

## *Bike Share: Part 1*

PLEASE FIND YOUR NAME on the list of today's studio groups. Then find your partner(s), seat yourselves comfortably according to your group number, and read through the rest of this document.

### *A New Pattern: Randomly Shuffled Studio Groups*

For at least the next several weeks (until we form Project 1 teams), we will ask you to work in small groups (usually pairs) for most of the class session. As in the first two ModSim classes, there will be a worksheet for each day. We expect that some of you will be able to complete and submit it before the end of class, but if you need additional time you are welcome to finish up and submit later in the evening. We encourage you to collaborate, but each of you should do your own worksheet.

How did we form the studio groups? Glad you asked! We used a sophisticated algorithm that takes into account 73 variables related to your background, skills, aptitude, and personality in order to match you with partners who will help you achieve optimal learning.<sup>1</sup>

<sup>1</sup> Doesn't that sound like a great idea, based on our summer reading book?

Just kidding — we actually used a very simple algorithm, namely uniform random shuffling. This algorithm makes no effort to create groups that are matched or balanced in any way. Its efficacy relies on two important facts: (1) the studio is filled with people who are both motivated to learn and capable of helping *you* learn, and (2) we will be shuffling the groups often enough that you will end up working with a majority of these people during the semester. Taken together, these facts imply that it doesn't matter very much who you work with on a particular day, because you are likely to have a good experience no matter who you are grouped with — and even if you don't, the downside is likely to be outweighed by the good experiences you have on other days. Furthermore, we believe that each of these experiences (good, bad, or just different) will help you learn about yourself and develop your skills at working with others.

### *Today's Agenda*

We have two things on the agenda today: A discussion of modeling based on the example in the Chapter 1 notebook, and then an introduction of the bike share model from Chapter 2.

Our main goals are:

- To practice working with Jupyter notebooks, reinforcing what we did in the auditorium on Tuesday.
- To introduce some basic modeling concepts (states and state changes, model parameters, time steps, randomness) and tasks (running a simulation, storing the output as a time series, plotting results graphically).
- To introduce some related programming concepts (functions and function parameters, conditionals, iteration) and objects in the ModSimPy library (State, TimeSeries).

We will start with a discussion of modeling, then work through the Chapter 2 notebook in three “chunks” with time for questions and discussion between each chunk. Feel free to interact with the people at your table in any way that is helpful. You are also welcome to get up and move around the studio, make use of the whiteboards, etc.

### *Modeling a Bikeshare System (20 minutes)*

Work through the first three sections of the Chapter 2 notebook (Modeling a bikeshare system, Updating, Functions). Think about the following question, which we will discuss as a group:

Q1: What happens when this code runs?

```
def a_function():
    print('Hello')

a_function()
```

### *Constructing a Step Function (20 minutes)*

Work through the next three sections of the notebook (Conditionals, Step, Parameters), and think about the following question:

Q2: What happens when this code runs?

```
def step(p1, p2):
    if flip(p1):
        bike_to_wellesley()
    print('Moving a bike to Wellesley')
```

```
if flip(p2):  
    bike_to_olin()  
    print('Moving a bike to Olin')  
  
step(0.5, 0.4)
```

Q3: In the context of the bike share model, why is it useful to move the probabilities outside the step function?

### *Running a Simulation (30 minutes)*

Work through the next three sections of the notebook (For loop, TimeSeries, Plotting), and optionally the final section (Opening the hood) if you are interested and have time.

Q4: You have now created and simulated a model. What does that mean? What are the key steps?

### Reflection Questions

1. What features does this model include? What does it ignore? Of the things it leaves out, which seem most important? Which might be good enough?
2. Which programming concepts (if any) were new to you today? What strategies were effective in helping you become familiar with them? If you were comfortable with these concepts already, in what ways were you able to help others in the studio become more comfortable with them?

## Next Steps

Before class next Monday, please do the following things:

- ☐ Write your name here: \_\_\_\_\_
- ☐ Write your name(s) of your studio partner(s) here: \_\_\_\_\_
- ☐ By tonight: Scan this worksheet and submit it on Canvas.  
(Make sure that you scan all pages of this document, and that each page is legible and oriented correctly.)
- ☐ By Sunday night: Find and complete the Canvas assignment that contains the homework for Monday's class (hint: Chapter 3!).
- ☐ Meet in the studios again on Monday.