



COMP777

Computing Methods for Research

S2 Evening 2014

Computing

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General Information

Unit convenor and teaching staff

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Credit points

4

Prerequisites

Admission to MRes

Corequisites

Co-badged status

Unit description

This unit deals with the effective use of computing devices and tools for research purposes. It aims at equipping research students with relevant computing skills that can greatly improve their research productivity. It introduces a range of tools covering data processing and analysis (eg, data mining), coding (eg, scripting, web-based programming, control version system), modelling techniques, communication media, document preparation systems (eg, LaTeX), computer-based presentation tools, bibliography management, and human-computer interfaces, among other topics.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

Apply a knowledge of programming in carrying out research tasks in a relevant discipline.

Articulate clearly a coherent argument in written and oral form to a variety of audiences.

Apply a knowledge of the principles of ethical conduct of research, including an examination of the role of open access to data and publications.

Recognise the requirements for open access dictated by journals and granting bodies in the appropriate research area.

Demonstrate best practice in document preparation and management in research.

General Assessment Information

Submission of assignments will be for the most part via iLearn; presentations associated with assignments will be given and assessed during class time.

For policy on late assignments, see Policies and Procedures.

Assessment Tasks

Name	Weighting	Due
<u>Publication Practices</u>	10%	Week 4
<u>Assignment 2: Ethics</u>	15%	Week 5
<u>Data Gathering and Analysis</u>	30%	Week 9
<u>Computational Experiments</u>	45%	Week 14

Publication Practices

Due: **Week 4**

Weighting: **10%**

This involves writing a report on the current status of open access and publication practices in a chosen subfield of computing, covering also any related issues of ethics. It will require the use of material from Modules 1 and 2.

On successful completion you will be able to:

- Articulate clearly a coherent argument in written and oral form to a variety of audiences.
- Recognise the requirements for open access dictated by journals and granting bodies in the appropriate research area.
- Demonstrate best practice in document preparation and management in research.

Assignment 2: Ethics

Due: **Week 5**

Weighting: **15%**

This involves looking at one particular scientific case involving ethical violations, or of ethical debate. The paper will, for example, cover the background to the case; a description of the ethical breaches that occurred, with reference to relevant ethics guidelines or codes of research practice; and a discussion of what ways scientific processes (e.g. peer review) may have failed such that this breach could occur, along with possible suggestions for changes to fix these. It will be based on material from Modules 1 and 2.

On successful completion you will be able to:

- Articulate clearly a coherent argument in written and oral form to a variety of audiences.
- Apply a knowledge of the principles of ethical conduct of research, including an examination of the role of open access to data and publications.
- Demonstrate best practice in document preparation and management in research.

Data Gathering and Analysis

Due: **Week 9**

Weighting: **30%**

This will involve gathering data (e.g. using Amazon's Mechanical Turk or SurveyMonkey) and analysing it, using Python scripting as appropriate. An analysis of the data is then to be presented in a report. It will be based on material from Modules 2 and 3.

On successful completion you will be able to:

- Apply a knowledge of programming in carrying out research tasks in a relevant discipline.
- Articulate clearly a coherent argument in written and oral form to a variety of audiences.
- Demonstrate best practice in document preparation and management in research.

Computational Experiments

Due: **Week 14**

Weighting: **45%**

This will involve carrying out computational experiments, using scripting and data analysis tools. There will be an emphasis on appropriate data storage and version control, and on reporting experimental results. It will be based on material from all the modules.

On successful completion you will be able to:

- Apply a knowledge of programming in carrying out research tasks in a relevant

discipline.

- Articulate clearly a coherent argument in written and oral form to a variety of audiences.
- Demonstrate best practice in document preparation and management in research.

Delivery and Resources

CLASSES

Each week of COMP777 has a three-hour session which is a mix of lecture (typically for the first two hours), tutorial and practical session. For details of days, times and rooms, consult the University timetables webpage (<http://www.timetables.mq.edu.au>).

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

There is no set text for the unit. We will be providing pointers to reading material over the course of the unit.

The unit has some parallels with the freely available [Software Carpentry](#) course. We'll be using those resources as supplementary ones for the unit.

UNIT WEBPAGE AND TECHNOLOGY USED AND REQUIRED

Web Home Page

COMP777 will make extensive use of the iLearn course management system, including for delivery of class materials, discussion boards, submission of work and access to marks and feedback. Students should check the iLearn site (<https://ilearn.mq.edu.au>) regularly for unit updates.

Questions and general queries regarding the content of this unit, its lectures or mixed classes, or its assignments should be posted to the discussion boards on the COMP777 iLearn site. In particular, any questions which are of interest to all students in this unit should be posted to one of these discussion boards, so that everyone can benefit from the answers. Questions of a private nature should be directed to the unit teaching staff.

Technology Used and Required

The practical work in this unit involves programming in the Python language (<http://www.python.org/>) which is widely used for the sorts of scripting purposes covered in this unit. Python can be downloaded free of charge for a range of operating systems from the Python website.

The unit will use [Python 2.7](#).

Note that as this is a master's unit, there will be some self-directed learning. We do not expect that you will know Python before the unit starts, but will pick up the necessary elements in the first few weeks of the unit; we will give pointers to resources for learning Python, will include snippets of Python in lecture notes where relevant to computational experiments, and will have set exercises for discussion during class.

The unit will also use [Amazon's Mechanical Turk](#) for data gathering, and a range of other tools.

Unit Schedule

Module #1	The Nature of Research in Computing [2 weeks]
Module #2	Document Preparation [2 weeks]
Module #3	Data Gathering and Curation, and Data Processing [2 weeks]
Module #4	Basics of Computational Experiments [3 weeks]
Module #5	An Instance of Computational Experiments: Machine Learning [3 weeks]

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Late Assignment Policy: No extensions will be granted. Late tasks will be accepted up to 72 hours after the submission deadline. There will be a deduction of 20% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission – 40% penalty). This penalty does not apply for cases in which an application for special consideration is made and approved.

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Apply a knowledge of programming in carrying out research tasks in a relevant discipline.
- Recognise the requirements for open access dictated by journals and granting bodies in the appropriate research area.

Assessment tasks

- Publication Practices
- Data Gathering and Analysis
- Computational Experiments

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Apply a knowledge of programming in carrying out research tasks in a relevant discipline.
- Articulate clearly a coherent argument in written and oral form to a variety of audiences.
- Recognise the requirements for open access dictated by journals and granting bodies in the appropriate research area.
- Demonstrate best practice in document preparation and management in research.

Assessment tasks

- Publication Practices
- Assignment 2: Ethics
- Data Gathering and Analysis
- Computational Experiments

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcome

- Apply a knowledge of programming in carrying out research tasks in a relevant discipline.

Assessment tasks

- Data Gathering and Analysis
- Computational Experiments

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- Articulate clearly a coherent argument in written and oral form to a variety of audiences.
- Apply a knowledge of the principles of ethical conduct of research, including an examination of the role of open access to data and publications.
- Demonstrate best practice in document preparation and management in research.

Assessment tasks

- Publication Practices
- Assignment 2: Ethics
- Data Gathering and Analysis
- Computational Experiments

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcome

- Apply a knowledge of the principles of ethical conduct of research, including an examination of the role of open access to data and publications.

Assessment task

- Assignment 2: Ethics

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- Articulate clearly a coherent argument in written and oral form to a variety of audiences.
- Apply a knowledge of the principles of ethical conduct of research, including an examination of the role of open access to data and publications.
- Recognise the requirements for open access dictated by journals and granting bodies in the appropriate research area.

Assessment tasks

- Publication Practices
- Assignment 2: Ethics
- Data Gathering and Analysis
- Computational Experiments

Changes from Previous Offering

There is one additional assessment item, the ethics paper. Other assessment items have been scaled down accordingly.

Assessment Standards

COMP777 will be graded according to the following general descriptions of the letter grades as specified by Macquarie University.

- High Distinction (HD, 85-100): provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application as appropriate to the discipline.
- Distinction (D, 75-84): provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.
- Credit (Cr, 65-74): provides evidence of learning that goes beyond replication of content

knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; convincing argumentation with appropriate coherent justification; communication of ideas fluently and clearly in terms of the conventions of the discipline..

- Pass (P, 50-64): provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; routine argumentation with acceptable justification; communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
- Fail (F, 0-49): does not provide evidence of attainment of learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; missing, undeveloped, inappropriate or confusing argumentation; incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.

The standards of achievement that will be used to assess each of the assessment tasks with respect to the letter grades are as follows.

Learning Outcome 1: Apply a knowledge of programming in carrying out research tasks in a relevant discipline.

P	Can develop algorithms for problems that are similar to provided examples.
Cr / D	Can analyse problems that differ from provided examples and apply a variety of provided algorithmic approaches to their solution.
HD	As for Cr or D and can develop programs using techniques or approaches that have not been discussed.

Learning Outcome 2: Articulate clearly a coherent argument in written and oral form to a variety of audiences.

P	Can formulate and convey most important points that could be expected on the topic.
Cr / D	Can formulate and convey clearly all important points that could be expected on the topic.
HD	As for Cr or D and can come up with novel insightful points on the topic.

Learning Outcome 3: Apply a knowledge of the principles of ethical conduct of research, including an examination of the role of open access to data and publications.

Learning Outcome 4: Recognise the requirements for open access dictated by journals and granting bodies in the appropriate research area.

P	Can explain the most important principles how research is conducted on computing and of ethical conduct in research, including how the functions of conferences and journals and the role of open access in at least one subfield of computing.
Cr / D	As for P, but with a broader knowledge than just for one subfield of computing.
HD	As for Cr or D, along with novel insights into issues of ethics, publication practices, and so on.

Learning Outcome 5: Demonstrate best practice in document preparation and management in research.

P	Be able to write a paper or document, or give a presentation, that would be acceptable at a conference.
Cr / D	Be able to write a paper or document, or give a presentation, that would be well received at a conference.
HD	Be able to write a paper or document, or give a presentation, that would be well received at a major international conference.

These assessment standards will be used to give a numeric mark out of 100 to each assessment submission during marking. The mark will correspond to a letter grade for that task according to the University guidelines. The final raw mark for the unit will be calculated by combining the marks for all assessment tasks according to the percentage weightings shown in the assessment summary.

We will look at your overall performance on all assessments when determining your final grade. A total raw mark of at least 50% in each of the assessment tasks will be sufficient to pass the unit. Students who do not meet this cut-off will be examined on a case-by-case basis.

On occasion your raw mark for the unit may not be the same as the Standardised Numeric Grade (SNG) which you receive as the final result. Under University Senate guidelines, raw marks may be scaled to ensure that there is a degree of comparability across the university, so that units with the same past performances of their students should achieve similar results.