**CPLN 675 – Land Use And Environmental Modeling**

**HW4 – Designing Agent-Based Simulations**

**Spring, 2022**

**Instructor: Michael Fichman**

**Due: 4/13/2022 – Before Class (code/slides), in-class (presentations)**

The purpose of this project is to conceptualize (and/or build) an agent-based model of an urban, spatial phenomenon and explore emergent outcomes that might result from its use. You are to think about an urban system consisting of agents, behaviors, rules and outcomes. You have two project options – A) **creating a model concept** and presenting it, OR B) **building a model** with the language netlogo and demonstrating it (option B is worth an additional 3 guaranteed extra-credit points).

Your presentation in class will be a maximum of 3 minutes – this is a data communication challenge. If you choose Option A, you should have a concise presentation that works well for both a reader *and* in a presentation context.

**Option A:**

* **Slide deck** in pdf form due in the HW dropbox linked below by the beginning of class on 4/13 (10 points)
  + Format: firstName\_lastName.pdf
* In-class 3-minute presentation of slides on 4/13 (5 points)

**Total (15/15 points)**

OR

**Option B:**

* A **functional NetLogo model** turned in as code in the HW dropbox by the beginning of class on 4/13 (13 points)
  + Format: firstName\_lastName.nlogo
* In-class 3-minute demonstration of model on 4/13 (5 points).

**Total (18/15 points)**

[HOMEWORK DROPBOX](https://upenn.app.box.com/f/d929f242d0204714989d566ae223e52f)

**Option A: Create and present an urban or place/space agent-based model concept**

Enumerate the following themes in a pdf deck of no more than 3 slides that can be interpreted both on its own (e.g. like a project poster) and used for your class presentation. This is a layout and visualization challenge.

Concept: Describe the model concept. Why is this a model that lends itself to using ABM instead of, say, regression? What is the theory you are trying to model?

Agents & Rules: Enumerate the agents in your models, and the rules they are governed by. Be precise – recall our example that the first rules of evacuating a classroom are “stand up” and “locate the nearest exit” and not “go to the exit.” You will be judged on how well you parameterize the thinking in agent-speak – so “locate the nearest exit” means “find the cell with the shortest distance to you called “exit”.” Do these agents have “states” of being? How do these states change? Do the agents interact? Mechanically,how does that work?

The Model “World”: Tell us about the world in your model, and draw a picture or diagram of it (you can do this in any software you want or free-hand). Does the “world” have rules and conditions that affect the agents or change as a result of the activity there? Are there parameters that you can vary like “viral transmission rate” might be a global condition in a COVID model?

Outcomes: What do you suppose is going to happen when this model executes? This might require you to create a diagram or graphic to show what this looks like or what the alternatives are (perhaps a hypothetical graph of some population of infected and uninfected people under virus transmissibility V and mask-wearing probability M over time).

You will be assessed on the completeness of your assignment, the clarity of your thinking in conceptualizing the pieces of your model, and the design and communication of your concept.

**Option B: Create a simulation of an urban or place-based phenomenon using Net Logo.\***

\**There is limited support from your instructors and TAs for coding in NetLogo – if you choose project option B, you acknowledge that you cannot expect the level of code troubleshooting you get on projects in R.*

In the nlogo document I should be able to run your model successfully. Please include any additional user-instructions in the Info tab of your model. The Info tab of your model should also contain the following information (which will essentially be the concepts in your demo):

*What is it*: Tell me what this simulation does. Tell me about the theory you are trying to model; whether your simulation succeeds and how you know if it succeeded or not.

*How it works*: Here I want to hear about your movement rules. Be descriptive but specific.

*How to use it*: What should I click on?

*Things to notice:* What is the interesting emergence? What should I click on to observe this emergence?

*Things to try:* Are there any variables that I should change to lead to a different kind of emergence (If so you should use slider bars and other netlogo features that will allow me to change these variables? What about plots?

In class you will demonstrate your tool and introduce the above info to the class. The simulation should be in the most recent version of NetLogo.

By the way, do not just simply tweak one of the on-board models in NetLogo that we see in class (I will obviously notice if your model is that sophisticated), but if you want, you can do something building on the “geography” of one of two models - the “Urban Sandbox” land use model (I will give you this in class) or one of the traffic simulation traffic base-maps from Chapter 5 of the IABM model library in NetLogo. Please cite these in the info section of your model if you use them.