

3511ICT

Machine Learning and Perception

Semester 1 - 2008

Academic Organisation:	School of Information and Communication Technology
Faculty:	Science, Environment, Engineering and Technology
Credit point value:	10
Student Contribution Band:	Band 2
Course level:	Undergraduate
Campus/Location/Learning Mode:	Gold Coast / On Campus / In Person Nathan / On Campus / In Person
Convenor/s:	Mr John Thornton (Gold Coast) Dr Phillip Sheridan (Nathan)
Enrolment Restrictions:	Nil
This document was last updated:	30 January 2008

BRIEF COURSE DESCRIPTION

This course introduces machine learning, the study of algorithms that improve automatically through experience. Applications and techniques are selected from a vast area, ranging from learning under uncertainty, neural networks, user behaviour anticipation, natural language processing, vision, and robotics to data mining programs that discover general rules in large data sets.

Prerequisites 1002ICT, 1005ICT, 1006ICT, 2508ICT

SECTION A – TEACHING, LEARNING AND ASSESSMENT

COURSE AIMS

Information and communication technology has provided users with the capacity to generate ever-increasing amounts of information. As a result, we now require automated tools to help us make sense of the mountains of information that we are continually confronted with. The main goal of this course is to introduce the theory and practice associated with the building of systems that can adapt to their environments and learn from their experiences. More specifically, the objectives of this course are:

1. Introduce students to the concept of machine learning and the main applications for which it is appropriate;
2. Introduce students to the main issues surrounding the design of learning algorithms;
3. Introduce a contemporary platform for implementing learning algorithms.

LEARNING OUTCOMES

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

1. Describe the core issues common to all learning algorithms;
2. Describe specific learning algorithms that are currently transforming industry and society;
3. Determine problems that are appropriate for the employing of learning algorithms to solve;
4. Use the Weka software to build learning algorithms that solve specific problems.
5. Evaluate the effectiveness of various learning algorithms on specific problems.

CONTENT, ORGANISATION AND TEACHING STRATEGIES

Organisation and Teaching Methods

The course will adopt a strong student centred focus with formal contact being based primarily on tutorials and workshops. There will be *one one-hour tutorial per week* as well as *one two-hour workshop per week*. In line with University policy on teaching and learning, the course will be based on flexible delivery and learning techniques. Material that is required to establish the individual student's knowledge base will be provided in a variety of forms (texts, on-line facilities etc.), which students can re-explore during tutorials. Workshops will then involve the practical application of this material. It is considered that both of these activities are central to the conduct of the course and will form the foundation on which all assessment will be based.

Generic Skills Development

After taking this course, the student should be able to:

- Understand machine learning algorithm analysis and design techniques in a real-world context and appreciate their use. It will explain the theories behind concept learning methodologies and how they are applied to data mining applications.
- Practical workshops are designed to facilitate understanding, analysis and critical evaluation of real world issues in developing computer systems that improve their performance autonomously.
- Students will develop and practice problem solving and decision making skills in individual and group contexts.

CONTENT SUMMARY

Topic	Lecture Content	Tutorial/Laboratory Content	Readings
1.	Introduction to Machine learning	Nil	Witten Chapter 1 Mitchell Chapter 1
2.	Supervised Learning	Weka software	Witten Chapters 2 & 3 Mitchell Chapter 2
3.	Bayesian Decision Theory (BDT)	Exercises	Witten Sections 4.2 & 6.7 Mitchell Chapter 6
4.	BDT continued	Exercises	
5.	Decision Trees (DT)	Exercises	Witten Sections 4.3 & 6.1 Mitchell Chapter 3
6.	DT continued		
7.	Assessing and Comparing Classification Algorithms	Exercises	Witten Chapter 5 Mitchell Chapter 5
8.	Linear Discrimination	Exercises	Mitchell Chapter 4
9.	Multilayer Perceptrons (MP)	Exercises	Witten Section 6.3 Mitchell Chapter 4
10.	MP continued		
11.	Selected topic		
12.	Selected topic		
13.	Review		

ASSESSMENT

Summary of Assessment

Item	Assessment Task	Length	Weighting	Total Marks	Relevant Learning Outcomes	Due Day and Time
1.	Assignment 1	10 hours	25%	25	1, 2, 3, and 4	Monday of Week 7, 4pm
2.	Assignment 2	10 hours	25%	25	1, 2, 3, 4, and 5	Monday of Week 12, 4pm
3.	Final Exam	3 hours	50%	50	1, 2, 3, 3, 4 and 5	TBA, Exam Week and 5

Assessment Details

There are three assessment items for the course. This includes two assignments and a final Examination. Assessment item one is concerned with basic concepts in machine learning. This will involve experimenting with Bayesian learners and Decision Tree learners. Students will be required to build, test and analyse these learning algorithms on the data from a real-world problem, e.g. medical diagnosis from patient history.

Assignment item two provides students with the opportunity to investigate a learning algorithm of their choice. In this assignment, students will investigate a current application of machine learning and present an oral report on this research.

The final examination will test the student's understanding of theoretical issues associated with the machine learning techniques considered in the course.

The details associated with each of the course assignments will be posted on Learning@Griffith in Week 1. These assignments will be due in week 7 and 12 respectively

Rationale for Assessment

To ensure that student's progress through the course material both in an appropriate sequence and time frame, progressive assessment and feedback of the assignments has been designed to motivate and guide students through the course material.

Each of the two assignments concentrates on developing practical skills in the use of popular machine learning techniques. In addition the progression of the assignments is intended to develop a student's understanding of the circumstances that makes the particular machine learning technique applicable. The main purpose of the final examination is to have students demonstrate their understanding of the theoretical issues that integrates the entire body of machine learning techniques considered in the course.

Return of Assessment Items

Each of the assignment items will be marked and returned to the student within one week of the due date.

Notification of Availability of Feedback on Assessment

Associated with each assignment is a detailed marking scheme, which will be available to the student when the assignment is posted. The marking scheme will also be employed to provide feedback to the student when the assignment is marked and returned.

GRADUATE SKILLS

Graduate Skills	Taught	Practised	Assessed
Effective communication (written)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Effective communication (oral)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Effective communication (interpersonal)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Information literacy	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Problem solving	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Critical evaluation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Work autonomously	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work in teams	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Creativity and innovation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ethical behaviour in social / professional / work environments	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Responsible, effective citizenship	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

TEACHING TEAM

Convenor Details	Logan
Campus Convenor	Dr P. Sheridan (Nathan)
Email	p.sheridan@griffith.edu.au
Office Location	Nathan
Phone	(07) 338 21088
Fax	(07) 338 21294
Consultation times	(Details will be posted on course website in first week of lectures)
Campus Convenor	Dr John Thornton (Gold Coast)
Email	j.thornton@griffith.edu.au
Office Location	Gold Coast
Phone	(07) 55528730
Fax	(07) 55528066
Consultation times	(Details will be posted on course website in first week of lectures)

COURSE COMMUNICATIONS

Communication with the course convenor via:

1. Email: If the first term of the subject field in the email is the word 3511ICT, the email will be treated with priority.
2. Personal consultation during the consultation hours by appointment.

TEXTS AND SUPPORTING MATERIALS

Prescribed text:

Witten, I. H. and Frank, E, *Data Mining Practical Machine Learning Tools and Techniques* (2005) Morgan Kaufman Publishers.

Supporting text:

Mitchell, T. *Machine Learning*, (1998) McGraw Hill

Alpadin, E. *Introduction to Machine learning*, (2004), MIT Press

Russell, S.J. and Norvig, P. *Artificial Intelligence*, (1995) Prentice Hall

Winston, P. *Artificial Intelligence*, (1992) Addison Wesley

SECTION B – ADDITIONAL COURSE INFORMATION

Students should refer to the Learning@Griffith website for further information about this course.

SECTION C – KEY UNIVERSITY INFORMATION

ACADEMIC MISCONDUCT

Students must conduct their studies at the University honestly, ethically and in accordance with accepted standards of academic conduct. Any form of academic conduct that is contrary to these standards is academic misconduct and is unacceptable.

Some students engage deliberately in academic misconduct, with intent to deceive. This conscious, pre-mediated form of cheating is one of the worst forms of fraudulent academic behaviour, for which the University has zero tolerance and for which penalties, including exclusion from the University, will be applied.

However the University recognises many students commit academic misconduct without intent to deceive. These students may be required to undertake additional educational activities to remediate their behaviour.

Specifically it is academic misconduct for a student to:

- **Cheat in examinations and tests** by communicating, or attempting to communicate, with a fellow individual who is neither an invigilator or member of staff; by copying, or attempting to copy from a fellow candidate; attempting to introduce or consult during the examination, any unauthorised printed or written material, or electronic calculating or information storage device; or mobile phones or other communication device, or impersonates another.
- **Fabricate results** by claiming to have carried out tests, experiments or observations that have not taken place or by presenting results not supported by the evidence with the object of obtaining an unfair advantage.
- **Misrepresent themselves** by presenting an untrue statement or not disclosing where there is a duty to disclose in order to create a false appearance or identity.
- **Plagiarise** by representing the work of another as their own original work, without appropriate acknowledgement of the author or the source. This category of cheating includes the following:
 1. collusion, where a piece of work prepared by a group is represented as if it were the student's own;
 2. acquiring or commissioning a piece of work, which is not his/her own and representing it as if it were, by
 - purchasing a paper from a commercial service, including internet sites, whether pre-written or specially prepared for the student concerned
 - submitting a paper written by another person, either by a fellow student or a person who is not a member of the University;
 3. duplication of the same or almost identical work for more than one assessment item;
 4. copying ideas, concepts, research data, images, sounds or text;
 5. paraphrasing a paper from a source text, whether in manuscript, printed or electronic form, without appropriate acknowledgement;
 6. cutting or pasting statements from multiple sources or piecing together work of others and representing them as original work;
 7. submitting, as one own work, all or part of another student's work, even with the student's knowledge or consent.

A student who willingly assists another student to plagiarise (for example by willingly giving them their own work to copy from) is also breaching academic integrity, and may be subject to disciplinary action.

Visit the University's Institutional Framework for Promoting Academic Integrity Among Students for further details.

PLAGIARISM DETECTION SOFTWARE

From semester 2, 2007 the University has been piloting the use of plagiarism detection software. Students should be aware that your Course Convenor may use this software to check submitted assignments. If this course is included in the pilot your Course Convenor will provide more detailed information about how the detection software will be used.

HEALTH AND SAFETY

Griffith University is committed to providing a safe work and study environment, however all students, staff and visitors have an obligation to ensure the safety of themselves and those whose safety may be affected by their actions. Staff in control of learning activities will ensure as far as reasonably practical, that those activities are safe and that all safety obligations are being met. Students are required to comply with all safety instructions and are requested to report safety concerns to the University.

General health and safety information can be obtained from http://www.griffith.edu.au/hrm/health_and_safety/

Information about Laboratory safety can be obtained from http://www.griffith.edu.au/ots/secure/health/content_labsafety.html

KEY STUDENT-RELATED POLICIES

All University policy documents are accessible to students via the University's Policy Library website at: www.griffith.edu.au/policylibrary. Links to key policy documents are included below for easy reference:

[Student Charter](#)

[Academic Standing, Progression and Exclusion Policy](#)

[Student Administration Policy](#)

[Policy on Student Grievances and Appeals](#)

[Assessment Policy](#)

[Examinations Timetabling Policy and Procedures](#)

[Academic Calendar](#)

[Guideline on Student E-Mail](#)

[Health and Safety Policy](#)

UNIVERSITY SUPPORT RESOURCES

The University provides many facilities and support services to assist students in their studies. Links to information about University support resources available to students are included below for easy reference:

[Learning Centres](#) - the University provides access to common use computing facilities for educational purposes. For details visit www.griffith.edu.au/cuse

[Learning@Griffith](#) - there is a dedicated website for this course via the Learning@Griffith student portal.

[Student Services](#) facilitate student access to and success at their academic studies. Student Services includes: Careers and Employment Service; Chaplaincy; Counselling Service; Health Service; Student Equity Services (incorporating the Disabilities Service); and the Welfare Office.

[Learning Services](#) within the Division of Information Services provides learning support in three skill areas: computing skills; library skills; and academic skills. The study skills resources on the website include self-help tasks focusing on critical thinking, exam skills, note taking, preparing presentations, referencing, writing, proof reading, and time management.
