

Artificial Intelligence

COMP3702/COMP7702

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Axon 308

Office Hours: Thursday 2-3pm Axon 308

Artificial Intelligence

COMP3702/COMP7702

- View
 - Methods and techniques within the field of artificial intelligence solve problems - theoretical and practical
- Scope
 - The course provides an understanding of the field and describes many of the most important algorithms and techniques that have found theoretical and practical applicability
- Purpose
 - The course helps the student
 - gain an appreciation for the scientific context of artificial intelligence
 - understand and develop computing algorithms, and to analyse their properties
 - find the right tools for solving specific problems, and to implement such tools in software

Course goals (1)

- In general terms, it is expected that the student gains an understanding of the theories, methods and practices which form the basis of Artificial Intelligence
- The course aims to introduce the basic concepts and methods used in the field of artificial intelligence and provide students with skills in the use of applying these techniques
- Specifically the course aims to give students an overview of the following topics in artificial intelligence:
 - Problem solving and optimisation (search algorithms)
 - Reasoning with uncertain knowledge (probability theory)
 - Machine Learning (decision trees, neural networks, etc)
 - Applications of AI

Course goals (2)

- After the course, you should
 - be familiar with the historical context of artificial intelligence
 - know several definitions of artificial intelligence
 - be familiar with an agent-based intelligent system design
 - understand several problem solving and optimisation techniques based on search (both uninformed and informed)
 - be able to implement and apply search techniques

Course goals (3)

- In addition, you should
 - understand general principles of machine learning (both supervised and unsupervised)
 - know several machine learning techniques (including decision tree learning and neural networks)
 - be able to implement, apply and systematically evaluate machine learning techniques
 - understand probability theory and how it can be used for representing and reasoning with uncertain knowledge
 - be able to apply basic probability theory to machine learning problems
 - know about some of the current advances in robotics and AI

Resources (1)

- Russell S. and Norvig P., Artificial Intelligence: A modern approach, 3rd edition, 2010
 - Highly recommended reading
 - Used extensively (see reading list on Semester overview)
 - Available for purchase from the University Bookshop
 - Several copies are also available at the library

Resources (2)

- Handouts
 - At www.itee.uq.edu.au/~comp3702 you will find
 - Slides used in lectures
 - Tutorials
 - Assignments
 - Readings and handouts
 - Links and resources

Resources (3)

- Announcements
 - www.itee.uq.edu.au/~comp3702
 - Newsgroup: uq.itee.comp3702
- Questions / Discussions
 - Newsgroup: uq.itee.comp3702

Times and Venues

- Lecture
 - Tuesday 2 – 3.50pm [42-212]
- Tutorials
 - Wednesday 2 – 3.50pm [78-420]
 - Thursday 12 – 1.50pm [78-420]
 - Friday 2 – 3.50pm [78-420]
- Sign-up for Tutorials via SI-net
- Tutor: Elizabeth Alpert elizabeth.alpert@uqconnect.edu.au
- Office Hours Thursday 2-3pm Axon 308

Semester overview (1)

<i>Lecture</i>	<i>Reading</i>	<i>Tutorial</i>	<i>Assessment</i>
1 Introduction to artificial intelligence, an agent-based perspective.	Chapters 1,2,26	No tutorial	
2 Solving problems by searching	Chapter 3	The definition of artificial intelligence	
3 Informed search and exploration	Chapters 3,4	Problem representation	
4 Adversarial search, game playing	Chapter 5	Informed search	Assignment 1 available
5 Probabilistic reasoning	Chapters 7,13	Adversarial search	

Semester overview (2)

	<i>Lecture</i>	<i>Reading</i>	<i>Tutorial</i>	<i>Assessment</i>
6	Mid-semester exam, Discussion of Assignment 1		Probabilistic reasoning	Mid- semester exam
7	Principles of machine learning	Chapters 18,19	Search and probabilistic reasoning	Assignment 1 deadline
8	Symbolic machine learning, Statistical machine learning	Chapters 18,19, and 20	Machine learning basics	
9	Neural networks Introduction, Discussion of Assignment 2	Chapter 18 (18.7)	Current best learning, Decision trees and Naive Bayes Classification	Assignment 2 available

Semester overview (3)

<i>Lecture</i>	<i>Reading</i>	<i>Tutorial</i>	<i>Assessment</i>
Mid-semester break			
10	Neural networks	Chapter 18 (18.7)	Neural Networks
11	Language and Robots	Chapter 25	Machine Learning Techniques
12	Applications of AI		Language and Robots
13	Assignment 2 Competition, Review		Assignment 2 deadline
Revision Period			
1	Final Exam		
2			

Assessment (1)

- Assignments (30%)
 - 2 assignments
 - Assignment 1 (10%): Search – game playing
 - Assignment 2 (20%): Machine learning – pattern recognition
- Tutorials (10%)
 - Active participation mark, submit answers at end of tutorial (1% per tutorial)
 - Can submit online at submit.itee.uq.edu.au
 - Due by 5pm on the Monday BEFORE the tutorial session
 - Must be submitted on time and be substantially correct to obtain marks for active participation
- Mid-semester Examination (10%)
 - During Lecture in Week 6
 - Covers lectures from Weeks 1-5
 - 45 minutes
 - Closed-book
 - Multiple Choice
- Final Examination (50%)
 - During final examination period
 - Covers lecture material
 - 2 hours
 - Closed-book
 - Primarily short answer / short essay

Assessment (2)

- COMP3702
 - Mid-semester exam is optional but recommended
 - Total exam mark is 60%, best result of:
 - Mid-semester 10% + Final 50%
 - Mid-semester 0% + Final 60%
- COMP7702
 - Mid-semester exam is compulsory
 - Total exam mark is 60 %
 - Mid-semester 10% + Final 50%

Important Assessment Information

- All assessment is due at 5pm of the due date
- Assignments need to be submitted on-line at <http://submit.itee.uq.edu.au>
- Late submission not accepted except for medical or strong personal reasons (documentation required)
- The programming language will be Java
- Tutorials for C/C++ programmers are available at the course website

Assignments

- Two assignments – Two problems/applications which require intelligence (artificial or natural)
 - Problem-solving/optimisation (solving a puzzle)
 - Approach: clever search algorithms, optimising outcomes on basis of a well-defined ‘current state’, exposes computational complexity issues
 - Pattern recognition (classifying handwritten characters)
 - Approach: learning-by-example/machine learning, exposes difficulties of ‘representation by rules’, illustrates the use of probabilistic methods and neural networks

Assignment 1

- Solving a puzzle
 - Use standard search algorithms to find an optimal solution
 - Write your own heuristic function that can provide informed guidance to the search algorithm, making combinatorial optimisation computationally feasible
 - Provides insights into search algorithms

Assignment 2

- Recognizing handwritten characters
 - Access a large data set of letters
 - Use example Java programs to train a letter-recognition model
 - Write your own machine learning program using existing example code and theory described in lectures, and evaluate how well the model works
 - A live competition will be held amongst submitted models on new data - estimates true, real-world accuracy

Tutorials

- Aims
 - to provide examples of potential examination questions
 - to enable and encourage peer-tutoring
 - to provide an opportunity for questions
 - to explore the theoretical concepts
 - to apply the theoretical concepts

Tutorials

- You receive 1% for participating in a tutorial and submitting the answers to be marked (or submitting a substantially correct solution online by the Monday before the tutorial)
- Students may work in groups during tutorials but must submit answers individually
- Participation marks will be allocated for active participation
 - Working through problems
 - Participating in discussions
 - Answering questions
 - Submitting tutorial solutions
- Feedback
 - Tutors will provide some feedback on submitted work
 - Work will be returned the week after submission

Mid-Semester Examination

- Multiple choice
- 45 minutes
- During the lecture in week 6
- Covers the first 5 weeks of lectures
- Closed book
- Optional for COMP3702, Compulsory for COMP7702

Examination

- Closed book, non-programmable calculator allowed
- Knowledge questions - theory
 - may have been in tutorials
 - explicit in the recommended text book
 - assessed on correctness of answer
- Knowledge questions - practical
 - similar to those in tutorials
 - method described in the recommended text and lectures
 - assessed on correctness of method application
- Discussion questions
 - may have been addressed in lectures
 - not necessarily explicit in the readings
 - assessed on insight / justifications
- Different exam for COMP3702 and COMP7702
 - COMP7702 will have more discussion questions, including a short essay question

Lectures

- Aims
 - to outline theories, methods and applications of the field of AI
 - to explain difficult concepts from the recommended text and other sources
 - to illustrate concepts in AI with diagrams and examples
 - to provide a forum for general discussion and questions about the subject matter

Some tips...

- Don't be shy, participate in lectures, ask questions
- Buy the book, read chapters as noted – it is well-written, up-to-date, and an excellent reference for later
- AI is actually quite fun and useful, but you need to work hard
- Assignments and tutorials are there to make you work and to help you to learn