MONASH University
Information Technology

FIT4009
Advanced topics in intelligent systems

Unit Guide

Semester 1, 2014

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FIT4009 Advanced topics in intelligent systems - Semester 1, 2014

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)

Workload Requirements

Minimum total expected workload equals 12 hours per week comprising:

(a.) Contact hours for on-campus students:

- Two hours of lectures

(b.) Additional requirements (all students):

- A minimum of 10 hours independent study per week for completing assignment and project work, private study and revision.

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

Associate Professor David Dowe

Campus Lecturer

Clayton

Reza Haffari

David Dowe

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 the Student Evaluation of Teaching and Units (SETU) survey. 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, see:

www.monash.edu.au/about/monash-directions/ and on student evaluations, see:
www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this Unit

Students have appreciated the variety of topics and the introduction to Minimum Message Length (MML) and Machine Learning.

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

Academic Overview

Learning 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.
- 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.

Unit Schedule

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1	Introduction to Machine Learning	
2	Non-parametric Methods	
3	Linear Models for Regression	
4	Linear Models for Classification	
5	Graphical Models	Assignment 1 handed out by now
6	K-means, Mixture of Gaussians, Expectation Maximization	
7	Bayesianism, Minimum Message Length (MML), inference, prediction	Assignment 1 due Week 7
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 2 due Week 11
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 learning system.

Teaching Approach

Problem-based learning

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

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 - Machine Learning	30%	Week 7

Unit Schedule

Assignment 2 - MML modelling	30%	Week 11
Examination 1	40%	To be advised

Assessment Requirements

Assessment Policy

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

Academic Integrity - Please see resources and tutorials at
http://www.monash.edu/library/skills/resources/tutorials/academic-integrity/

Assessment Tasks

Participation

- **Assessment task 1**

   Title:
   >Assignment 1 - Machine Learning

   Description:
   >This assignment will involve a set of programing questions as well as written questions relating to the learning material.
   >
   >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 7

- **Assessment task 2**

   Title:
   >Assignment 2 - 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

Examinations

- **Examination 1**

   Weighting:
   40%
   Length:
   3 hours
   Type (open/closed book):
   Closed book
   Electronic devices allowed in the exam:
   Possibly calculators, but nothing else.

Learning resources

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). This gives pointers and references to other related work.

Monash Library Unit Reading List (if applicable to the unit)
http://readinglists.lib.monash.edu/index.html

Faculty of Information Technology Style Guide

Feedback to you

Examination/other end-of-semester assessment feedback may take the form of feedback classes, provision of sample answers or other group feedback after official results have been published. Please check with your lecturer on the feedback provided and take advantage of this prior to requesting individual consultations with staff. If your unit has an examination, you may request to view your examination script booklet, see
http://intranet.monash.edu.au/infotech/resources/students/procedures/request-to-view-exam-scripts.html

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

- Graded assignments without comments
- Interviews

Extensions and penalties

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

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

Assignment submission

It is a University requirement (http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-managing-pla 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). Please note that it is your responsibility to retain copies of your assessments.

Online submission

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

Required Resources

Please check with your lecturer before purchasing any Required Resources. Limited copies of prescribed texts are available for you to borrow in the library, and prescribed software is available in student labs.

The Wallace (2005) MML book (some of whose details are at www.csse.monash.edu.au/~dld/CSWallacePublications#MMLBook) is probably available from the library in both hard copy and as .pdf . Please check and confirm.

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.

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:
www.policy.monash.edu.au/policy-bank/academic/education/index.html

Key educational policies include:

- Student Academic Integrity Policy and Student Academic Integrity: Managing Plagiarism and Collusion Procedures ;
  http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-policy.h
- Assessment in Coursework Programs;
  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.ht
- 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/dates/
- Orientation and Transition; http://intranet.monash.edu.au/infotech/resources/students/orientation/
- Academic and Administrative Complaints and Grievances Policy;
  http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.h

Faculty resources and policies

Important student resources including Faculty policies are located at
http://intranet.monash.edu.au/infotech/resources/students/

Graduate Attributes Policy

http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.ht

Student Charter

www.opq.monash.edu.au/ep/student-charter/monash-university-student-charter.html

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 http://www.monash.edu.au/students. For Malaysia see http://www.monash.edu.my/Student-services, and for South Africa see http://www.monash.ac.za/current/.

Monash University Library

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

Disability Liaison Unit

Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis.

- Website: http://www.monash.edu/equity-diversity/disability/index.html
- Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Commuity Services at 03 55146018 at Malaysia
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus