See Canvas
Return Method	Not Returned
Feedback Provided	Online - .
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 3 – Quiz (multi component)

Assessment Type	Quiz
Purpose	This multi-component quiz is designed to examine the individual student's knowledge of the course material and their ability to describe, analyse and hypothesize from this material.
Description	The quiz can comprise several components that can be run during the semester. For example, there can be four 60 min quizzes of 10% weight that all have the format of online multiple-choice exams. In total the sum of all quiz components will have a weighting of 40% and correspond to an exam. Students whose overall mark in the course is 50% or more, but who score less than 40% in the compulsory item and thus fail to demonstrate the required proficiency, will be awarded a Criterion Fail grade, which will show as FF on their formal transcript. However, students in this position who have scored at least 25% in the compulsory assessment item will be allowed to undertake a supplementary 'capped' assessment in which they can score at most 50% of the possible mark for that item.
Weighting	40%
Compulsory Requirements	Pass requirement 40% - Must obtain 40% in this assessment item to pass the course..
Due Date	Quiz 1: 22 March 2024, Quiz 2: 12 April 2024, Quiz 3: 17 May 2024, Quiz 4: 7 June 2024. Each quiz to be completed during first hour of allocated lab time; 60 minutes to complete once started.
Submission Method	Online
Assessment Criteria	Multiple choice exam
Return Method	Not Returned

Feedback Provided	No Feedback - .
Opportunity to Reattempt	Students WILL be given the opportunity to reattempt this assessment.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure. In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule.

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35.

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the

online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:
https://policies.newcastle.edu.au/document/view-current.php?id=236

Important Policy Information

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University.

Other Information

Attendance and/or Other Class Requirements

Students are strongly advised to attend lectures and labs in order to gain a full understanding of the theoretical and practical skills required in this discipline. We have observed during the past years a marked correlation on performance and attendance to classes.
There are several reasons that compel us to motivate you to attend classes. If you attend you can ask questions and participate in the class discussions. There may be material additional to the Canvas notes which be delivered in lectures. It is also clear that students who miss lectures or labs may not be able to satisfactorily complete assessment items/exams and may fail the course.

Group Work

Assessment 1 will be completed as group work in a small team. Students will have to submit a statement that explains the structure of their group and their individual contribution. Details on teamsize, individual alternatives, marking guides and group management will be provided on Canvas. If you have any questions please email the course coordinator.

GRADUATE PROFILE STATEMENTS

The following table illustrates how this course contributes towards building the skills students will need to work in their profession.

Level of capability

- Level 1 indicates an introduction to a topic at a university level
- Levels 2 and 3 indicate progressive reinforcement of that topic
- Level 4 indicates skills commensurate with a graduate – entry to professional practice
- Level 5 indicates highly specialist or professional ability

Bachelor of Computer Science

	University of Newcastle Bachelor of Computer Science Graduate Profile Statement	Taught	Practised	Assessed	Level of capability
1	Knowledge of basic science and computer science fundamentals	X	X	X	4
2	In depth technical competence in the discipline of computer science	X	X	X	4
3	An ability to carry out problem analysis, requirements capture, problem formulation and integrated software development for the solution of a problem	X			3
4	Capacity to continue developing relevant knowledge, skills and expertise in computer science throughout their careers	X	X	X	3
5	An ability to communicate effectively with other Computer Scientists, Software Engineers, other professional disciplines, managers and the community generally	X	X	X	3
6	Ability to undertake and co-ordinate large computer science projects and to identify problems, their formulation and solution	X			3
7	Ability to function effectively as an individual, a team member in multidisciplinary and multicultural teams and as leader/manager with capacity to assist and encourage those under their direction	X	X		3
8	Understanding of social, cultural, global and business opportunities of the professional computer scientist; understanding the need for and principles of sustainability and adaptability				

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.