Final Project Instructions

Your (individual) assignment is to produce a short essay describing numerical aspects in applications of scientific computing (i.e. applying computing to answer a question about a system or an equation motivating by a scientific application). The project contains three parts:

- A project proposal that will be due in Week 9;
- An oral presentation that will occur in class during Week 14; and
- An essay that will be due Sunday of Week 14.

Project Proposal

The project proposal introduces the background and basics of the problem that you will work on. If you already have some ideas or directions how to solve the problem, you can also add them in the proposal. The problem should be related to the topics we study in this class.

The project proposal should be no more than one page. I will review your project proposal and provide feedback. The purpose is to make sure that the proposed problem is within the scope of this class and also within reasonable difficulty level and workload (not too easy or too difficult to complete).

Written Requirements for the Essay

- The essay **must** be written in LaTeX, which is a high-quality typesetting system designed for mathematical and scientific documentation. To start, read this 30-min tutorial of LaTeX by Overleaf.
- Title, date and your name at top of page 1.
- Helpful figures embedded into document. Figures should have captions and be referenced from the text. "As shown in Figure 1, ...".
- Bibliography / references at the end. Use either numbered ([1] or [1]) or named (Skywalker et al. 2017) references as you prefer. Be sure to provide all references that you use. It is nice if URL references can be clickable in the PDF.
- No less than four pages and no more than five pages, including figures, equations and references. Reasonable margins and font size. Sensible choice of font(s).
- Carefully proofread for spelling and grammar errors.
- Mathematical / quantitative analysis is required (see below).

Mathematical and Quantitative Requirements

- Use mathematics to describe at least one aspect of the numerical analysis of the scientific system you are considering. Present the derivations of equations carefully. Make sure that you define all your symbols. Give units as appropriate.
- Include at least one figure relating quantities, with labelled legends, axes, and a caption.
- It is completely OK if the way that you describe the system does not lead to an equation that we studied in class, or if you are not able to "solve" something. You can describe how the equations might be addressed, give references to where someone else worked on it (such as a literature review), or suggest ideas that could lead to progress. However, your essay must be self-consistent and shows your own reading and thinking.

Oral Presentation Requirements

- Design presentations to last for 7–10 minutes. Practice beforehand with another human being to make sure you can finish on time.
- Generate slides (or use any similar software allowing output to PDF).
- Make your slides visually attractive. Avoid dense text and unnecessary details.
- Submit slides as a single PDF on Canvas before class time on TBA.
- Make sure to explain: WHY your topic is interesting and important, HOW the numerics works, HOW the numerics give insight into the system's behaviour are important, and HOW a quantitative description can be made - analytically, numerically, approximately, or otherwise, as well as WHAT it means. It is very important to convey your enthusiasm.
- Answer a few questions about your topic, after your talk.
- When attending presentations, be ready to ask a question at the end.

Grading scheme

- Project proposal 10%:
- Essay 50%: Thorough and high-quality description of system (including references). Quantitative and mathematical description. High-quality figure(s) (at least one). Written in Latex.
- Oral presentation 20%: High quality talk slides.
- Oral presentation 20%: Enthusiastic, lucid but concise description of the system, quantitative aspects / derivations and aspects for further learning. Keep to time. Answer questions clearly.
- Oral presentation Bonus%: Ask questions of other students.