

# CX 4230, Spring 2016: Project 1

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## A model of segregation

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This project asks you to finish and extend the in-class model of segregation. Its goals are

1. to reinforce the idea of a conceptual model, by giving you a chance to develop and formalize your own ideas in relation to segregation phenomena; and
2. to get your hands dirty coding up a simple simulator, based on your conceptual modeling ideas.

To save you time, you will adapt and extend the segregation model that we developed in class. We will refer to that model as the **baseline model**.

## Logistics

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The project has two parts. Part 1-A is due on **Friday, January 29, 2016 at 11:59pm Anywhere-On-Earth (AOE)**. Part 1-B is due the following **Friday, February 5, 2016 at 11:59pm AOE**. See the course syllabus ([https://piazza.com/class\\_profile/syllabus/ij9fpdo3zn96a9](https://piazza.com/class_profile/syllabus/ij9fpdo3zn96a9)) for a handy AOE clock and the late policy.

You will work on each part in teams of 2-3. For Project 1, *we will choose the teams*. You will work in one team for Part 1-A, and a *different* team for Part 1-B. We know, we know – you are collectively groaning. But mixing it up may turn out to be good for you! In future project components, you will get to choose your own teams.

## Part 1-A: Conceptual model, due Fri Jan 29 @ 23:59 AOE

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Submit your answers to Part 1-A as a PDF on T-Square. (If you write out your responses by hand, please submit a scanned version as a *single* PDF.) Only one member of the team needs to upload the team's work, but be sure to list all team members in the submission.

1. To improve or quantify segregation, you need a way to measure it. Design a scheme

- to *measure* segregation in the baseline model. Formalize, explain, and justify your scheme.
2. Make a list of (at least) six ways in which the conceptual model presented in class might be simplifying real-world segregation phenomena. For each simplification, explain how you think the results of baseline model would change *if* you were to account for it.
  3. Choose two of the simplifications you listed above. Explain how you might extend the baseline model to remove or reduce each simplification. (Try to be as precise as you can, but feel free to use a mix of both “plain English” and formal notation as needed. Let the IPython notebook’s conceptual model description be thy guide.)

You should **not** turn in any code for Part 1-A! It is strictly an exercise in conceptual modeling.

Also, note that the text cells in the segregation IPython notebook are, taken together, a conceptual model document. If you want to steal any of that text, feel free!

## Part 1-B: Code it up! Due Fri Feb 5 @ 23:59 AOE

In this part, you will implement some of your ideas from Part 1-A and do some analysis. Upload your work onto T-Square by the deadline. Only one member of the team needs to upload the team’s work, but be sure to list all team members in the submission.

Since you will be working in different teams for this part of Project 1, you may have different ideas and answers from Part 1-A. So, you will need to work with your teammate(s) to select or combine the best ideas to implement!

First, implement the baseline simulator so that it can also compute and report the measure of segregation you developed in Part 1-A. You can either use the code we developed in-class as a starting point, or you could implement a simulator from scratch.

Next, do some experiments to show how your measure of segregation behaves under various conditions. Recall that the three main parameters of the baseline model are the occupancy probability ( $\rho$  in the IPython notebook), the tribe A population bias ( $\alpha$ ), and the grid dimensions ( $M \times N$ ). For each parameter, fix the other two parameters and

vary the third over a small range (3-4 values is probably fine). Plot the change in your measure as each parameter varies. Discuss to what extent your quantitative measure of segregation reflects the qualitative behaviors you observe in the results.

Lastly, select one of your extensions from Part 1-A and extend the simulator to include it. Compare the behaviors of your new model and simulator against the baseline. Again, in addition to a qualitative comparison, use your measure of segregation to make quantitative comparisons. Discuss what you observe.

Submit both a PDF report and your code to T-Square.