

## **MASTER OF SCIENCE (MSc) IN COMPUTER SCIENCE MAJOR RESEARCH PAPER GUIDELINES**

### **INTRODUCTION**

The Major Research Paper (MRP) in the Master of Computer Science program should present an exploration and review of a practical, empirical or theoretical question or problem related to the broad field of Computer Science. The MRP need not involve original research but it must explore a well-defined problem. It may take the form of the exploration of existing work or the implementation of a new system exhibiting or demonstrating computing principles. The MRP is intended to be a research project that is narrower in scope, less sophisticated in methodology, or less complete in data gathering than would be required for a thesis.

Enrolment into the MRP option is subject to a Program faculty member agreeing to supervise the student, and the approval of the Graduate Program Director. The research topic is selected in consultation with the student's supervisor, after which the student must submit a written proposal of the research to be conducted. Once the supervisor has approved the proposal, work on the research paper may proceed. The completed research paper will be evaluated by the supervisor and a second reader, normally also a member of the Program faculty.

### **TIMELINE**

Work on the research paper will typically begin during the student's second or third term of the program, and should typically be completed within two or three terms.

### **PROPOSAL**

The MRP proposal (not exceeding 8 pages) should contain the following sections:

- Introduction - sets the context for the paper
- Literature Review - mentions key prior work that is relevant to the proposed project; this is not meant to be a full review at this stage
- Objectives Statement - a clear statement of the study question and why it is important
- Methodology and Approach - details the methods and tools that will be used
- Work Plan - the anticipated stages of the project in table format, including dates and outputs
- Anticipated Research Outcome
- References

## **CONTENT AND FORMAT OF THE MAJOR RESEARCH PAPER**

The format of the major research paper depends on whether it comprises i) a review paper or ii) a report on original work (either research or implementation of software).

- i) Format for a review paper:
  - Chapter I: Introduction
  - Chapter II: Discussion (with topic headings)
  - Chapter III: Summary
  - Chapter IV: References
  
- ii) Format for a practical paper:
  - Chapter I: Introduction
  - Chapter II: Related Work
  - Chapter III: Methodology
  - Chapter IV: Results
  - Chapter V: Summary
  - Chapter VI: References

These sections are described in detail below.

### **Introduction**

The Introduction typically forms Chapter I of your research paper. This is where you lead the reader into the core of your paper. It is where you frame what you will present in future chapters. It explains the context of your work. The Introduction might make reference to a particular field or perhaps a problem that your work addresses. You should state here the thesis of your work (what you plan to prove or do). Provide a clear statement of your contributions. Describe how the rest of your paper will be organized. The Introduction should be compelling but not very long.

### **Related Work (literature review, comparison between prior research and your MRP work)**

The literature review typically forms Chapter II of your research paper. This section is a review of all relevant research that impinges on your research paper. It is the work done by others that relates to what you hope to demonstrate with your work. This is also where the literature related to methods that you used in your work should be introduced.

This part of your document will form the bulk of your citations. The literature survey typically references only publicly available material. The purpose of this section is to illuminate the area of research, although some of the literature survey may begin in the Introduction to help prime the reader. This chapter also helps guide the reader through the rest of your paper in the sense that it provides direction as to what bodies of knowledge you used.

It is good practice to cite seminal and significant works directly, rather than through the work of others that relied on these primary sources. It is also good practice and prudent to cite one's own peer-reviewed works, since that adds to your position.

### **Methodology (explains your technical approach)**

If your research paper involves basic research or implementation of software, you will need a chapter on Methodology, typically Chapter III, where you describe your technical approach. This chapter discusses how you would do what you have already done, if you were to start again. Methodology chapters are intended to be complete, detailed reports of what someone would need to do to determine if your results can be replicated.

This section will also describe experiments you have run, along with testing methodologies and how these would be actually applied in your case. You disclose how you obtained your results, but do not actually give the results.

### **Results (empirical evaluation, details of experiments)**

In this section you will report the results of your work with reference to the methodology you discussed in the previous section. It is very important that you evaluate the results in relation to your thesis statement. This will bolster your arguments concerning the validity of your statement and will make it more difficult to attack. In many cases the claims you made in the first section of your paper can now be substantiated as well.

Generally speaking, it is a good idea to break this part of your research paper into sections that address a single claim at a time, by applying your methodology, reporting a result and discussing the result in the context of your thesis statement.

This section will normally form Chapter IV and is essentially the "meat" of your document. It may take more than one chapter to present.

### **Discussion (as part of a review paper)**

The discussion chapter of the review paper need not have the title "Discussion," but rather could have one or more topic headings. This chapter forms the body of your review. Your goal in this chapter is to analyze and discuss a number of primary papers in order to make arguments that support the thesis you revealed in the Introduction. Note that your job is not simply to report on what other researchers have done, but rather to draw connections and inferences based on their work to support original ideas that you are asserting. You are synthesizing and presenting your own opinions about this body of work.

## **Summary**

This section allows you to explain to the reader all conclusions that can be drawn from evidence that you have presented in previous sections. You should state again your contributions and make reference to how you validated them in your paper. Clearly state the limitations of your work, such as assumptions you have made and questions you have not addressed. Discuss the significance of these limitations.

## **References**

There are a number of styles and formats for in-text citations and the list of references at the end of your paper. You should consult with your supervisor for their recommendation, but can also refer to online resources such as “Scientific Style and Format.”

## **SUBMISSION AND EVALUATION OF THE MAJOR RESEARCH PAPER**

The student is responsible for submitting two hard copies of the finished research paper - one for the supervisor and one for the second reader - to the supervisor for evaluation.

The supervisor and second reader will evaluate the research paper and determine whether it is deemed satisfactory or unsatisfactory. In the event that the second reader finds the paper unsatisfactory, he or she should consult with the supervisor about possible revisions. The second reader may request minor or major revisions before the final paper is accepted and submitted to the Program office.

The supervisor and the second reader may opt to meet with the student to discuss the paper but this is not required.

A written and signed “Supervisor and Second Reader Report” will be submitted by the supervisor to the Graduate Program Administrator.

Once the research paper has been evaluated, the student must submit a final PDF copy (formatted according to the YSGS Thesis, MRP, and Dissertation Submission guidelines) to the Graduate Program Administrator, and the supervisor must inform the Graduate Program Administrator in writing that any required revisions have been made. Completion of the major research paper milestone will not be reflected on the student’s academic record until this is done.

## **RESPONSIBILITIES OF THE SUPERVISOR AND SECOND READER**

### **Supervisor:**

Typically, the MRP supervisor's responsibilities include:

1. Approving the research Proposal that guides the MRP.
2. Guiding the student's research/writing and requiring revisions as necessary. Students should recognize that producing multiple drafts is a normal and expected aspect of writing a major research paper. The supervisor is guiding the student to produce the strongest possible academic work before it is submitted for evaluation, however the student is responsible for the work. Typically the supervisor and student will hold regular meetings, and be in contact by email. The supervisor will establish the schedule of contact with the student.
3. Determining, in consultation with the student and Graduate Program Director, which faculty member will serve as second reader of the MRP.

For more information about the Student-Supervisor relationship and defining/discussing the expectations, please refer to the YSGS Student-Supervisor Discussion Checklist (available on the Yeates School of Graduate Studies web site)

### **Second Reader:**

The student and supervisor will confer on the selection of a second reader, who is normally a member of the Program faculty. The second reader represents an additional academic review of the student's work, however, the second reader is not a co-supervisor. The timing of the second reader's involvement is best determined by the supervisor. Normally the second reader will read the MRP only when the supervisor has deemed a completed draft to be satisfactory.

## **STUDENT CODE OF ACADEMIC CONDUCT:**

Graduate students are expected familiarize themselves with Ryerson University Policy 60, "Academic Integrity" and avoid academic misconduct.

It is the student's responsibility to understand what constitutes plagiarism and to take appropriate action to respect intellectual property rights. The student must ensure that the deliverables created for the MRP are completely original works of his/her own creation; that the use of other peoples' ideas and intellectual property are appropriately recognized, and that all citations provided are accurate. The Ryerson University policy on Academic Integrity applies to all aspects and stages of the MRP milestone, including early drafts of your paper. Failure to adhere to this policy may result in an Unsatisfactory evaluation for the MRP. The graduate programs in Computer Science have a zero tolerance policy on plagiarism.

Students should also be aware that the MRP will be submitted to Turnitin.com, an evaluative and feedback tool to which Ryerson subscribes. Turnitin is a tool to assist faculty members in determining the similarity between student work and the work of other students who have submitted papers to the site (at any university), internet sources, and a wide range of journals and other publications. While it does not contain all possible sources, it gives faculty some assurance that students' work is their own. No decisions are made by the service; it simply generates an "originality report". Faculty must evaluate the originality report to determine if something is plagiarized. Students who do not want their work submitted to this plagiarism detection service must, before submitting their MRP proposal, consult with their supervisor to make alternate arrangements.