1.041/1.200 Fall 2020: Final Project Guidelines

As a part of the course, you are expected to complete a project on a topic of your choice, related to the subject of this class.

1 Project Description

The final project is an opportunity to reflect on the class by synthesizing the techniques taught with a specific transportation problem. As such, we expect students to propose a topic of their choice and to give a presentation at the end of the semester, which builds upon the course topics. The exercise is open-ended, and course staff will be available to guide the topic choice and presentation preparation as needed.

1.1 Undergraduate Projects

For undergraduate students, the project entails choosing a topic, writing a topic proposal and making a short presentation during the last week of classes. You are expected to submit a 1-page project proposal by November 13th. You are encouraged to talk to the instructor before then, about the topic you have in mind. You can partner up with another student or can do an individual project.

At its core, the presentation must focus on the following:

- A specific transportation problem.
- A technical approach introduced in the course.

Examples may include (not an exhaustive list):

- How the techniques taught in this course are seen, used, adapted, or extended in practice for real-world transportation problems.
- How a transportation problem introduced in this course is solved using engineering approaches. If they are not addressed using techniques covered in this course, then why not? What are the limitations of these approaches?
- The relationship between methods and problems in Units 2 and 3 (or any other combination of units).
- A deep dive into a specific transportation phenomena, e.g. traffic jams, bus bunching, waiting time paradox, capacity drop.
- How can a technique introduced in this course help address problems introduced by new challenges in transportation, from urbanization, electrification, the sharing economy, and automation?
- What is a local Boston-area transportation problem, and how can it be viewed from the lens of the techniques introduced in the course?

- Why can a technique that works for a transportation problem in the US not be as effective in a different country (or vice versa)?

1.2 Graduate Projects

For graduate students, the project entails choosing a topic, writing a topic proposal, writing a project report, and making a short presentation during the last week of classes. You are expected to submit a 1-page project proposal by November 13th. You are encouraged to talk to the instructor before then, about the topic you have in mind.

There are two types of projects:

- (Theoretical project) Read, report, and extend 2-3 theoretical papers in the area. This involves understanding deeply and evaluating critically the papers. Beyond a synthesis of the material you read, you would be expected to offer your own thoughts on possible directions for further research, possible extensions, etc. Theoretical projects would be appropriate if you are prepared to meet a high bar: simply understanding and summarizing the papers would not be enough; some original thoughts will be expected.
- (Applied project) Pick a particular problem of interest in the area of the subject, develop, analyse and implement a methodology to solve it. You may focus on the problem itself (that is, compute solutions for variants of the problem and develop some insights), or on an assessment of computational methods (try different algorithms, and compare their performance). This could also be a mini-research project related to your areas of interest.

For a project of type (1) you are required to work alone. For a project of type (2) you can work alone or in a group of 2 people.

Our recommendation: Most students will benefit the most from applied projects. These present the opportunity to translate what you have learned into something tangible, and also give the satisfaction of seeing something work (or first fail, and then work). Again, theoretical projects would be appropriate if you are prepared to meet a high bar: simply understanding and summarizing the papers would not be enough; some original thoughts will be expected.

1.2.1 Project Report

A final paper should be written with 12pt font, single space, single column, and should be at least 6 pages and at most 12 pages in length, including figures and excluding references. The length restriction is intended to help you focus on delivering a crisp message. On the other hand, you can include an appendix with additional material (e.g., long technical arguments, if you think these are necessary).

You should describe and evaluate what you did in your project, which may not necessarily be what you hoped to do originally. A small result described and evaluated well will earn more credit than an ambitious result where no aspect was done well. Be specific in describing the problem you tried to solve. Explain in detail your approach, and specify any simplifications or assumptions you have taken. Also demonstrate the limitations of your approach. When doesn't it work? Why? Include potential directions of future work. Make sure to add references to all related work you reviewed or used.

You are allowed to submit any supplementary material that you think it important to evaluate your work, however we do not guarantee that we will review all of that material, and you should not assume that. The report should be self-contained.

2 Project Proposal

The presentation topic proposal is a written proposal of 0.5-1 pages, describing: 1) the overall topic, 2) the specific transportation problem, and 3) the relation to one or more techniques introduced in this class. The course staff will provide feedback on the topic.

3 Project Presentations

There are two options for the presentation delivery:

- In class: 10-15 minutes with slides (the exact duration will be determined in mid-November by the number of student groups), during class on Dec 7th or 9th, followed by questions and discussion. Slides are to be uploaded to Canvas by 5pm on Dec 3rd.
- Video: 5 minutes. Video will be shown in class on Dec 7th or 9th, followed by questions and discussion. The video must be uploaded to Canvas in mp4 format by 5pm on Dec 3rd. If this option is selected, we may ask you for permission to upload the video online (e.g. Youtube).

4 Final Presentation Grading for Undergraduate Projects

The grading is out of 100 points. 135 points is possible.

15pts Presentation proposal

50pts Content.

- 10pts Introduction is attention-getting, lays out the problem well, and establishes a framework for the rest of the presentation.
- 10pts Concepts (from the class) which are important for the presentation topic are introduced and reviewed. (This exercise is also meant to be a review of the class material.)
- 5pts Technical terms are well-defined in language appropriate for the target audience.
- 10pts Presentation contains accurate information. Material included is relevant to the overall message/purpose.
- 5pts Appropriate amount of material is prepared, and points made reflect well their relative importance.
- 10pts Conclusion: Summarizes major points of talk. Provides you with a "take-home" message. Discusses some future problems, solutions, ideas, or implications of the proposed topic.
- 5pts (Video option only) The presentation is accessible to a general audience, i.e. a college student who may not have taken this class and may not be studying CEE.
- 10pts (Video option only) The presentation is interesting to a general audience.

25pts Presentation.

- 5pts Speaker maintains good eye contact with the audience and is appropriately animated (e.g., gestures, moving around, etc.). Delivery is poised, controlled, and smooth. Speaker uses a clear, audible voice. Good language skills and pronunciation are used.
- 5pts Visual aids are well prepared, informative, effective, and not distracting.
- 5pts Information is presented in a logical sequence.

5pts Presentation appropriately cites requisite number of references.

5pts Length of presentation is within the assigned time limits.

20pts (Video option only) Creativity with the video medium, for improving communication and delivery. Examples include: tighter coordination between audio and visual components, use of animation, bringing in different video clips / voices.

10pts Q&A: Student is correct, clear, and knowledgeable in answering questions during / following the presentation.

5 Final Presentation Grading for Graduate Projects

The grading is out of 100 points. 135 points is possible.

15pts Presentation proposal

20pts Content.

- see undergraduate project guidelines for general guidance; up to 15 points for video option

15pts Presentation.

- see undergraduate project guidelines for general guidance; up to 20 points for video option

40pts Project report.

10pts Introduce the problem and well motivate the problem.

10pts Analyse and present the related literature.

10pts Logically present the methodology.

10pts Evaluate and discuss the results and possible limitations of the proposed method.

10pts Q&A: Student is correct, clear, and knowledgeable in answering questions during / following the presentation.

6 Deadlines

- Project Proposal : Due November 13, 2020
- Project report (graduate students only) : Due December 4, 2020
- Project presentations : Week of December 7, 2020