COMP9991 Research Project A

School of Computer Science and Engineering

Course outline

1 Requisites

All conditions below must be met at the time when the application is made.

1. Be enrolled in program 8543 Master of Information Technology.

2. Be (possibly partly thanks to advanced standing) credited with 66 units of credit.

3. Have a WAM of 75 or higher.

4. Not have failed any course.

5. Have agreement from a CSE or Data61 academic supervisor.

6. Have written a project description.

2 Learning outcomes

On successful completion of this course, graduates will be able to demonstrate the following learning outcomes.

1. Be able to carry out a literature survey on a specified research problem.

2. Be able to plan a research project (under supervision).

3. Be able to present one's work via a live presentation.

4. Be able to conduct research (under supervision).

3   Course aims

This course aims for students to commence study on a research topic mutually agreed with a CSE academic supervisor. By the end of the term, they need to

1. present a review of the topic, including current approaches,

2. offer a plan for future work, and

3. have made some progress towards carrying out that plan.

It is not expected that student submit a written report. Still, projects are very different in nature and supervisors are free to guide, direct and support students in a way they consider to be particularly appropriate or desirable. In particular, supervisors can require that a written report be submitted. They will then, at the beginning of the term, provide students with the necessary details (how long the report could or should be, what it should contain, how it should be structured, when it should be sent to supervisor and assessor, what kind of feedback will be provided on that basis).

4   Assessment

A seminar should be held in week 11, between Monday 9am and Friday 6pm, at a day and time that is suitable to all. The student should organise it, either online or physically depending on the circumstances and what is possible or best for everyone at the time. The seminar will be attended by at least the supervisor and the assessor. It is strongly advisable to advertise the seminar to the research students in the School (via email sent to research-students@cse.unsw.edu.au) to

- give a chance to every PhD and Master by research student who is interested in the topic to find out more,

- make sure that maximal feedback is received,

- practice giving presentations to a larger audience.

Supervisor and assessor will not only provide feedback on the progress and plan, but also determine which of COMP9992 or COMP9993 is most appropriate in the following term, taking into account student wishes and administrative constraints.

An EC grading scheme is used. A mark is awarded at the end of COMP9992 or COMP9993 (provided that supervisor and assessor agree that student can enrol in one or the other in the following term), and includes assessment of work done in both terms, including a mark for COMP9991.

Still, students who do not provide an adequate plan for the project by the end of term will NOT be allowed to continue to COMP9992 or COMP9993 and must repeat COMP9991.

Also, the Thesis Management System (TMS) will invite supervisor and assessor to provide feedback on the seminar, by awarding marks whose value is indicative only, and by providing comments using the following marking scheme, distributed over 3 criteria.

- **Problem definition and state of the art (50%)**

  - **FL (0-49%)**: The problem being tackled is ill-defined.
  - **PS (50-64%)**: The problem being tackled is well-defined but there is not enough knowledge or understanding of the techniques available to solve it, of their strengths and limitations.
  - **CR (65-74%)**: Good understanding of the problem and the gap in the state of the art that would be filled by addressing the problem successfully.
  - **DN (75-84%)**: Very good understanding of the problem, very good knowledge of the relevant literature.
  - **HD (85-100%)**: Excellent understanding of the problem and an in-depth knowledge of where and why the best techniques known so far are limited.

- **Achievements so far (30%)**

  - **FL (0-49%)**: Nothing has been done besides studying the literature.
  - **PS (50-64%)**: Some preliminary results, possibly experimental but not necessarily, have been obtained thanks to which the problem is better understood.
  - **CR (65-74%)**: Some preliminary results, possibly experimental but not necessarily, represent the first steps towards a solution.
  - **DN (75-84%)**: Substantial results have been obtained that offer a partial solution to the problem.
  - **HD (85-100%)**: Thanks to the results that have been obtained, part of the problem can be considered as being fully solved.

- **Plan for COMP9992 or COMP9993 (20%)**

- **FL (0-49%)**: Not much more clarity on how to approach the problem than when the project started.
- **PS (50-64%)**: Understanding of how to approach the problem and with a high probability, obtain good results.
- **CR (65-74%)**: Clear understanding of how to approach the problem in a structured manner and which milestones to aim for.
- **DN (75-84%)**: Very good understanding of the work ahead, of the chances of success of the planned approaches, and of the outcomes that can reasonably be expected.
- **HD (85-100%)**: Excellent proposal to structure the work ahead, with an in-depth appreciation of the chances of success of the various parts of the proposed work, with different paths to follow or not depending on progress to maximise the final achievements.

These marks are only provided as feedback, they are not "official", they won't appear on your transcript, they won't be used in the computation of the mark that is eventually awarded to COMP9991. That computation will be performed when completing COMP9992 or COMP9993, with a mark awarded to COMP9992 or COMP9993 and (retrospectively) to COMP9991 as well.

5   Details on the project description

Your application should include a precise and detailed research proposal, that will on average require 1 or 2 pages of text, possibly including diagrams. The length of the proposal is not of paramount importance. What is essential is that it be very clearly and very precisely formulated. Here are the key points that your proposal should address.

- What problem will you tackle? Is the research theoretical, practical, or does it mix theory and implementation?
  - If the research is theoretical, then you are expected to express in a suitable theoretical framework significant statements, whose proofs are nontrivial and properly written. An example of such a result would be the precise description of a new algorithm that solves a given problem, a statement on the running time complexity of the algorithm, and a nontrivial proof that justifies that statement. For the work to be significant, the underlying problem should be known to be important, and the algorithm should have advantages over existing ones, being either more efficient, or no less efficient but markedly more elegant, or simpler.
  - If the research is practical, then you are expected to deliver a stable, well designed, well tested implementation of a system that could be released as beta software. As this

is a research project, there should be challenges to solve before you can proceed with the implementation. For instance, you might have to modify some data structures or algorithms in a nontrivial way to perform some crucial computations. For the work to be significant, it should be known that there is a community of potential users who would be keen to try your system to address some of the needs they have, and your implementation should have advantages over existing ones, being more powerful, or more user-friendly.

– If the research mixes theory and implementation, then you would typically improve an algorithm that is known to have important practical use, and accordingly modify an existing implementation, or implement a prototype. The modifications to the algorithm would not by themselves be substantial enough and the proof of correctness of the algorithm, or the proof that is has such and such complexity, would not be difficult enough to result in a successful theoretical research project. Also, the implementation would not be challenging enough to result in a successful practical research project. But taken together, theoretical results and implementation would require substantial work and validate the interest of the approach.

- It is definitely not enough to use existing techniques on a given problem and determine which one performs better on the basis of experimental results. Though this kind activity could be part of a research project, it would not be enough to fully qualify the work as research, whereas you are expected to complete a full fledged, comprehensive piece of research. Hence it is essential to pitch the difficulty of the project at the right level, neither too easy nor too challenging, and make sure that you will have to demonstrate enough creativity, inventiveness, cleverness, rigour, knowledge, and more, but within the limits of what you can achieve in at most 9 months of work.

- Why is the problem you want to tackle significant, what tells you it is an important problem?

- What are the limitations of the current approaches, what do you claim your re- search will bring to the current state of the art?

- What do you expect your research to deliver, in terms of theoretical results or implementation? By its very nature, research is unpredictable, and the outcome of your research might be significantly different to what you had envisioned. What will be evaluated is the outcome itself, and not whether the outcome matches what you had envisioned. But it is important when you write your proposal to have views on what are the significant and achievable aims that will first guide your research.

- What are the fundamental features of your approach? Successful research usually starts with one or two very good ideas, that appear as promising and fruitful. You should be able to express these ideas as clearly and precisely as possible, so that interested readers can appreciate their potential. Writing a good research proposal is essential to put your research project on the right footing. The exercise will help you considerably in getting a clear picture of the work

that lies ahead. It is likely that you will have to go through a number of drafts, discussing each of them with your supervisor, before you write and submit the final version. If your research proposal is not good enough, then the Postgraduate Coursework Academic Advisor will not approve your application. If your application is successful, then a request will be made to have the admin staff enrol you manually in COMP9991. Also, an assessor will be assigned to the project, who together with your supervisor, will eventually evaluate your work as previously indicated, and who is expected to serve as assessor again when you enrol in COMP9992 or COMP9993 (provided you can do so).

6   Information of interest to students undertaking a research project

The School of Computer Science and Engineering (CSE) at the University of New South Wales will be offering up to 8 Top-Up scholarships of $12k per annum for domestic students commencing their PhD/MPhil programs at CSE in 2022. The top-up will supplement the main RTP award worth $28,854 p.a. More information can be find at https://www.unsw.edu.au/engineering/news-events/news/cse-top-scholarships-domestic-phdmphil-students.