COURSE OUTLINE

3511ICT
Machine Learning and Perception

Semester 1 - 2007

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:	Dr John Thornton (Gold Coast)
	Dr Phillip Sheridan (Nathan)
Enrolment Restrictions:	Nil
This document was last updated:	23 January 2007

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	Chapter 1 of text
2.	Supervised Learning	Weka software	Chapter 2 of text
3.	Bayesian Decision Theory (BDT)	Exercises	Chapter 3 of text
4.	BDT continued	Exercises	
5.	Decision Trees (DT)	Exercises	Chapter 9 of text
6.	DT continued		
7.	Assessing and Comparing Classification Algorithms	Exercises	Chapter 14 of text
8.	Linear Discrimination	Exercises	Chapter 10 of text
9.	Multilayer Perceptrons (MP)	Exercises	Chapter 11 of text
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

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 whit 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 8 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)	☒	☒	☒
Effective communication (oral)	☒	☒	☐
Effective communication (interpersonal)	☐	☒	☐
Information literacy	☐	☒	☐
Problem solving	☒	☒	☐
Critical evaluation	☐	☒	☐
Work autonomously	☐	☐	☐
Work in teams	☐	☒	☐
Creativity and innovation	☐	☒	☐
Ethical behaviour in social / professional / work environments	☐	☒	☐
Responsible, effective citizenship	☐	☐	☐

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 3146ICT, the email will be treated with priority.
2. Personal consultation during the consultation hours by appointment.

TEXTS AND SUPPORTING MATERIALS

Prescribed text:
Alpadin, E. Introduction to Machine learning, (2004), MIT Press

Supporting text:
Mitchell, T. *Machine Learning*, (1998) McGraw Hill
Russell, S.J. and Norvig, P. *Artificial Intelligence,* (1995) Prentice Hall
Winston, P. *Artificial Intelligence,* (1992) Addison Wesley
Witton, I. and Frank, E. *Data Mining: Practical Machine Learning Tools & Technologies with JAVA implementations,* (2000) Morgan Kaufmann

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, for which the University may penalise a student. Specifically it is academic misconduct for a student to:

present copied, falsified or improperly obtained data as if it were the result of laboratory work, field trips or other investigatory work;

include in the student's individual work material that is the result of significant assistance from another person if that assistance was unacceptable according to the instructions or guidelines for that work;

assist another student in the presentation of that student's individual work in a way that is unacceptable according to the instructions or guidelines for that work;

cheat; (Cheating is dishonest conduct in assessment);

plagiarise (Plagiarism is knowingly presenting the work or property of another person as if it were one's own.)

Visit the University's *Policy on Academic Misconduct* for further details.

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
Student Administration Policy
Assessment Policy
Academic Calendar
Health and Safety Policy
Academic Standing, Progression and Exclusion Policy
Policy on Student Grievances and Appeals
Examinations Timetabling Policy and Procedures
Guideline on Student E-Mail

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.