COIT20277 *Introduction to Artificial Intelligence*
Term 2 - 2024

Profile information current as at 29/07/2024 03:53 pm

General Information

Overview

Artificial intelligence is closely related to the field called soft computing which provides a foundation for the conception, design, and deployment of intelligent systems directed towards intelligence and autonomy. This unit introduces you to the fundamental concepts of artificial intelligence in the three prominent areas of fuzzy systems, artificial neural networks, and evolutionary computation. You will be introduced to topics of genetic algorithms, evolutionary programming, and genetic programming. You will also be introduced to the most commonly used neural network paradigms. You will learn the concepts of fuzzy sets and fuzzy logic, and approximate reasoning, as part of fuzzy systems. The theoretical concepts will be reinforced with hands-on experience during computer lab tutorials.

Details

Career Level: *Postgraduate*
Unit Level: *Level 9*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites

Pre-requisite: COIT20245 Introduction to Programming
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 2 - 2024

- Melbourne
- Online

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website

This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Postgraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 30%
2. **Written Assessment**
Weighting: 25%
3. **Written Assessment**
Weighting: 45%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Student Feedback

Feedback

Some students find it difficult to understand Particle Swarm Optimisation (PSO) and genetic programming.

Recommendation

A use case with sample coding will be helpful.

Feedback from Unit Coordinator Reflection

Feedback

Python is a more appropriate industry-standard programming language to prepare industry-ready graduates in AI.

Recommendation

Introduce Python and Cloud Technology to Solve AI Problems as per unit update plan.

Unit Learning Outcomes

On successful completion of this unit, you will be able to:

1. Model internal representation, performance criteria, and computational components identifying elements of authentic problems to apply neural, fuzzy or evolutionary computation
2. Create effective and efficient computational intelligence solutions to authentic problems
3. Evaluate the solution to a computational intelligence problem, analysing the merits and demerits of the chosen approach
4. Investigate the potential to enhance the model using one or more computational intelligence techniques.

The Australian Computer Society (ACS) recognises the Skills Framework for the Information Age (SFIA). SFIA provides a consistent definition of ICT skills. SFIA is adopted by organisations, governments, and individuals in many countries and is increasingly used when developing job descriptions and role profiles.
ACS members can use the tool MySFIA to build a skills profile at https://www.acs.org.au/professionalrecognition/mysfia-b2c.html.
This unit contributes to the following workplace skills as defined by SFIA. The SFIA code is included:

- Data modelling and design (DTAN)
- Software design (SWDN)
- Programming/Software Development (PROG)
- Testing (TEST)
- Application Support (ASUP)

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level ● Introductory Level ● Intermediate Level ● Graduate Level ◦ Professional Level ◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes			
	1	2	3	4
1 - Written Assessment - 30%	●	●		

Assessment Tasks	Learning Outcomes			
	1	2	3	4
2 - Written Assessment - 25%		•	•	•
3 - Written Assessment - 45%	•		•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes			
	1	2	3	4
1 - Knowledge	○	○	○	○
2 - Communication	○	○	○	○
3 - Cognitive, technical and creative skills	○	○	○	○
4 - Research				○
5 - Self-management	○	○	○	○
6 - Ethical and Professional Responsibility				
7 - Leadership				
8 - Aboriginal and Torres Strait Islander Cultures				

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes							
	1	2	3	4	5	6	7	8
1 - Written Assessment - 30%	○	○	○		○			
2 - Written Assessment - 25%	○	○	○		○			
3 - Written Assessment - 45%	○	○	○	○	○			

Textbooks and Resources

Textbooks

There are no required textbooks.

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Anaconda Data Science Platform (Individual - Free Distribution)

Referencing Style

All submissions for this unit must use the referencing style: American Psychological Association 7th Edition (APA 7th edition)
For further information, see the Assessment Tasks.

Teaching Contacts

Ambi Jayal Unit Coordinator
a.jayal@cqu.edu.au

Schedule

Week 1 - 08 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Introduction to Artificial Intelligence * Fundamental Use Cases for AI	Artificial Intelligence with Python (2nd edition), Artasanchez and Joshi, ISBN 978-1-83921-953-5 • Chapter 1 and 2	

Week 2 - 15 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Machine Learning Overview * Supervised Learning: Classification	Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 3.1 - 3.2	

Week 3 - 22 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Supervised Learning: Regression * Unsupervised Learning	Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 3.3 - 3.4	

Week 4 - 29 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic

* Reinforcement Learning * Responsible AI	Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 3.6 Introduction to Responsible AI: Implement Ethical AI Using Python, Manure et al., 2023, ISBN 978-1-4842-9981-4: • Chapter 1 and 2	

Week 5 - 05 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Heuristic Search Techniques: • What is Heuristic Search? • Uninformed vs. informed search	Artificial Intelligence with Python (2nd edition), Artasanchez and Joshi, ISBN 978-1-83921-953-5: • Chapter 10	**Assignment 1** Due: Week 5 Friday (9 Aug 2024) 11:45 pm AEST

Vacation Week - 12 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 19 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Deep Learning: • AI, Machine Learning, and Deep Learning • Artificial Neural Networks	Artificial Intelligence with Python (2nd edition), Artasanchez and Joshi, ISBN 978-1-83921-953-5: • Chapter 19 Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 4	

Week 7 - 26 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Convolutional Neural Networks • Architecture of CNNs • Building an Image Classifier	Artificial Intelligence with Python (2nd edition), Artasanchez and Joshi, ISBN 978-1-83921-953-5: • Chapter 20 Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 4.3	

Week 8 - 02 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Recurrent Neural Networks * Other Deep Learning Models	Artificial Intelligence with Python (2nd edition), Artasanchez and Joshi, ISBN 978-1-83921-953-5: • Chapter 21 Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 4.3 - 4.8	**Assignment 2** Due: Week 8 Friday (6 Sept 2024) 11:45 pm AEST

Week 9 - 09 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic

* Applications I - Image Recognition and Classification • Face Recognition • Object Detection and Segmentation	Artificial Intelligence with Python (2nd edition), Artasanchez and Joshi, ISBN 978-1-83921-953-5: • Chapter 18 Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 5, 6, and 7	

Week 10 - 16 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Applications II - Natural Language Processing (NLP) • NLP Concepts • Chatbots	Artificial Intelligence with Python (2nd edition), Artasanchez and Joshi, ISBN 978-1-83921-953-5: • Chapter 15 and 16 Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 10	

Week 11 - 23 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Advanced AI Computing • AI on the Cloud • AI with Hardware Processing Units	Artificial Intelligence with Python (2nd edition), Artasanchez and Joshi, ISBN 978-1-83921-953-5: • Chapter 12 Artificial Intelligence Programming with Python - From Zero to Hero, 2022, Perry Xiao, ISBN 978-1-119-82086-4: • Chapter 12	

Week 12 - 30 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
* Exam Review		**Assignment 3** Due: Week 12 Friday (4 Oct 2024) 11:45 pm AEST

Review/Exam Week - 07 Oct 2024

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 14 Oct 2024

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Unit Coordinator: Dr Ambi Jayal
Level 20, 160 Ann Street, Brisbane Campus
Email: a.jayal@cqu.edu.au (Preferred Contact)

Assessment Tasks

1 Assignment 1

Assessment Type
Written Assessment

Task Description

TASK DESCRIPTION

- Assignment 1 is designed to reinforce the knowledge and skills acquired in Week 1 to

Week 4. It is an individual assessment to be submitted in Week 5.

- In this assessment, students are asked to analyse a given problem description and apply AI knowledge, particularly Machine Learning, to propose their solution. They will translate their solution into a computational algorithm, and implement the algorithm using Python and its libraries. Students will decide the AI method(s) to use in their solution. They are required to justify the choice of method(s) with adequate reasons.
- For this assessment, students will select one suitable dataset from the following options or any dataset that is publicly accessible:
  UCI Machine Learning Repository: https://archive.ics.uci.edu/datasets
  Australian Government Data: https://data.gov.au
  Amazon: https://registry.opendata.aws/
  Google: https://cloud.google.com/bigquery/public-data/
  Additionally, students need to record and submit a 5 to 7-minute video presentation summarizing their solution and explaining key concepts. The recorded video should be framed to include the presenter and their desktop.
- This assessment contributes to 30% of the total mark of the unit.
- It addresses the following unit learning outcomes:
  - Model internal representation, performance criteria, and computational components identifying elements of authentic problems to apply neural, fuzzy or evolutionary computation
  - Create effective and efficient computational intelligence solutions to authentic problems

Assessment Due Date
Week 5 Friday (9 Aug 2024) 11:45 pm AEST
Submit online via the Moodle link

Return Date to Students
Week 6 Friday (23 Aug 2024)
Within 2 weeks of the due date or within 2 weeks of submission (whichever is the later)

Weighting
30%

Assessment Criteria

The submission will be assessed based on the student's ability to:

- Decide the suitable AI method(s) for their solution to the given problem, and justify their choice of the methods
- Write correct Python code, include adequate comments, and discuss how their solution meets the requirements of the problem
- Discuss how responsible AI principles are used to develop their solution

The detailed marking criteria will be provided on the unit Moodle. Please ensure to read through the marking criteria carefully before submitting your work.

Referencing Style

- American Psychological Association 7th Edition (APA 7th edition)

Submission
Online

Submission Instructions
Submit online via the Moodle link

Learning Outcomes Assessed

- Model internal representation, performance criteria, and computational components identifying elements of authentic problems to apply neural, fuzzy or evolutionary computation
- Create effective and efficient computational intelligence solutions to authentic problems

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Self-management

2 Assignment 2

Assessment Type
Written Assessment

Task Description

TASK DESCRIPTION

- Assignment 2 is designed to reinforce the knowledge and skills acquired in Week 5 to Week 7. It is an individual assessment to be submitted in Week 8.
- In this assessment, students are asked to analyse a given problem description and apply AI search techniques in their solution. They will explore both uninformed and informed (heuristic) search in their solution. Students are asked to discuss the pros and cons in applying either search technique in their solution, and compare the performance using metrics such as time and space complexities, execution time, accuracy, etc.
- This assessment contributes to 25% of the total mark of the unit.
- It addresses the following unit learning outcomes:
    - Model internal representation, performance criteria, and computational components identifying elements of authentic problems to apply neural, fuzzy or evolutionary computation
    - Create effective and efficient computational intelligence solutions to authentic problems
    - Investigate the potential to enhance the model using one or more computational intelligence techniques

Assessment Due Date
Week 8 Friday (6 Sept 2024) 11:45 pm AEST
Submit online via the Moodle link

Return Date to Students
Week 10 Friday (20 Sept 2024)
Within 2 weeks of the due date or within 2 weeks of submission (whichever is the later)

Weighting
25%

Assessment Criteria
The submission will be assessed based on the student's ability to:

- Analyse the given problem and apply AI search techniques appropriately in their solution
- Write correct Python code, include adequate comments, and discuss how the solution and its output meet the requirements of the problem
- Discuss the pros and cons in applying either type of search technique in their solution, and compare the performance using metrics such as time and space complexities, execution time, accuracy, etc.

The detailed marking criteria will be provided on the unit Moodle. Please ensure to read through the marking criteria carefully before submitting your work.

Referencing Style

- American Psychological Association 7th Edition (APA 7th edition)

Submission
Online

Submission Instructions
Submit online via Moodle link

Learning Outcomes Assessed

- Create effective and efficient computational intelligence solutions to authentic problems
- Evaluate the solution to a computational intelligence problem, analysing the merits and demerits of the chosen approach
- Investigate the potential to enhance the model using one or more computational intelligence techniques.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Self-management

3 Assignment 3

Assessment Type
Written Assessment

Task Description

TASK DESCRIPTION

- Assignment 3 is designed to reinforce the knowledge and skills acquired from Week 6 onwards on Deep Learning models and their applications. It is a group (min. 2 and max. 3 students each group) assessment to be submitted in Week 12.
- In this assessment, students are given a problem description which they will apply deep learning models in their solution. For example, the given problem could be on image classification, natural language processing, or other interesting applications. Students are asked to apply the concept of transfer learning using pre-trained models in their solution. The objective is to leverage the knowledge embedded in pre-trained models to enhance the performance of a model tailored for the given problem.
- For this assessment, students will select one suitable dataset from the following options or any dataset that is publicly accessible:

  UCI Machine Learning Repository: https://archive.ics.uci.edu/datasets

  Australian Government Data: https://data.gov.au

  Amazon: https://registry.opendata.aws/

  Google: https://cloud.google.com/bigquery/public-data/

  Additionally, students need to record and submit a 5 to 7-minute video presentation summarizing their solution and explaining key concepts. The recorded video should be framed to include the presenter and their desktop.

- This assessment contributes to 45% of the total mark of the unit.
- It addresses the following unit learning outcomes:

- Model internal representation, performance criteria, and computational components identifying elements of authentic problems to apply neural, fuzzy or evolutionary computation
- Evaluate the solution to a computational intelligence problem, analysing the merits and demerits of the chosen approach
- Investigate the potential to enhance the model using one or more computational intelligence techniques

Assessment Due Date
Week 12 Friday (4 Oct 2024) 11:45 pm AEST
Submit online via the Moodle link

Return Date to Students

Feedback and marks for this assessment will be released on the certification date as this unit does not have an exam.

Weighting
45%

Assessment Criteria
The submission will be assessed based on the student's ability to:

- Analyse the given problem and apply deep learning models in their solution
- Write correct Python code, include adequate comments, and discuss how the solution and its output meet the requirements of the problem
- Apply the concept of transfer learning using pre-trained models suitably in their solution

The detailed marking criteria will be provided on the unit Moodle. Please ensure to read through the marking criteria carefully before submitting your work.

Referencing Style

- American Psychological Association 7th Edition (APA 7th edition)

Submission
Online

Learning Outcomes Assessed

- Model internal representation, performance criteria, and computational components identifying elements of authentic problems to apply neural, fuzzy or evolutionary computation
- Evaluate the solution to a computational intelligence problem, analysing the merits and demerits of the chosen approach
- Investigate the potential to enhance the model using one or more computational intelligence techniques.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Research
- Self-management

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?
A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?
A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?
For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem