

Computational Modeling & Simulation I (Interdisciplinary Science)
CS 346, Spring 2021
Final Project

Due in part by Saturday, May 1, and
in part by Wednesday, May 12, and
with a code demo by Friday, May 14.

(Please see the notes and descriptions of exercises below!)

Cellular Automata Simulation—Modeler's Choice!

Some introductory notes from your Prof.:

- Like HW3, this Final Project is a team assignment. You are welcome to work in the same team as you did for HW3.
- The Final Project is due by 11:59pm (Maine time) on May 12. Code demos for all CS346 assignments must be completed by the end of the day (Maine time) on Friday, May 14—and please do not expect me to be available very late on May 14! You are strongly encouraged to submit work and set up code demos well before the deadlines.

PLEASE do not wait until the last minute for code demos! I may be busy at the end of the semester, and if there isn't enough time available for your demo to enable me to fully appreciate your code, it may negatively affect your grade on the HW.

Please treat these May 12 and May 14 as hard deadlines, with severe lateness penalties (25% or more) for unexcused late work. If these deadlines are a concern for you, please talk with me as early in the process as possible to see how I can help!

- Please read the **HW Notes & Guidelines** document (posted on the CS346 website) carefully! For this assignment, each team should submit one or more `.m` files and a single PDF document; please check with me *far in advance of the submission deadline* if your team would like to submit more than one `.m` file, to confirm that it is appropriate by CS346 style guidelines to do so. Please use the string `Final` in the folder name for submitting this assignment; some variant of that (e.g., `final`) could be a useful part of filenames for this assignment. See documents on the course website for additional HW guidelines and submission instructions.

Please make sure all submissions are to your Private folder!

The **HW Notes & Guidelines** document contains full instructions for submitting HWs, as well as containing other *important* guidelines about naming conventions for files you submit, and about your PDF write-up—not following those guidelines will result in deductions on your submitted work. Please read that document and let me know if you have any questions.

- For presenting a model you developed, your write-up should include not only the model itself—e.g., the differential equations (or finite difference equations), constants, and initial conditions that may comprise the model—but also an explanation of how the model was developed, including what each variable / parameter in the model stands

for, what simplifying assumptions were made, and what the reasons were for your decisions. Include all pertinent information; incomplete write-ups may not merit full credit. (Please see the HW Notes & Guidelines document for additional guidelines about write-ups.)

- For simulations, as usual, your write-up should include the values of constants / parameters employed for each run of the simulation, a brief explanation / analysis of results, and a very brief explanation of why you chose to run those particular values for simulations. Descriptions of results should be concise and information-heavy; feel free to include figures (e.g., Matlab plots) in write-ups to illustrate your observations. (Please see the HW Notes & Guidelines document for additional guidelines about write-ups.)

Exercises

1. **Find A Topic!** The first thing to do is identify a project topic—one that you will be excited about working on!

In consultation with me, your team will choose a topic for this CS346 Final Project assignment; together, we will determine the project's components, and perhaps even more importantly, we'll make sure the scope and focus of your project are reasonable for a Final Project assignment for our CS346. You will be required to use Cellular Automaton (CA) modeling for this project; moreover, because CS346 is about modeling and simulating time-varying dynamical systems, with applications for the sciences (typically natural sciences), projects should be within that broad scope.

There are some deadlines associated with this:

- By the beginning of class on Thursday, April 29, please have some suggestions about topics you might like to pursue for this Project. Your textbook is a great source of possibilities! I encourage you to look at both Chapters 10 and 14 for project ideas. (In the past, students have stopped before looking through Chapter 14, and they've later wished they hadn't!)

There will be time set aside to meet during class on Thursday, April 29, to discuss project possibilities—please come prepared for our meeting!

- A mini-proposal for your project must be presented by the end of the day on Saturday, May 1. Please email me with the mini-proposal; it needn't be more than a paragraph or two. *If at all possible, please submit this part of the assignment before the last minute*—I will try to get you feedback on it as soon as possible!

For the final project assignment, we must agree on exactly what will be modeled and what the component exercises will be for the project. This may require some conversations, so *please begin thinking about your mini-proposal early*.

2. **Modeling & Simulation!** You must then, of course, actually design and implement the model and the relevant simulations. But that's not all there is to this Final Project assignment!
3. **Code Validation!** It is important for all programming projects—and especially for work in interdisciplinary computational science—to be sure your code is well validated.

As part of the write-up for this Final Project, be sure to explain the criteria you use to determine if your code functions properly, and the tests you ran on your code to do that validation. (This does not need to be more than you would normally do, if you normally thoroughly validate your code! It just needs to be fully documented.) If you have any questions about how to test or validate code, or what to include in your write-up, please let me know!

We will talk more about this project in class, but please feel free to ask me any clarifying questions about it, in or out of class!