Guidelines for MSc/Diploma Projects and Dissertations MSc in Artificial Intelligence

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General Perspective

The MSc project and dissertation give you the opportunity to spend a significant amount of time developing a piece of practical work. You will not be doing a great deal of open-ended original research - this would obviously be impossible given the amount of time you have - but you may well be extending previous work into new areas or reimplementing an existing system in a new way. Your project should be practical rather than purely a discussion of theory or a survey of other people's work.

The first two terms of the course are intended to give you the basic concepts of the subject, and the project work is intended to enable you to develop some practical skills to complement this. The ability to write non-trivial programs is one of these skills, but not the only one. These are some of the others:

- The ability to build an AI program in such a way that others can understand it. This calls for good design and good commenting of code.
- The ability to test ideas by means of a program, to assess whether they work or not, and to be able to put forward evidence that others can accept for their success or reasons for their failure.
- The ability to sustain a significant enterprise and make progress with it, judging what constitutes progress, what is preventing progress and when it is sensible to amend the goals.

In the light of these points, it is advisable for you to produce a timetable early in your project, and discuss it with your supervisors. You can then use this as a guide to your progress.

The dissertation, then, should show that you have begun to develop such skills. It should describe the goals of the project, and any changes you made to them in the light of experience, and why. It should present sufficient context, in terms of work done here or

elsewhere, to show why the goals are interesting – you can, however, assume that the reader is knowledgeable, although perhaps with a different perspective on the subject than yours. This means that you should not regurgitate lecture material, nor spend much space on defining well-known terminology and ideas. The overall flavour of the dissertation should be a record of sustained and well-applied effort, describing the development of your ideas about the project and their expression and testing in program form. A common mistake is to believe that a description of the structure of a program fulfills this; it does not! Rather, there should be an account of how parts of the program relate to ideas about attaining the project goals, and why, and how the ideas were or could be tested. It is unwise to include large chunks of program code in the text, since nearly all programs consist largely of uninteresting scaffolding that supports the key fragments. You should show that you appreciate the distinction. The key issues are:

- balance,
- good judgement,
- sustained and coherent effort,
- identification of relevance to others' work.

All this may suggest to you that, to produce a good dissertation, your project should achieve its original aims or a close version of them. This is not necessarily so. It is equally worthwhile if you fail to achieve what had originally seemed viable, provided that your dissertation explains why the aims had seemed feasible and how you explored the problem to discover that they were not. Such an exploration if thoroughly done and well analysed can be equally valuable as a dissertation as a straightforward record of success. The eighteen weeks allotted for the project is not long, and it is rare to be able to produce a complete and self-contained piece of useful work in that time. It is, therefore, a good idea to include in your dissertation a discussion of how you would have developed the work given more time. This can also mean describing how you would have set about identifying the problems that you finally hit, or how you might have solved them if you had already identified them, or how you would have changed the aims of the work to avoid them.

Project Selection

Project selections can come from: a database of about 100 proposed by the academic and research staff, some externally proposed projects, and self-proposed projects (another document describes these).

Your project will be allocated to you, based on your preferences and the available resources of the department. The usual practice is for you to submit a short list of project choices in preference order to the Project Organiser. The Project Organiser allocates the projects to students and staff, taking account of your preferences and the workloads of the staff. Most students get their first choice.

Project allocation is made before the spring exams. If your exam performance suggests that your proposed project is too difficult, then you will be required to select an easier or simpler project (although this might just entail simplifying the allocated project).

Project Review Meeting

Students are divided into small groups of between four and six students. This group will meet in late June, with supervisors in attendance. One of the supervisors acts as group coordinator.

At the meeting each student will give a 10-15 minute talk describing progress on project work and future plans. 5 minutes of questions will follow. The talk is informal and should be viewed as a means of eliciting feedback and suggestions from the audience, rather than a confrontation. Accordingly, any constructive comments from those present (both staff and students) are strongly encouraged. Supervisors should assist their students in preparing for the meetings, and transmit further feedback to them afterwards. The purpose of this system is fourfold:

- to ensure that suitable progress is being made;
- to catch potential problems and mistakes quickly;
- for students and supervisors to benefit from the experience of other students and supervisors;
- to provide students with practice in giving presentations.

A brief report from the meeting will be forwarded by the group coordinator to the projects organizer. Students whose progress, as perceived by the group meeting, gives cause for concern may be required by the projects organizer to fulfill further monitoring requirements in order to ensure that progress is being made.

The talk should cover the following points:

- the aims and objectives (objectives being concrete milestones that can be verified);
- what background information has been sought/will be sought;
- what design/implementation work is required, and what has been done to date;
- what experimentation is/will be required;
- what resources are needed;
- what are anticipated to be the most difficult problems;
- timeplan for the work, including what will be dropped if things so slower than expected.

Speaking about something takes much longer than you will anticipate if you're not used to it; you only have 10-15 minutes, and so will have to be very brief on each point. You will probably find it helpful to use slides (overhead transparencies) to structure your talk. If you find yourself using more than 5 or 6 slides then you probably are going into too much detail and are unlikely to finish within 15 minutes.

Programming Practice

1. Plan it first (i.e. before programming it). Try, if you can, to work out (in advance) a specification (which is possible in more cases than you think) – this frees the thinking stage from the tedium of debugging, editing, etc. Do NOT do this specification in your head alone – the trouble with forgetting the details is that often you forget that you've forgotten (see advice below on Writing Practice).

2. Document your code as you go, since this project is sufficiently long that you will have to re-read and understand code that you wrote some weeks before. Then you will realise the point of all those sermons about commenting the parameter details of procedures.

3. Spread your software sensibly across files, e.g. I/O tools in one file, utilities in another file, and so on. Put comments at the head of each file giving a policy statement about its contents. Also put the date of the last edit of that file – you can often persuade your favourite editor to do this for you at the touch of a key, if you know the right magic.

4. Keep a file whose sole job is to tell you what the other files are for.

5. Remember, the I/O of your program is what others see. Put a lot of effort into making it good. For instance:

   - provide a 'help' mechanism
   - give the user a hint about the form of an acceptable reply whenever asked to give one
   - put some thought into what to do if the user gives an unexpected reply. Printing "you dirty rat" and exiting, or continuing, is not good enough.

Design these features at the start. Any later is too late.

Eighteen weeks is remarkably short. If you are the kind of person who relaxes until it is time to panic, then works flat out, you need to know: now is the time to panic. There is no second chance.

You must leave your software in a usable state. This includes written documentation on how to run the programs and what their inputs and outputs are, and what the various source files are and how they are used to construct your programs. These will be used by

staff and future students to develop your work further. This is part of the documentation you will write in the two weeks after the dissertations have been submitted.

Good Neighbourly Practice

Be considerate of other users when running large programs which take up a lot of cpu time, especially if you are running these as background jobs when you are not there. You can use the 'nice' program to lower the priority at which background jobs are run, and the 'polite' program which suspends a large job whenever someone else logs in to the console of that machine. The 'at' command can be used to set the job up to run overnight.

Writing Practice

Write up as you go along. Have some kind of working document which outlines, fairly clearly, what you are doing, why, and how your current system works/should work, and which can grow as the project progresses. This will do several things:

- By attempting to set down clearly what you are doing, you may, as a result of the effort of explaining it to someone else (your supervisors), see errors or ways of improving what you are doing. Late August is a bit late for such revelations to have useful consequences. For this to have a real effect, you must write these notes for an imaginary reader other than yourself. That is, these are not to be jottings for jogging your memory a week later – they should be a lucid exposition of what you are doing.
- It will give you something to show to your supervisor (or any interested party) to illustrate your current thinking and intentions (it is remarkably difficult for a supervisor to get inside your head just by a one hour chat).
- It will furnish raw material in textual form which should be useful for the final dissertation – spending the last week of the project period frantically writing is no way to produce a dissertation.

Clearly this is a strong argument for doing textual work on a workstation – then alterations to this document can be made easily (you just wouldn't make them if it wasn't).

Dissertation

More advice on the actual structure and contents of your dissertation will be given in early July. LaTeX outlines are provided to help in the preparation, though it is not obligatory for you to use them as long as the appearance of your dissertation complies with University rules.

The dissertation will not be very long. About 70 normal A4 pages is usually about right for the main text (excluding appendices). MSc AI dissertations are limited to less

than 20,000 words and 15,000 has been the average. (This limit is for the main text and does not include appendices and tables, etc.)

Deadlines

Your dissertation is due on Friday 14th September

You must submit your dissertation by this date or you are virtually certain to fail. Unless you have a very good excuse (e.g. serious illness, last week illness - you must get a doctor's certificate - or death in the family, etc.) you stand little chance of getting any extension. (Bad planning, too many distractions, too hard a problem are not excuses: part of your training is to recognize such problems and act accordingly.) This is a Faculty decision and the Division has no say in extensions at all. If you feel there are grounds for an extension, see your supervisor and the MSc course organizer as soon as possible. They will have to write letters to Faculty requesting the extension. Don't wait until the last moment.

The last two weeks of the course will be taken up with demonstrating your project, writing an outline paper based on your work, and setting up a workable demonstration in a directory on one of the Division's machines. The dissertation deadline is NOT the end of the course.

The Board of Examiners has also decided that if a demonstration is weak, you may be required to take a viva examination before the end of the course.