

# **Building an ABM**

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# Model 1 - First Model

Create  $m$  Agents and a slider to control the number of agents

Have them adopt at each time step randomly

Optional: different thresholds for adoption of each agent

# Model 2 - Adoption Rules

Add *broadcast-influence* and *social-influence* sliders to the model

Have agents adopt based on the Bass model so agents adopt either due to:

1. *broadcast-influence*
2. *social-influence* \* fraction-of-adopters

Optional: Have different adoption rules

# Model 3 - Plotting Results

Plot the Adoption Rate over time

Stop the model if no one is left to adopt

Optional: Plot the different types of adoption  
(due to broadcast vs. social) separately

# Model 4 - Networks

Add a Random Network to the model

Adoption Rule Change

Rather than *social-influence* being modified by the whole population of adopters, it is only modified by the local neighborhood

Optional: Set up a distribution for the density of agents

# Model 5 - Rerunning on the Same Network

Add a reset innovation button so you can run on the same network multiple times

# Model 6 - Different Network Structures

Create a chooser to choose different network structures

Create a slider to choose network density

Hint: Look into network extension

# Model 7 - Different Types of Agents

Create a second type of agent - “An Influential”

Add a weight that controls how influential  
“influentials” are

Plot adoption of each agent type



# Analyzing the Model

- Now that we have a model we would like to analyze
- For instance, we might ask, “If we hold *broadcast-influence* constant, what is the effect of different *social-influence* values on the total adoption rate for each type of agent?”

# Multiple Runs and Parameter Sweeping

- Whenever a model has stochastic components, you must do multiple runs
- You also want to be able to systematically alter an input parameter
- Then you want to take the data and analyze it
- BehaviorSpace

The screenshot shows the 'Experiment' dialog box in NetLogo. It contains the following fields and options:

- Experiment name:** A text field containing the word 'experiment'.
- Vary variables as follows (note brackets and quotation marks):** An empty text area for specifying variables to vary.
- Repetitions:** A text field containing the number '1'.
- Measure runs using these reporters:** A text area containing the reporter 'count turtles'.
- Measure runs at every step:** A checked checkbox.
- Setup commands:** A text area containing the command 'setup'.
- Go commands:** A text area containing the command 'go'.
- Stop condition:** A section with a checkbox and a text field for specifying when the run should stop.
- Final commands:** A section with a checkbox and a text area for specifying commands to run at the end of each run.
- Time limit:** A text field containing the number '0'.
- Buttons:** 'Cancel' and 'OK' buttons at the bottom right.

# Analysis of Data

- You can use any statistical package to analyze the data output by NetLogo
  - Excel, SAS, R
- We will show you how to read the data into R and present some results