

# Weekly Report (4.11-4.17)\*

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During the past week, I spent most of my time modifying my codes for the smoking contagion model.

## Coding

**(Summary From Last Week)** With available datasets, what can be observed is the percentage of never-smokers (N), smokers (S), and quitters (Q) in the population by the end of each year. With the agent-based model depicting the intricate dynamics of state change process for each agent, through simulations we are able to get the simulated data of each kind by the end of each step (year), which follows the methodology of **BOLFI**. By implementing **BOLFI**, what we want are inferences for the parameters that characterise the state change process as well as the social network topology.

This week, I successfully implemented the smoking contagion model with Mesa and NetworkX, with all the update mechanisms properly planted. When using the model, the only thing to do is input the network type and its parameters. The data output is a table of **Step**, **NONSMOKER**, **SMOKER**, and **QUITTER**, just as observed in the available datasets. It seems that my implementation is working properly, however, **I still need to verify its validity with you both.**

For more details, please check the **ABM.py** (for the main model) and **Draft\_and\_Notes.py** (for some notes and questions).

## Maths

Nothing has been done with mathematical derivation or proof for this week.

## Questions Raised for This Week

- **Coding:**
  - **NSQ\_Model:** I suppose it is working in the correct way now but needs to be reviewed.
  - **NSQ\_Agent:** I suppose it is working in the correct way now but needs to be reviewed.

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\*This is a summary of the works was done in the past week.

- **(Question From Last Week) Maths:** (in the arXiv version paper, S3 Appendix. Parameter estimation from Christakis)
  - Why can the interaction parameter  $g$  between smoker and quitter be replaced by the probability of quitter over  $t$  years, as in (20)?
  - How does the expression in (22) get derived by applying (21) to both the interaction term and the spontaneous term?

- **(Question From Last Week) General Question - Physics to Complexity Science:**

How do statistical physics and those physical rules further assist our modeling of social systems and real-world social phenomena (e.g., heterogeneity of agents; capturing complexity versus model simplicity, etc.)?

- **(Question From Last Week) General Question - Long-term Plan and Short-term Goals in PhD Journey:**

From my perspective, the short-term goals are coding the agent-based modelling mechanism for our smoking contagion model and implementing BOLFI to obtain better inferences for the model parameters. Can we have a discussion about the long-term plan (since you both seem to have many potential options)?

## Plan for Next Week

- **Coding:**
  - **BOLFI** settings to cope with inferences for model parameters given the simulated data obtained in the last task.
  - Testing the **BOLFI** implementation to our smoking contagion model.  
**IDEA:** First, obtain inference for a single parameter by keeping other model parameters and network generation parameters fixed.