MONASH University
Information Technology

FIT4009
Advanced topics in intelligent systems

Unit Guide

Semester 2, 2012

Last updated: 23 Jul 2012

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FIT4009 Advanced topics in intelligent systems - Semester 2, 2012

Methods from Artificial Intelligence (AI) form the basis for many advanced information systems. These techniques address problems that are difficult to solve or not efficiently solvable with conventional techniques. Building on the undergraduate curriculum this unit introduces the student to advanced AI methods and their applications in information systems.

Mode of Delivery

Clayton (Day)

Contact Hours

2 hrs lectures/wk

Workload

For on-campus students, workload commitments are: (12 hours per week total)

- Lectures: 2 hours per week
- Reading, preparation, assignment work, revision: 10 hours per week

Unit Relationships

Prerequisites

Completion of the Bachelor of Computer Science or equivalent to the entry requirements for the Honours program. Students must also have enrolment approval from the Honours Coordinator.

Chief Examiner

Professor Ingrid Zukerman

Campus Lecturer

Clayton

Gholamreza Haffari

David Dowe

Academic Overview

Outcomes

At the completion of this unit students will have:

- achieved an overview of different technologies that form the basis of intelligent information systems;
- understood the capabilities of these methods;
- learned to recognise tasks that can be solved with these methods;
- the ability to judge the limitations of these methods.With successful completion of the unit the students;
- the ability to apply the standard techniques in the chosen sub-fields of intelligent information systems to the construction and design of such systems;
- the ability to critically evaluate the performance of these approaches;
- the ability to compare these techniques to alternative approaches;
- gained an appreciation of the practical relevance of intelligent information systems.

Graduate Attributes

Monash prepares its graduates to be:

1. responsible and effective global citizens who:

a. engage in an internationalised world
b. exhibit cross-cultural competence
c. demonstrate ethical values

critical and creative scholars who:

a. produce innovative solutions to problems
b. apply research skills to a range of challenges
c. communicate perceptively and effectively

Assessment Summary

Assignment and Examination, relative weight depending on topic composition. When no exam is given students will be expected to demonstrate their knowledge by solving practical problems and maybe required to give an oral report.

Assessment Task	Value	Due Date
Assignment 1 - Supervised Learning	15%	Week 4
Assignment 2 - Parametric Methods, Clustering	15%	Week 6
Assignment 3 - MML modelling	30%	Week 11, Thursday, 11 October 2012
Examination 1	40%	To be advised

Teaching Approach

Problem-based learning

Students are encouraged to take responsibility for organising and directing their learning with support from their lecturers.

Feedback

Our feedback to You

Types of feedback you can expect to receive in this unit are:

- Graded assignments without comments
- Interviews

Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through SETU, Student Evaluation of Teacher and Unit. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, and on student evaluations, see:
http://www.monash.edu.au/about/monash-directions/directions.html
http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this unit

If you wish to view how previous students rated this unit, please go to
https://emuapps.monash.edu.au/unitevaluations/index.jsp

Prescribed text(s)

Limited copies of prescribed texts are available for you to borrow in the library.

C. S. Wallace. (2005). *Statistical and Inductive Inference by Minimum Message Length*. () Springer (ISBN: 0-387-23795-X).

Ethem ALPAYDIN. (2010). *Introduction to Machine Learning*. () The MIT Press.

Unit Schedule

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1	Unit introduction, Introduction to Machine Learning	
2	Supervised Learning (PAC theory, ...)	Assignment 1 released Week 2
3	Parametric Methods (maximum likelihood, bias-variance, ...)	
4	Clustering (mixture models, k-means, ..)	Assignment 1 due Week 4; Assignment 2 released Week 4
5	non-parametric methods (k-nearest neighbor, ...)	
6	Decision Trees	Assignment 2 due Week 6
7	Bayesianism, Minimum Message Length (MML), inference, prediction	
8	MML multinomial; MML clustering and mixture modelling	
9	MML decision trees (and graphs) and log-loss	
10	Neyman-Scott and related problems for Maximum Likelihood	
11	MML Bayesian nets, grammatical inference	Assignment 3 due Week 11, Thursday, 11 October 2012
12	Algorithmic information theory, formal definitions of intelligence	
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period	LINK to Assessment Policy: http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html

*Unit Schedule details will be maintained and communicated to you via your MUSO (Blackboard or Moodle) learning system.

Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles
(http://www.infotech.monash.edu.au/resources/staff/edgov/policies/assessment-examinations/unit-assessment-hu

Academic Integrity - Please see the Demystifying Citing and Referencing tutorial at
http://lib.monash.edu/tutorials/citing/

Assessment Tasks

Participation

- **Assessment task 1**

  Title:
  > Assignment 1 - Supervised Learning

  Description:
  > This will be a programming assignment.
  >
  > Further details will be provided in the assignment handout.

  Weighting:
  > 15%

  Criteria for assessment:

  > ♦ How well solutions are explained.
  > ♦ Quality of code demonstrated where applicable.
  >
  > Further details will be provided in the assignment handout.

  Due date:
  > Week 4

- **Assessment task 2**

  Title:
  > Assignment 2 - Parametric Methods, Clustering

  Description:
  > This assignment will involve a set of written questions relating to the learning material.
  >
  > Further details will be provided in the assignment handout.

  Weighting:
  > 15%

  Criteria for assessment:
  > Quality of answers to questions, demonstrates understanding of the learning material.
  >
  > Further details will be provided in the assignment handout.

  Due date:
  > Week 6

Assessment Requirements

- **Assessment task 3**

  Title:
  Assignment 3 - MML modelling
  Description:
  This will be a theory and programming assignment.

  Further details will be provided in the assignment handout.
  Weighting:
  30%
  Criteria for assessment:

  ♦ How well solutions are explained.
  ♦ Quality of code demonstrated, where applicable.

  Further details will be provided in the assignment handout.
  Due date:
  Week 11, Thursday, 11 October 2012

Examinations

- **Examination 1**

  Weighting:
  40%
  Length:
  3 hours
  Type (open/closed book):
  Open book
  Electronic devices allowed in the exam:
  Calculators

Assignment submission

It is a University requirement
(http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-procedures.html) for
students to submit an assignment coversheet for each assessment item. Faculty Assignment
coversheets can be found at http://www.infotech.monash.edu.au/resources/student/forms/. Please check
with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the
online assignment submission, hand-in a hard copy, or use an online quiz).

Online submission

If Electronic Submission has been approved for your unit, please submit your work via the VLE site for
this unit, which you can access via links in the my.monash portal.

Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

Assessment Requirements

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process:
http://www.infotech.monash.edu.au/resources/student/equity/special-consideration.html.

Returning assignments

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

Other Information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:
http://policy.monash.edu.au/policy-bank/academic/education/index.html

Key educational policies include:

- Plagiarism
  (http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-policy.html)
- Assessment
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-po
- Special Consideration
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.h
- Grading Scale
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/grading-scale-policy.html)
- Discipline: Student Policy
  (http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-discipline-policy.html)
- Academic Calendar and Semesters (http://www.monash.edu.au/students/key-dates/);
- Orientation and Transition (http://www.infotech.monash.edu.au/resources/student/orientation/);
  and
- Academic and Administrative Complaints and Grievances Policy
  (http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.
- Codes of Practice for Teaching and Learning
  (http://www.policy.monash.edu.au/policy-bank/academic/education/conduct/suppdocs/code-of-practice-tea

Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at www.monash.edu.au/students. For Sunway see http://www.monash.edu.my/Student-services, and for South Africa see http://www.monash.ac.za/current/

The Monash University Library provides a range of services and resources that enable you to save time and be more effective in your learning and research. Go to http://www.lib.monash.edu.au or the library tab in my.monash portal for more information. At Sunway, visit the Library and Learning Commons at http://www.lib.monash.edu.my/. At South Africa visit http://www.lib.monash.ac.za/.

Academic support services may be available for students who have a disability or medical condition. Registration with the Disability Liaison Unit is required. Further information is available as follows:

- Website: http://monash.edu/equity-diversity/disability/index.html;
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1 Gallery Building (Building 55), Monash University, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Sunway Campus
- Telephone: 03 9905 5704, or contact the Student Advisor, Student Commuity Services at 03 55146018 at Sunway

Reading list

Additional reading:

Pattern Recognition and Machine Learning, Chris Bishop, Springer, 2006.

D. L. Dowe (2011a), "MML, hybrid Bayesian network graphical models, statistical consistency, invariance and uniqueness", Handbook of the Philosophy of Science - (HPS Volume 7) Philosophy of Statistics, P.S. Bandyopadhyay and M.R. Forster (eds.), Elsevier, pp901-982, 1/June/2011 (accessible via www.csse.monash.edu.au/~dld/David.Dowe.publications.html#Dowe2011a)