

Final Project Guidelines

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We will end this semester with a group final project. You must form a group of 3 to 5 students in order to complete this project. If you would like to have a group that has less than 3 or more than 5 members, you must write to me to request this as early as possible (in your request, please make clear why this is occurring and what everyone's role in the group will be). Please note that the scope of a project is expected to scale with the number of group members, so there is no real advantage/disadvantage to a larger/smaller group. If you ever have significant issues with a group member, please reach out to me via a Teams message.

The components of the final project across the entire timeline (and their deadlines) are as follows:

- Project proposal
 - Due November 20th by 11:59pm EST (no late submissions accepted)
- Mid-project check-in
 - See below for due date
- Final project write-up
 - Due Monday, December 8th by 11:59pm EST (no late submissions accepted)
- Pre-recorded final presentation
 - Due Monday, December 8th by 11:59pm EST (no late submissions accepted)

Project Proposal

The project proposal should contain the following information:

- The name and Northeastern emails of all group members
- The title of the project
- The type of project
- A paragraph or two explaining, at a high level, the motivation and goals of the project
- A high-level framework as to how you will investigate and proceed with the project
- A breakdown of expected distribution of major tasks/topics across group members

One member of the group must email your group's project proposal to me by the deadline accompanied by a direct message via Teams to alert me of the submission. All other group members must be cc'd. Your proposal will be replied to in around 24 to 48 hours, even if submitted weeks before the deadline. Thus, the earlier a group submits the proposal the earlier you will receive feedback.

The project proposal is not expected to be perfect, but should show some thought and effort to make an interesting project, of a scope reasonable for 2 full weeks of serious group effort, and with some initial ideas as to how your group will proceed (such as by what time certain checkpoints will be reached and who is primarily responsible for what portion of the project). Reading these project proposals gives me the opportunity to reach out to you and your group mates sooner rather than later so I may assist you in refining things such as the scope of the project (which may be too small to receive full credit or too large to be completed).

While I do not have a fixed list of types of project, I provide some examples of project “types” here:

- **Topic Investigation:** Collaboratively investigate some concept beyond the base scope of the course and express your group's understanding of it, potential applications of it, and how it both builds and expands upon what you learned in the course.
- **Educational Resource:** Write a resource to introduce and teach a topic from the course, providing the basic introduction, an intuitive walkthrough with examples, exercises with clearly stated purposes as to their value for the students, answer keys, etc.
- **Practical:** Finding a practical application for some of the more mathematical/theoretical content of this course, investigating this application, implementing an algorithm based on this investigation (or several algorithms and doing benchmarking), and reporting on various performance results, implementation pitfalls for future users to be wary of, etc.
- **Original Research:** Focus on a singular use case or topic and try to solve a novel problem within this space. An example would be improving on a known algorithm in some environment, providing a theoretical framework for understanding some topic, writing a novel algorithm for a problem and systematically testing its performance, etc.

Mid-Project Check-In

This is roughly a 30 minute meeting between myself and your group to go over progress so far and plans for ongoing work. All group members should be present (if this will not be possible, please reach out to me in advance). The mid-project check-in should take place at least 48 hours after your project proposal has been submitted and at least 48 hours before the main deadline for the project). There are no specific guidelines as to what needs to be completed by the check-in or how you should organize the meeting, but please do some planning as to how you want to update me as to the progress and any questions/concerns you wish to discuss with me. To schedule this meeting, please reach out to me via Teams as far in advance as possible, but at least 48 hours before you intend to meet me (you do not need to be ready for the meeting to schedule it for a few days or even a week in the future).

Project Write-Up

This should include an overview of the work, some notes on the motivation behind it, the primary body of the project content, a summary, notes on future potential extensions, and a full bibliography. The vast majority of space should be taken up by the “primary body of the project content” which will vary in nature based on project type. Due to this, I do not specify exactly how the core content should be organized, as it is project type dependent. I do not give a specific page minimum or limit, but I will say that the focus is primarily upon quality, not quantity. For a group of four people, a 12 page write-up would be a bit on the short side. That being said, if the work were clearly justified, well-thought out, thoroughly researched, carefully executed, and immaculately type-set, it would likely receive full-marks (and maybe even extra credit). On the other hand, a 30 page report would be long, but could receive many deductions if it were hastily

and poorly assembled with minimal thought or effort. Focus on quality, clarity and demonstrating the depth of your understanding of the topic, **not** on length.

The report must be typed, but need not be done in LaTeX. If you choose not to use LaTeX, your mathematical content must be similarly well type-set as it would be had you used LaTeX, so be aware that you will either need to grapple with the general pain of LaTeX use or with the sometimes extremely difficult battle of trying to wrestle clean mathematical equations out of something like Microsoft Word. Which will be easier to use depends heavily on the nature of your project and will also depend somewhat on your group's comfort level with LaTeX.

Please note that, as with other assessments, you may **not** use LLMs to generate non-negligible ideas or content included in your project and must understand all content you include in your project.

Final Presentation

Each group will record a 15-20 minute presentation of their work. The presentation does **not** need to carefully explain every detail of the project (this would likely be impossible given time constraints) and is more of a “behind the scenes” view for me of your project, explaining the purpose of various sections and how they were structured and realized to achieve these goals. There are many ways one can manage this walkthrough such as slides, drawing on a digital board, scrolling through (and potentially annotating over) the project write-up, or some other method. As long as the alternative presentation method is reasonable and well organized, it is fine. All group members must be included in the recording in a non-trivial fashion (but not necessarily equal in terms of time). Group members do not need to be consistent in their method of presentation so for example, one person could use slides, while another walked through the write-up pdf and explained various sections. Requests to have a shorter presentation, a longer presentation, or a group member not included in the presentation should be made to me via Teams as far in advance as possible.

Extra Credit

While we set a high bar for full credit on the final project, we do not wish the standard for such to be unreasonable. In addition, there is occasionally a group that decides to go above and beyond in one or more ways on a project such as this, and we wish to leave some room to acknowledge such efforts (while still allowing other solid projects to achieve high marks). Thus, we reserve the right to give 4.5 out of 4 in one of the several categories that went significantly beyond our expectations in one or more ways. Most projects will not receive any extra credit. Further, we wish to highlight that this is **not** the most efficient way to improve your grade. While starting to organize a group and formulate a project idea a bit early would be wise, we strongly discourage students from letting an early start on the project take up so much time and energy that it negatively impacts their homework or challenges submissions (even with possibility of extra credit, this would not be worth it).

Rubric

Your score is the sum of 6 categories, each score out of 4 (with up to 0.5 extra credit each).

Category	Well Beyond Expectations (4.5pts)	Excellent (4pts)	Good (3pts)	Approaching (2pts)	Learning (1pts)	Missing (0pts)
Proposal	N/A	The project goal is clear, scope is sensible, and member duties are clearly/fairly distributed	Either project goals, scope, or duty distribution require significant adjustment	Two of these require significant adjustment and/or the proposal is not clear	All of these require significant adjustment	Proposal not turned in or does not meet basic requirements
Mid-Project Check-in	Check-in is incredibly well organized with a clear/comprehensive update and well thought out questions to receive feedback on. Project progress is already beyond expectations at the time of the check-in	Check-in is well organized with a clear update and at least two well thought out questions to receive feedback on	Check-in is somewhat organized with a clear update and at least one well thought out questions to receive feedback on	Check-in is somewhat disorganized, but provides some update as to meaningful progress or there were no well thought out questions prepared by the group or group progress is significantly behind	Check-in is disorganized with no well thought out questions prepared by the group or group progress is minimal	No mid-project check-in was scheduled and attended by the required deadlines
Final Presentation	Satisfies "excellent" requirements and offers an entirely new dimension of value to the project, offering utility and depth of understanding of the project	Presentation is clear, well organized, involves all group members to a reasonable degree, and offers me valuable insights on the project	Presentation is lacking in either clarity, organization, group member inclusion, or offers minimal insights to the project that were not already	Presentation is lacking in 2 or 3 of these 4 categories	Presentation is lacking in all 4 of these categories	No pre-recorded presentation submitted by the deadline

	not possible through the write-up	and the work done to create it	gained by simply reading the write-up			
Complexity vs Scope (project write-up)	Both the scope and complexity of the project well exceed what is expected	Either the scope or complexity of the project is notable while the other is acceptable	The scope and complexity of the project are both acceptable	Either the scope or complexity of the project is lacking	Both the scope and complexity of the project is lacking	The project write-up was not submitted by the deadline
Organization (project write-up)	The project is extremely well organized with appropriate sections/subsections, with all topics flowing in a well thought out way (both within sections and across the entire work) and the bibliography is exemplary	The project is well organized, has appropriate sections/subsections, most topics flow in a natural way (both within sections and across the entire work) and the bibliography is clear	The project is lacking in either section/subsection set-up, the flow of topics (either within sections or across the entire work) or the bibliography is flawed	Organization is lacking in 2 of the 3 categories	Organization is lacking in all 3 categories	The project write-up was not submitted by the deadline
Clarity (project write-up)	The clarity of the goals, math, logic, analysis, discussion, etc. are all extremely clear and great effort is made to enhance clarity through the use of well thought out visuals and examples	The clarity of the goals, math, logic, analysis, discussion, etc. are almost always clear and there is some use of visuals and/or examples to enhance clarity	The clarity of the goals, math, logic, analysis, discussion, etc. are semi regularly unclear or there are only minimally useful visuals or examples	The clarity of the goals, math, logic, analysis, discussion, etc. are semi regularly unclear and there are only minimally useful visuals or examples	The clarity of the goals, math, logic, analysis, discussion, etc. are frequently unclear or there are no useful visuals or examples	The project write-up was not submitted by the deadline