

## Modelling human knowledge, part II

<b>Who do I work with?</b>	Today, you will work <b>alone</b> , and submit your own work for grading. Next Monday, you'll work in a pair.
<b>How do I get a grade?</b>	Submit your individual work on the course website. <b>The server closes at 4:30</b>
<b>What do I submit?</b>	You will submit a ZIP file containing four files with <b>specific names</b> : <ul style="list-style-type: none"><li>- a word document <b>named <i>First_Last_Report.docx</i></b>.</li><li>- the CSV file listing the map from last week, named <b><i>First_Last_map1.csv</i></b></li><li>- the CSV file listing your map after structural analysis, <b><i>First_Last_map2.csv</i></b></li><li>- the CSV file listing your final map for today, <b><i>First_Last_map3.csv</i></b></li></ul> Points will be deducted if files are not named as stated above.

### 1) Setting up ActionableSystem for structural analysis

- Go to <https://osf.io/7ztwu/>
- Download "Ready to use.zip" and "Sample maps.zip"
- Unzip both archives
- In "Ready to use", start ActionableSystem using the jar file (*i.e.* ActionableSystems.jar)
- Open the map you created last week
  - If** your map does not open, or what shows up on the screen doesn't look right, then:
    - Open a sample (edges) maps with notepad to see how it's formatted. Reformat your file.

### 2) Conducting structural analysis

Complex real-world problems are complex in part because they are produced by systems with many loops (of different types and lengths) and many disjoint paths between pairs of concepts. Due to cognitive limitations, we easily forget loops and disjoint paths. Your goal is to use ActionableSystems to consciously bring the loops and disjoint paths that your map may not initially have captured.

- In your word document from last week, create **a new section** named "Structural Analysis".
- In ActionableSystems, under *See*, use "Analyze Cycles" and "See the pathways between two factors". If you're not sure how to use the pathways tool, use the tutorial. In your word document, explain all of the cycles (as well as types) that are present in your map. Identify a few disjoint paths.
  - If your map had no cycles and no disjoint paths, then just state so.
  - You can't *remove* edges from your map to simplify it. The instructor has your map's file too.
- Copy the file of your map, and rename it as *First\_Last\_map2.csv*
- By iteratively editing the file for your map and exploring it with ActionableSystems:
  - ensure that your map has loops, of different types (balancing/reinforcing) and different lengths (they can't all be of length 2 or 3)
  - ensure that some pairs of factors are connected in multiple ways (*i.e.* disjoint paths). The paths may be of different lengths.
- **Once you're done transforming your map**, create a new section in your word document named "Structural Transformation". List the changes you've made them, and why you think they're valid. That is, you can't add loops just because you've been asked to: they also need to be plausible.

By completing of this section, you have **produced a new map, and added two sections to your report.**

### 3) Case studies

Read the two case studies behind the page. When reading them, *think* about:

- What are the main points of the case?
- How are the experiences in this case similar/different to the case of Pleasantville?
- How might you apply the lessons learned to the Pleasantville case? What lessons are specific to this case and should not be applied?

- **Create your final map *First\_Last\_map3.csv***. Instead of just + and -, express the strength of causation. You can use the notation VS (Very Strong), S (Strong), M (Medium), L (Low), and L (Very Low). For instance, writing "A,B,-VS" means that as A increases, it very strongly decreases B.

### ***Impact on existing residents***

"Thank you all for coming today to our budget meeting", the Mayor of Happy Valley said as she closed the door. "I've invited you all here today as I prepare for my speech about the state of our city that is coming up in a few weeks. As you know, we had a rough patch for a number of years, but it seems like our economy has been trending upward since the online retailer, HomeStore, opened up here. Can you give me some talking points to share with our voters?"

Sanjeev, the city planner, was first to speak up. "It's true that HomeStore brought in a number of computer science jobs, but there have been some unintended consequences."

"What do you mean? What specifically has been impacted?" the Mayor asked.

"Well," Sanjeev started, "there is no doubt that we are seeing an upswing in terms of things like schools, libraries, and hospitals. One of the problems we are facing is that new people are buying the properties like crazy."

After thinking for a moment, the mayor asked: "Sorry, I'm not sure if I understand the problem. After being such a down economy for a number of years, this is exactly what we were looking for."

"That's true", Sanjeev said. "But this has impacted many of our existing residents in a number of ways. Yes, it's true that HomeStore came here because of the low cost of living and our available warehouse space they have used. We assumed that our unemployed residents would fill many of those jobs, but we failed to recognize that HomeStore has a very specialized set of skills they are looking for. There are only so many janitor or warehouse jobs to be had at HomeStore. So while they stay unemployed, the housing rates have skyrocketed and landlords are charging higher rent. Every time property time values are reassessed, it is assessed on new values. As a result, we are seeing increases in overpopulation and homelessness, while bigger chunks of our city budget is spent on subsidized housing. We are also seeing crime increase in those areas, so businesses like grocery stores are moving out as the city becomes more unequal. The problem is only growing as housing prices increase and we need to do something before the problem gets worse."

### ***Impact on existing businesses***

Sanjeev had entered the office and had just settled in when he heard a knock on his door. "Come in," he said as he sat in his chair.

"Hey Sanjeev, I know I dropped in unexpectedly, but can I talk to you about a new project?", Dustin, his assistant city manager, asked.

"Sure, come on in. Seems like I've been seeing a lot of you recently with all the new developments going on." Sanjeev asked. "What new project do you have going on this time?"

"With you being the city manager, we've been seeing a lot of each other with all the new developments. With the new online retailer, HomeStore, coming into town, we are seeing a big ripple effect."

Sanjeev looked at the memo. "You want to expand the highways? This seems like a lot. Since HomeStore moved in, we've had to upgrade a lot of the roads and infrastructure around downtown. Since we sold the greenspace, the water doesn't absorb as easily into the ground, so we are seeing a lot of flooding. Those are my most pressing concerns at the moment. Why do you need to expand the highways?"

Dustin pointed to his paper. "Look at this graph here. With all the property values skyrocketing, there is a big homelessness and overpopulation problem. This has also led to a lot of hourly workers not being able to afford the city, so they have to live further away from their workplaces where it is cheaper. For those that want to stay close to work, they are needing to take longer bus rides and they don't have time for things like going back to school to get a better job. They are gone from home more, so they have to pay more for things like daycare and the cycle keeps going. For others that can afford a car, they have to move out where it is cheaper, but we only have two lane roads as it stands. We need do something quick."

Sanjeev thought for a moment. "I'm not sure what to tell you. In terms of expanding the highway, we already had some pushback from environmentalists when we sold the land, and we're seeing flooding. I'm guessing they will not be happy with the air pollution if I make it easier for more cars to get on the road. I need to pay for the runoff problem and people are already starting to complain about the higher taxes needed to do that. I'm not sure what to tell you."