Project Guidelines

Phys 4350, Fall 2023

Deadlines:

- November 14, 11:59 PM: Choose your topic by putting your name beside the project in the Excel sheet (link on Canvas)
- November 16, 21, 28, 30, 1:00 PM: The in-class assignment is to report what you accomplished during the class period; submit on Canvas to in-class assignments for each day (labeled by the date as usual).
- December 1, 11:59 PM: Turn in your project (code and results).

Grading:
This project counts for 20% of your course grade. I will grade it on a 20-point scale, with the following breakdown:

1) (5 points) Participation in in-class work
2) (5 points) Function/Readability of code
3) (5 points) Accuracy of solution
4) (5 points) Ability to explain your problem, discuss your solution

Expectations:
Coming to class on the four days listed above and working on your project while you are in class is required. I will be speaking to each of you in class about what you are working on. You can certainly work outside of class as well. In our discussions, we will decide what the expected output of your project should be. If you are ever uncertain about this, talk to me again.

Everyone's progress will differ slightly, but here's a general guide for what you should accomplish during each class period:
Nov 16: Read about problem, work out any equations, get a general idea of what code should do
Nov 21: Write code, debug, validate
Nov 28: More work on code, decide how to present results (plots, numbers, etc)
Nov 30: Work on final results
After the last class, you will have one more day before it needs to be turned in to clean up your code, make sure it's commented well, include instructions for running it if necessary (what inputs are required, etc)

Topics
Below I list 15 possible topics. You can find a document related to each topic on Canvas.

Topics 1-12 are fairly typical computational physics problems. The provided document will assist you in setting up the problem and suggest how to show your results. For topics 13-15, the provided documents are papers describing real experimental results; the project is to reproduce

those results as much as possible. Topics 13-15 are more open-ended and will require more investigation; choose those only if you are really interested in that type of problem.

1. Planetary motion (three-body system)
2. Precession of the perihelion of Mercury
3. Chaotic Tumbling of Hyperion
4. Wave on a string with spectral method
5. Schrodinger Equation with shooting method
6. Schrodinger Equation with spectral method
7. Protein Folding
8. Molecular Dynamics
9. Cluster Growth Models (DLA)
10. Percolation
11. Double Pendulum
12. Image Deconvolution
13. Discovery of Neutrino Oscillations
14. Detection of Gravitational Waves
15. Testing Lorentz Invariance