

MS-DMC Graduate Student Thesis Handbook

Purpose

This handbook provides guidance about the expectations and procedures for completing

- DATA 750: Thesis in Data Science
- MATH 750: Thesis in Applied Mathematics
- CMPS 750: Thesis in Computer Science

for students enrolled in the Masters of Science in Data Science, Applied Mathematics, or Computer Science programs (MS-DMC) at Ramapo College.

Overview

- All MS-DMC students must complete a thesis (DATA 750/MATH 750/CMPS 750) as part of their graduation requirements¹.
- Typically, the thesis is completed in the last semester of the student's degree program.
- Prior to registration, students must have an approved **proposal** for their project. The proposal must have signatures from the thesis advisor and two readers.
- In order for a proposal to be approved prior to registration, the student must have started a dialog between the advisor and readers **at least 4 weeks** prior to registration. It is recommended that students initially contact (select) their advisor during the early part of the preceding semester to begin the discussion.
- Students do not need fully elaborated project plans to start the dialog with their advisor - the advisor will assist in solidifying and clarifying the project. Students **do** need to have an **idea**, **topic**, and rough **goal** to start the discussion.
- Projects that require the collection or evaluation of personal information may require approval from the College's Institutional Review Board (IRB). The thesis advisor will help determine whether the project requires IRB approval - which **must** be applied for prior to DATA 750/MATH 750/CMPS 750 registration. Students who plan to use data sets that include personally identifiable information or actively collect information from individuals must begin discussing their project towards the **beginning of the semester preceding their thesis**, as IRB approval can take several weeks.

Thesis Expectations

A Master's level thesis project in Data Science, Applied Mathematics, or Computer Science can take on many different shapes, and students are encouraged to begin discussing their ideas

¹ Completion of DATA/MATH/CMPS 730 - Fieldwork 2 will substitute for the Thesis requirement, however students should not plan for this to be a regular occurrence - this option will be available on a limited basis, constrained by the number of available two-semester Fieldwork projects sponsored by partners.

with potential thesis advisors and readers as soon as possible in order to mold their project ideas into a suitable thesis.

Thesis projects may be characterized as (but are not limited to) any of the following:

1. **Technique-focused:** Improving upon existing, or developing new mathematical and computational techniques for a specific problem.
2. **Tool-focused:** The creation of a mathematical or computational tool that can be used to solve or present specific types of generalizable problems.
3. **Domain-focused:** The application or development of a tool or technique to a specific domain to answer domain-specific questions relevant to the stakeholders within that domain.

The key commonality among all Master's theses is that students must demonstrate the **value** of their project's outcomes. The thesis must contribute useful knowledge to their discipline (Data Science, Applied Mathematics, or Computer Science) or use skills from their discipline for a particular domain/industry. While the deliverable of a project may be a technique/tool to solve specific or general categories of problems, projects may also produce visualizations, dashboards, or meta-analyses that expand upon and synthesize existing literature and data to build on knowledge within the field and/or explore ethical implications of data.

The project's scope must be realistic, to fit within the constraints of a 15-week semester - while also substantial enough to warrant an entire semester of work (DATA 750, MATH 750, CMPS 750 are 3-credit courses).

A necessary component of any thesis is some degree of risk. When proposing a project, the student advisor will explore what aspects of the project may prove more difficult than expected.

- When a project involves answering new questions using new techniques, the answers to those questions may not be what was expected.
- When developing a new mathematical or computational technique to better solve a problem, it may turn out that it does not!

The evaluation of your thesis centers around the **process** in which you went about completing your project - not solely on the outcome/deliverable. Your thesis committee will work with you throughout the project to guide you through the expected challenges you encounter - **which is why constant communication with your thesis committee is so crucial to your success.**

Thesis Proposal

A thesis proposal must clearly articulate the following aspects of your plan:

- What problem are you trying to solve?
- Why is the problem worth solving? What industry, research question, or group would benefit from the outcome of the thesis project?
- Why is the problem hard? What are the key challenges that make the project / solution / deliverable impactful?

- Does your project require data? If so, what data are you using? Do you have access or permission to use this data?
- What are the ethical considerations around your project? How might various stakeholders benefit from or be harmed by your work?
- What are the core technical skills that you will need to complete your thesis?
- What is the specific deliverable? This might be an “answer” to a set of questions about a particular domain, a framework for solving questions, an application or program to assist in completing work more effectively , etc.
- What are the specific milestones you expect to accomplish, and when? Your proposal should have a project plan, outlining specific steps you will take to complete the project.

Thesis Document Requirements

The thesis document is the primary deliverable of the project, and will be made available publicly as a digital (PDF) document through the College’s website. While there are no specific page number limitations, the thesis document must be a complete, self-contained document that adequately describes the project, the process by which it was completed, the results of the project, and a conclusion describing and reflecting upon the project’s impact. All thesis documents must also include a related work / background section that adequately contextualizes the project within the discipline (i.e., the tools and techniques utilized or improved upon) and the domain where applicable.

The document must adhere to the following formatting and content guidelines:

- All straight text is to be double spaced.
- Quotations, if more than a few lines in length, should be indented from margins and single spaced.
- Footnotes, tabulations, formulas, etc. should likewise be single spaced.
- Margins on all pages should be at least 1 inch.
- Margins on illustrations, tables, graphs, etc., shall conform to the above.
- Page numbers should be at the center bottom without violating the 1-inch margin.
- Figure numbers and titles should be centered and below the figure.
- Illustrations, tables, graphs, etc., shall be consecutively numbered, so that they may be readily referred to in the context.
- Figures and tables placed sideways (landscape orientation) on the page must be outward facing (facing to the right). Page numbers shall remain at the bottom, center of the page (as if portrait oriented).
- A Table of Contents, giving at least the chapter headings, with page numbers, must be prefaced to the thesis.
- If the thesis contains a significant number of tables, figures, etc., they shall be listed as List of Figures or List of Tables. This list will normally follow the list of chapter headings. Check to be sure that the titles on the actual figures, etc., agree with those listed.
- An abstract is to be prepared which will summarize the main findings and conclusions of the thesis. Abstracts are limited to 500 words.

- The material of the complete thesis shall be arranged and numbered as follows:
 1. Title page (which is page i but is not numbered)
 2. Copyright page (which is page ii)
 3. Blank certificate of approval (iii)
 4. Acknowledgments (if any)
 5. Table of contents
 6. List of tables (if any)
 7. List of figures (if any)
 8. List of illustrations (if any) NOTE: Roman numeral pagination ends here
 9. Abstract (arabic numeral 1) NOTE: Arabic numeral pagination starts with the abstract at page 1 and is continued in consecutive order to the last page of the thesis.
 10. Main text of the thesis including any footnotes, tables and figures
 11. List of references cited.

The thesis is to be submitted via email to the faculty advisor as a single PDF, along with appendices such as distributable computer code, data sets, and interactive data visualizations if applicable.

There are several referencing styles that can be used in listing books, articles, reports, unpublished materials, and public documents, etc. in your set of references. Please consult with your advisor on the appropriate style. It is important that you maintain consistency with one style throughout your thesis. The following list highlights manuals that are excellent guides to referencing styles:

- Dodd, J.S. (Ed.) (1986). The ACS style guide: A manual for authors and editors. Washington, DC: American Chemical Society.
- Turabian, K.L.(1987). A manual for writers of term papers, theses, and dissertations. (5th ed.). Chicago: University of Chicago Press.
- Chicago: University of Chicago Press. (1982). The Chicago manual of style. Chicago, IL.

Purdue University's Online Writing Lab (OWL) also provides a wealth of valuable information and guides for thesis writing:

https://www.google.com/url?q=https://owl.purdue.edu/owl/research_and_citation/resources.html

A MS Thesis template adhering to these guidelines can be found ([here](#)) for download. If you are completing a MS in Applied Mathematics or Computer Science, then be sure to change the program name on the title page.

Thesis Committee

The thesis committee is comprised of three faculty members:

- **One thesis advisor** - the advisor is the primary resource for guidance on the project. Students should contact potential advisors during the preceding semester, prior to

creating a proposal. Individual faculty members may or may not be able to act as a student's advisor, so students must plan ahead and consult with potential advisors early. The thesis advisor will consult with the student to help identify potential readers (see below), will assist the student in formulating their proposal, and allow for registration into DATA 750/MATH 750/CMPS 750. Students are expected to meet with their faculty advisor on a regular basis during the semester they are completing their thesis. The schedule and frequency of meetings will be determined by the thesis advisor.

- **Two thesis readers** - readers are secondary advisors to the thesis project. Readers are faculty members who have an interest or expertise in aspects of the project, and can assist the thesis advisor in evaluation of the project proposal and final deliverable. In some cases, with the thesis advisor's approval, up to one of the readers may be an industry professional from outside Ramapo College if the student requests this.

Two of the three committee members **must** belong to the Data Science, Mathematics, or Computer Science convening groups.

Thesis Evaluation and Grading

- DATA 750/MATH 750/CMPS 750 is a Pass/Fail course.
- Students will submit their thesis document to their faculty advisor/readers no later than **two weeks prior to the end of the semester**.
- Students will schedule a one hour oral presentation (the presentation itself should be 40 minutes, followed by 20 minutes of discussion). The presentation is to be attended by all members of the Thesis committee (advisor and readers) and is open to all DMC faculty and MS-DMC students. The presentation should be scheduled **no later than one week prior to the last day of the semester**.
- The Thesis committee will consult with DMC faculty to determine the Pass/Fail outcome of the student's thesis project, and students will have the opportunity to discuss the outcome with their committee prior to a final grade assignment. The final outcome of the thesis grade assignment is of the sole discretion of the thesis committee.

Timeline for Thesis Activities

The term “Thesis Semester” refers to the academic semester in which a student is enrolled in

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The timeline represents deadlines for thesis-related activities, but completing activities earlier than the listed deadlines is strongly encouraged.

- **Semester prior to Thesis Semester**
 - Talk with potential advisors
 - Submit an IRB proposal, if necessary
- **4 weeks prior to the start of Thesis Semester**
 - Finalize a thesis advisor and committee members
 - Submit a thesis proposal for approval
- **During Thesis Semester**
 - Complete and write up thesis work
 - Meet regularly with Thesis Advisor
 - Meet as needed with the Thesis Readers
 - Maintain open communication with Thesis committee
 - Reach out to other personnel as needed for thesis topic
 - **2 weeks prior to the end of Thesis Semester**
 - Submit thesis document to faculty advisor/readers
 - **One week prior to the end of Thesis Semester**
 - Give oral presentation