FIT4012
Advanced topics in computational science

Unit Guide

Semester 2, 2015

Last updated: 16 Jul 2015

Table of Contents

FIT4012 Advanced topics in computational science - Semester 2, 2015

All sciences are increasingly relying on computational support and the growth of many branches of science has only become possible due to the availability of efficient computational methods. The common basis of such methods are; numerical methods and high performance computing. Topics for this unit include: Numerical Methods, High Performance and Parallel Computing, Optimisation and Operations Research Bioinformatics, Simulation, Visualisation and Modelling.

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 lab and project work, private study and revision.

See also Unit timetable information

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

Dr Julian Garcia

Campus Lecturer

Clayton

Dr. Julian Garcia

Dr. Arun Konagurthu

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

The unit has been updated to include a broader range of computational science topics. Feedback has shown that students find the material covered interesting.

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 should be able to:

- explain the role of computational methods in the chosen field of specialisation and their relation to complimentary and related approaches;
- solve non-trivial problems using the algorithms specific to the chosen field of specialisation;
- compare and evaluate alternative computational approaches in the chosen domain in terms of performance and suitability to a specific problem;
- critically evaluate the limits and capabilities of these methods;
- select, design and test computer programs in the domain;
- use standard computational packages in the chosen domain effectively for practical problem solving where appropriate.

Unit Schedule

Week	Activities	Assessment
0	Review recommended reading	No formal assessment or activities are undertaken in week 0
1	Part 1: Model-driven Computational Science - Computational models	
2	Fundamentals: Markov chains	
3	Fundamentals: Game Theory	
4	Choosing Equilibria	
5	Dynamics	
6	Case study: Repeated Games	
7	Part 2: Data-driven Computational Science - Sequential data	Project Part 1 due week 7
8	Case studies involving sequential data analysis	
9	Problems involving structured data	
10	Case studies involving structured data analysis	
11	Problems involving semi/un-structured data	
12	Cases studies involving semi/un-structured data	Project Part 2 due end of week 12
	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

Research activities

Students are encouraged to explore the research literature, combined with practical problem-solving and learning 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
Project 1	30%	Week 7
Project 2	30%	End of Week 12

Unit Schedule

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:
    >   Project 1
    Description:
    >   Hands-on project from part 2. Students will negotiate an appropriate project with their
    >   tutors/lecturers. This assessment relates to all learning outcomes.
    Weighting:
    >   30%
    Criteria for assessment:
    >   Adherence to negotiated brief.
    Due date:
    >   Week 7

- **Assessment task 2**

    Title:
    >   Project 2
    Description:
    >   Hands-on project from part 2. Students will negotiate an appropriate project with their
    >   tutors/lecturers. This assessment relates to all learning outcomes.
    Weighting:
    >   30%
    Criteria for assessment:
    >   Adherence to negotiated brief.
    Due date:
    >   End of Week 12

Examinations

- **Examination 1**

    Weighting:
    >   40%
    Length:
    >   2 hours
    Type (open/closed book):

Closed book
Electronic devices allowed in the exam:
None
Remarks:
This assessment relates to all learning outcomes.

Learning resources

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

Feedback to you

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

- Informal feedback on progress in labs/tutes
- Graded assignments with comments

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 electronic submission). 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.

Recommended Resources

Access to a C, C++ or Java compiler and IDE environment. These are available in University computer labs.

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

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.h

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