AM205: Final project information

The final project is worth 32% of the total grade and is due at 2 PM ET on Saturday December 18th.[1] The project, plus any other associated documents and code, should be submitted via Canvas.

In general, the project should be completed in teams of two or three students. Single-person projects will also be allowed with permission of the instructor. Projects with $n \geq 4$ people will also be considered, but will require permission of the instructor and a statement detailing the division of the work. All team members will receive the same grade for the project.[2] The best place to find team members is on Ed Discussion, by posting some information about yourself and your areas of interest.

Topic

The final project should involve applying methods from the class to an application area of interest. The project should involve some coding, and purely theoretical projects will not be allowed.

It is fine (and in many cases encouraged) to take project ideas directly from existing research topics. However, in this case, the project should be based on aspect or direction that is carried out specifically for this course, as opposed to simply submitting ongoing or existing work. Three examples of projects are given at the end of this document.

Format and length

The table below gives a *very rough* guideline about the length of the final project write-up.

Team members	Pages
1	9
2	14
3	18
n	$\lfloor 9.5n^{0.6} \rfloor$

However, the precise length of the write-up is not important; the scientific content of the project is more important, and keeping your write-up concise and to-the-point is preferable. In addition, there is an option to give a final project presentation. This will count as two group activities (*i.e.* 3% of the grade).

Project proposal – deadline November 17th, 5 PM ET

To ensure the everyone starts off on the right track, each team must arrange a half-hour meeting via Zoom with a member of the teaching team to discuss their project idea and

[1] This time is set by the Harvard Registrar.

[2] In exceptional circumstances, grades may be assigned differently among team members.

direction. Only the meeting is required—it is not necessary to submit a written proposal. This must be completed by Wednesday November 17th at 5 PM ET. Four points will be automatically awarded for doing this.

Grade breakdown

The project will be graded out of 60 points. A complete breakdown is shown below.

- **4 points** – Automatically awarded for completing the project proposal by the deadline.
- **8 points** – Project motivation: what problem are you trying to solve? What has been done before in this area? If appropriate, cite relevant books and papers.
- **24 points** – Project methods and results: what mathematics and code did you develop for your problem? Where appropriate, did you consider mathematical analyses of your approach? Is the code that you developed correct?
- **6 points** – Project conclusions: did you solve what you set out to do? What are possible limitations and problems with your approach? How you could you develop the project further?
- **18 points** – Project presentation and organization, divided among the following categories:
  - write-up clearly written with good spelling and grammar,
  - figures and tables clear and properly labeled,
  - code well-commented and well-organized.

Example projects

Three examples of suitable projects are given below:

- Chris took a similar computing course during graduate school. He was already developing a serial code for his thesis to study mixing in granular materials. For the class he developed two parallel versions of the code, which required the consideration of a new set of implementation issues.
- Previous TF Jordan Hoffmann took the course in Fall 2014, and completed a two-person project on analyzing the MBTA subway system. The project involved obtaining passenger usage data from the MBTA on the Red Line, building a model for train motion, and then considering a variety of different scenarios for optimizing the train dispatch protocol.

- Previous TF Raphaël Pestourie took the course in Fall 2014, and completed a two-person project on solving the Helmholtz equation in a waveguide, using finite-difference and finite-element methods. The project made use of the Bi-CGSTAB iteration for solving large sparse matrix problems. The Bi-CGSTAB iteration was preconditioned using the multigrid method.

Several example projects are posted on the AM205 Canvas site in the "Files" section. The teaching team are happy to discuss other previous projects during office hours.