Course Outline

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Course Details

Course Code	COMP9414
Course Title	Artificial Intelligence
Convenor	Wayne Wobcke (http://www.cse.unsw.edu.au/~wobcke/)
Admin	Alfred Krzywicki
Classes	

Tutorial Time	Room	Tutor
Wed 7.00-8.00	Online	Jingying Gao
Wed 7.00-8.00	Online	Armin Chitizadeh
Wed 8.00-9.00	Online	Jingying Gao
Thu 10.00-11.00	Online	Lina Zhang
Thu 11.00-12.00	Online	Lina Zhang
Thu 12.00-1.00	Online	Joshua Goncalves
Thu 1.00-2.00	Online	Joshua Goncalves
Thu 3.00-4.00	Online	Armin Chitizadeh
Thu 3.00-4.00	Online	Anna Trofimova
Thu 4.00-5.00	Online	Armin Chitizadeh
Thu 4.00-5.00	Online	Anna Trofimova
Thu 5.00-6.00	Online	Anna Trofimova
Thu 5.00-6.00	Online	Jingying Gao
Fri 10.00-11.00	Online	Anchit Verma
Fri 11.00-12.00	Online	Anchit Verma
Fri 12.00-1.00	Online	Anchit Verma
Fri 1.00-2.00	Online	Armin Chitizadeh

Consultations	**Lecture Consultations**	**Room**	**Lecturer**
	Tue 3.00-4.00	Online	Wayne Wobcke
	Wed 2.00-3.00	Online	Wayne Wobcke
	Thu 2.00-3.00	Online	Wayne Wobcke
Units of Credit	6		
Course Website	http://cse.unsw.edu.au/~cs9414/ (http://cse.unsw.edu.au/~cs9414/)		
Handbook Entry	http://www.handbook.unsw.edu.au/postgraduate/courses/2020/COMP9414.html (http://www.handbook.unsw.edu.au/postgraduate/courses/2020/COMP9414.html)		

Course Summary

COMP9414 is an introductory course on Artificial Intelligence covering fundamental topics such as autonomous agents, problem solving, search,logic, knowledge representation, reasoning under uncertainty, natural language processing, machine learning and neural networks. The course provides a foundation for further study in AI such as COMP4418 Knowledge Representation and Reasoning, COMP9417 Machine Learning and Data Mining, COMP9517 Computer Vision, COMP9434 Robotic Software Architecture, and COMP9444 Neural Networks and Deep Learning. Postgraduate students with more programming experience may consider enrolling in COMP9814, which is the same as the undergraduate AI course COMP3411 (offered in Term 1).

The course is taught with an orientation towards data science and with a view to practical applications of Artificial Intelligence using Python, and focuseson the use of Python toolkits for AI such as NLTK (for natural language processing) and Scikit Learn (for machine learning). Some AI applications that make use of foundational concepts will be demonstrated in lectures.

Assumed Knowledge

Students are assumed to have completed an introductory course in Python programming, such as COMP9021 Principles of Programming. Students are also assumed to have some mathematical ability, though any necessary mathematical concepts will be introduced in the course. Background knowledge of discrete mathematics would be useful.

Student Learning Outcomes

After completing this course, students will:

1. Gain in-depth understanding of a variety of fundamental AI techniques
2. Understand the foundational issues of AI drawing on philosophical enquiry
3. Be able to choose appropriate AI techniques to solve given problems
4. Be able to implement programs based on standard AI algorithms
5. Acquire experience in utlizing AI Python tookits in realistic contexts
6. Be aware of a variety of application areas of current AI technology
7. Appreciate the dangers of unthinkingly applying AI in business and industry

This course contributes to the development of the following graduate capabilities:

Graduate Capability	Acquired in
Scholars capable of independent and collaborative enquiry, rigorous in their analysis, critique and reflection, and able to innovate by applying their knowledge and skills to the solution of novel as well as routine problems	1,2,3,4,5
Entrepreneurial leaders capable of initiating and embracing innovation and change, as well as engaging and enabling others to contribute to change	3,4,5,6
Professionals capable of ethical, self-directed practice and independent lifelong learning	1,2,6,7
Global citizens who are culturally adept and capable of respecting diversity and acting in a socially just and responsible way	1,2,6,7

Teaching Strategies

The course has a 3 hour lecture and a 1 hour tutorial each week (in Weeks 1–10, with the exception of Week 6 which is "Flexibilty Week"). Lectures are **essential** for providing conceptual foundations for the course and preparation and understanding of tutorial exercises. Tutorials are **essential** for understanding specific techniques, programming experience, individual feedback from tutors, and preparation for the exam.

The instruction mode of the course is fairly traditional, however the style places a greater emphasis than usual on practical applications of AI technologies and existing tools (in Python) for AI, data analytics and data science. Lectures cover more conceptual material and give an overview of the main topics and their interconnections. Lectures also provide an essential foundation to apply in tutorials and assignments. Tutorials provide students an opportunity for more in-depth analysis of particular topics and practical help on assignments. As part of tutorials, students will be given self-guided programming activities to aid in understanding core concepts. While not assessed, these lab-style exercises will help with exam preparation. **Attendance is strongly encouraged to gain the maximum value from the course.**

There will also be a course forum where students can post (anonymously to other students if desired) course-related questions that can be answered by staff and other students and viewed by all students. The forum will be moderated by course staff and tutors. For matters of general interest, students should use the forum in preference to e-mailing their tutor; for personal matters please e-mail the lecturer in charge. Note that while forum questions will be endeavoured to be answered in a timely fashion,
tutors work on a casual basis and cannot be guaranteed to work outside normal working hours. **So before posting to the forum, please use the search functionality to check if your question has already been asked.**

Teaching Rationale

COMP9414 is an introductory course that provides fundamental knowledge and skills needed for further study in Artificial Intelligence and for the application of AI in industry, particularly machine learning and data science. Where possible, concepts are augmented with practical applications of AI techniques and systems based on widely-used paradigms, tools and platforms.

The Python programming language has been chosen for several reasons: (i) this follows on from the introductory postgraduate programming course, (ii) Python is used in the machine learning and neural networks/deep learning courses, (iii) there are many practical AI toolkits built using Python, (iv) these toolkits are widely used in industry, (v) this enables the course to adopt an emphasion data analytics/data science, a major growth area in business.

The course will use the textbook by Poole and Mackworth. This book has been chosen because: (i) it is shorter

and easier to read than other AI textbooks, (ii) it adopts an approach based on logical reasoning, (iii) the book is freely available online, (iv) the book has recently been updated, and (iv) the book comes with Python implementations of standard algorithms.

Student Conduct

The **Student Code of Conduct** (Information (https://student.unsw.edu.au/conduct) , Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)) sets out what the University expects from students as members of the UNSW community. As well as the learning, teaching and research environment, the University aims to provide an environment that enables students to achieve their full potential and to provide an experience consistent with the University's values and guiding principles. A condition of enrolment is that students *inform themselves* of the University's rules and policies affecting them, and conduct themselves accordingly.

In particular, students have the responsibility to observe standards of equity and respect in dealing with every member of the University community. This applies to all activities on UNSW premises and all external activities related to study and research. This includes behaviour in person as well as behaviour on social media, for example Facebook groups set up for the purpose of discussing UNSW courses or course work. Behaviour that is considered in breach of the Student Code Policy as discriminatory, sexually inappropriate, bullying, harassing, invading another's privacy or causing any person to fear for their personal safety is serious misconduct and can lead to severe penalties, including suspension or exclusion from UNSW.

If you have any concerns, you may raise them with your lecturer, or approach the School Ethics Officer (mailto:ethics-officer@cse.unsw.edu.au) , Grievance Officer (mailto:grievance-officer@cse.unsw.edu.au) , or one of the student representatives.

Plagiarism is defined as (https://student.unsw.edu.au/plagiarism) using the words or ideas of others and presenting them as your own. UNSW and CSE treat plagiarism as academic misconduct, which means that it carries penalties as severe as being excluded from further study at UNSW. There are several on-line sources to help you understand what plagiarism is and how it is dealt with at UNSW:

- Plagiarism and Academic Integrity (https://student.unsw.edu.au/plagiarism)

In particular you should take note of the new plagiarism policy and procedures effective 1 June, 2020:

- Plagiarism Management Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

Make sure that you read and understand these. Ignorance is not accepted as an excuse for plagiarism. In particular, you are also responsible that your assignment files are not accessible by anyone but you by setting the correct permissions in your CSE directory and code repository, if using. Note also that plagiarism includes paying or asking another person to do a piece of work for you and then submitting it as your own work.

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.

If you haven't done so yet, please take the time to read the full text of

- UNSW's policy regarding academic honesty and plagiarism (https://student.unsw.edu.au/plagiarism)

The pages below describe the policies and procedures in more detail:

- Student Code Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)
- Student Misconduct Procedure (https://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)
- Plagiarism Policy Statement (https://www.gs.unsw.edu.au/policy/documents/plagiarismpolicy.pdf)

- Plagiarism Management Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

You should also read the following page which describes your rights and responsibilities in the CSE context:

- Essential Advice for CSE Students (https://www.engineering.unsw.edu.au/computer-science-engineering/about-us/organisational-structure/student-services/policies/essential-advice-for-cse-students)

Assessment

Item	Topics	Due	Marks	Contributes to
Tutorial Participation	All topics	Weeks 1-5,7-10	10%	1,2,3,4,6,7
Assignment 1	Constraint Satisfaction	Week 5	15%	1,3,4,5,6
Assignment 2	Machine Learning	Week 9	25%	1,2,3,4,5,6,7
Final Exam	All topics	Exam period	50%	1,2,3,4

Course Schedule

Week	Lectures	Tutorials	Assignments
1	Artificial Intelligence and Agents	Agents	
2	Problem Solving and Search	Search	
3	Constraint Satisfaction Problems	Constraint Satisfaction/Planning	
4	Logic and Knowledge Representation	Propositional Logic	
5	Reasoning with Uncertainty	Uncertainty	Assignment 1 due
6	–	–	
7	Machine Learning	Machine Learning	
8	Natural Language Processing	Language Processing	
9	Knowledge Based Systems	First-Order Logic	Assignment 2 due
10	Neural Networks and Reinforcement Learning	Neural Networks/Reinforcement Learning	

Resources for Students

Texts and recommended readings:

- Poole, D.L. & Mackworth, A. Artificial Intelligence: Foundations of Computational Agents. (https://artint.info/2e/html/ArtInt2e.html) Second Edition. Cambridge University Press, Cambridge, 2017.
- Russell, S.J. & Norvig, P. Artificial Intelligence: A Modern Approach. Third Edition, Pearson Education, Upper Saddle River, NJ, 2010.

- Bird, S., Klein, E. & Loper, E. Natural Language Processing with Python. (http://www.pitt.edu/~naraehan/ling1330/nltk_book.html) O'Reilly, Sebastopol, CA, 2009.

Other resources:

- NLTK (https://www.nltk.org/)
- Scikit Learn (https://scikit-learn.org/stable/)
- Python Tutorial (https://docs.python.org/3/tutorial/)
- Anaconda (https://www.anaconda.com/distribution/)

Course Evaluation and Development

Computer Science and Engineering courses are evaluated by student survey each time they are taught. The survey includes standard questions asked of all comparable courses so that it is possible to compare a course with other relevant UNSW courses, and also includes space for free-form comments. Survey responses are anonymous. The completed survey forms are analysed statistically by someone independent of the course staff, and the results, including free-form comments, are made available to the lecturer in charge *after* grades have been reported and released.

From 2013–2018, Artificial Intelligence was offered as a combined course for undergraduate and postgraduate students. However, the two cohorts have very different backgrounds, leading to difficulty in setting suitable assessments. The combined course also grew extremely large. Thus the course has now been split into courses tailored for the two cohorts, COMP3411 for undergraduates and COMP9414 for postgraduates (COMP9814 students take COMP3411, which assumes a background in programming equivalent to CSE undergraduate students). With the introduction of Python in COMP9021 Principles of Programming, and the use of Python in COMP9417 Machine Learning and Data Mining, the new COMP9414 course is consistent with the postgraduate coursework programme. The COMP9414 course was highly regarded in 2019 when offered to postgraduate students only. Changes for 2020 include shortening the second assignment.

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