



SOCIAL CONTAGION: MODELS FOR HUMAN FLOURISHING

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Therefore, I urge you, brothers and sisters, in view of God's mercy, to offer your bodies as a living sacrifice, holy and pleasing to God—this is your true and proper worship. ² Do not conform to the pattern of this world, but be transformed by the renewing of your mind. Then you will be able to test and approve what God's will is—his good, pleasing and perfect will.

Romans 12:1-2



[...] His children are to go into the world and create some imperfect models of the good world to come.

-- Lewis B. Smedes, My God and I

Agenda

1. Concepts
2. Past work
3. Current work
4. Future Challenges





CALVIN

WHAT IS AGENT-BASED MODELING?

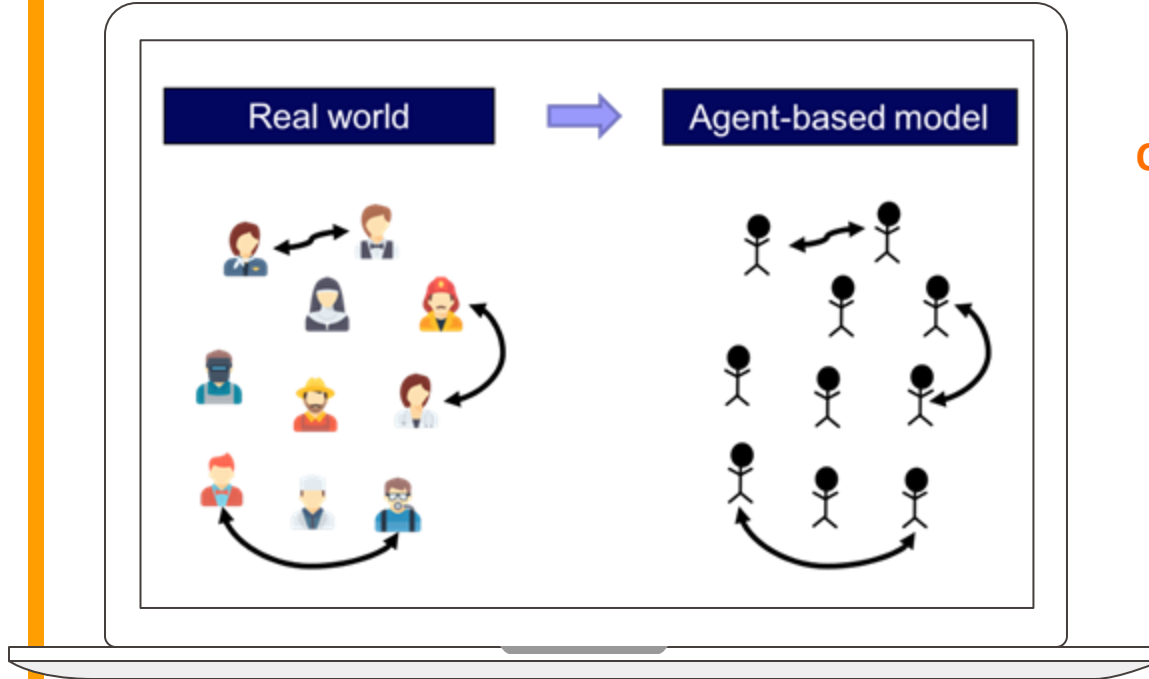
"A model is a purposeful representation of a real system"

-- Starfield et al. 1990

Agent-based Models

- An agent is an **autonomous** individual with properties and actions within a computational simulation.
- ABMs implement the concept that the world can be modeled through multiple distributed agents, each following **simple rules** of behavior.
- From these basic rules for individual agents, we **observe** the outcomes of their interactions.





Characteristics

- Agent Heterogeneity
- Interdependence among processes studied in different disciplines
- Non-equilibrium dynamics
- Macro and micro levels
- Local interactions and the importance of physical space





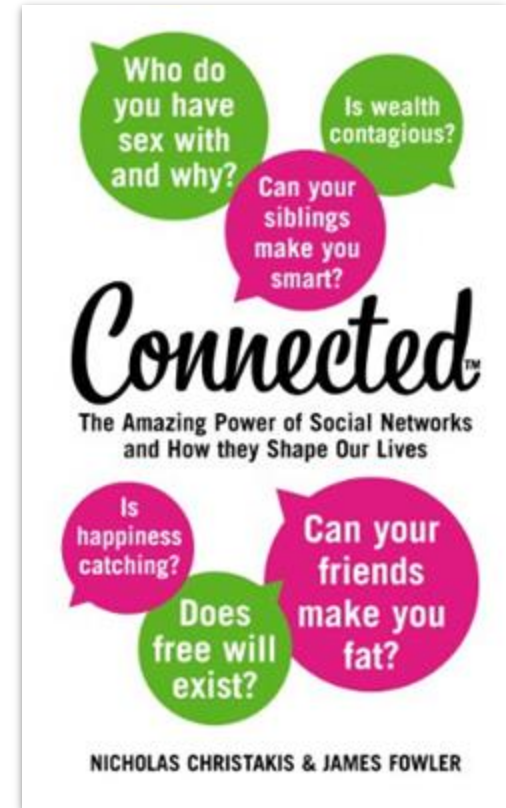
CALVIN

WHAT IS SOCIAL CONTAGION?

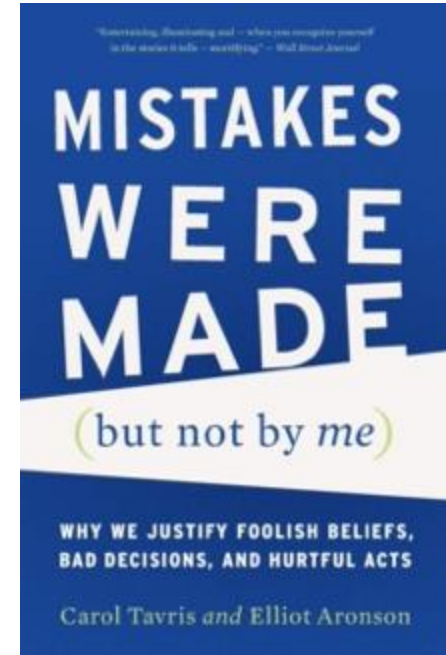
"Our task is to live our personal communion with Christ with such intensity as to make it contagious."

-- Paul Tournier

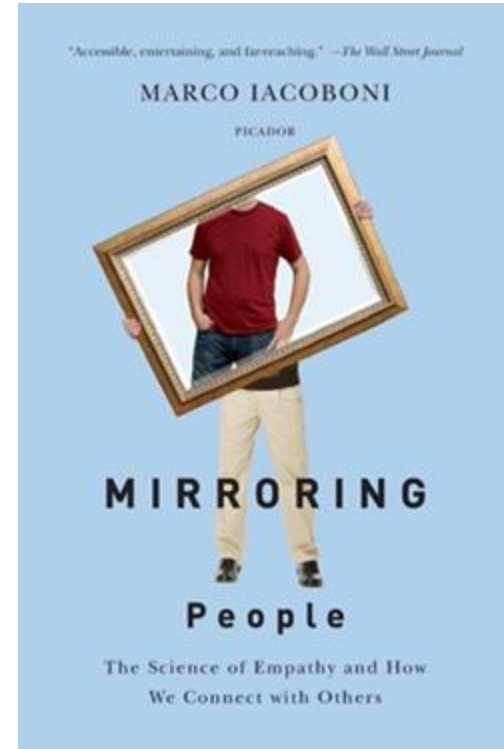
Christakis & Fowler (2007)



CAROL TRAVIS & ELLIOT ARONSON (2007)

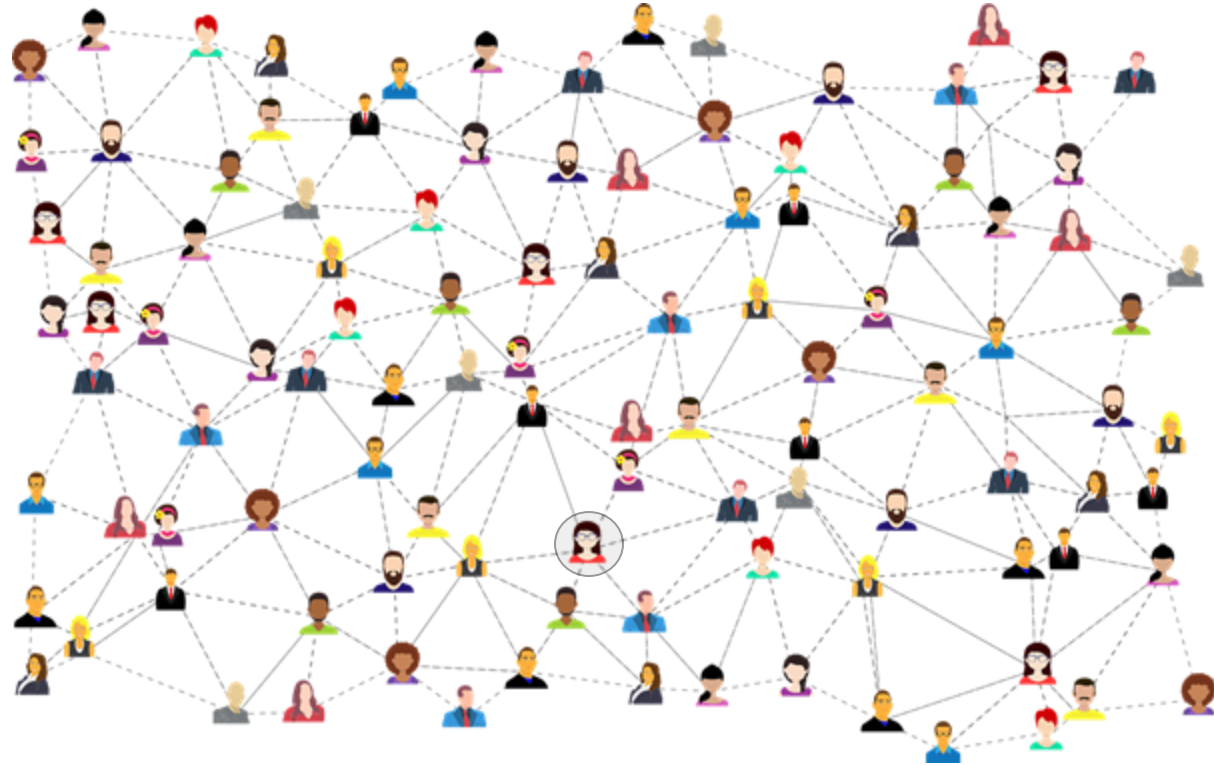


Marco Iacoboni (2008)



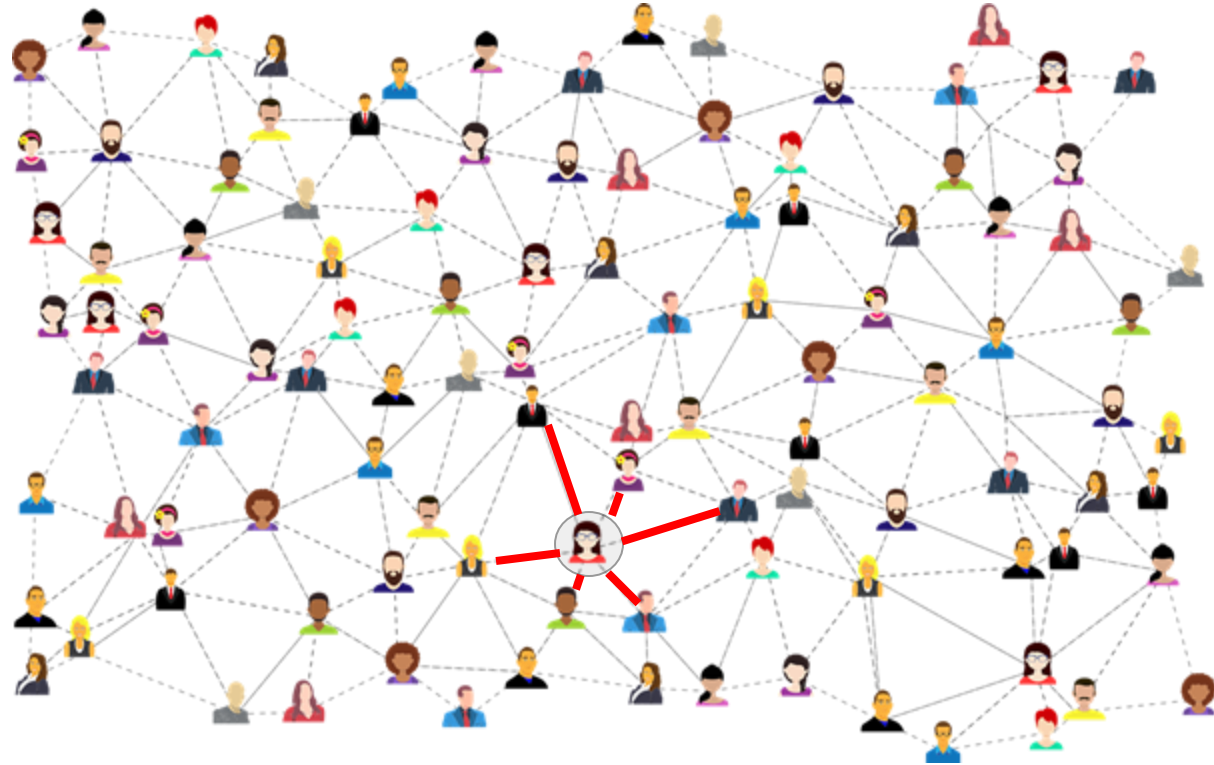


Social Networks



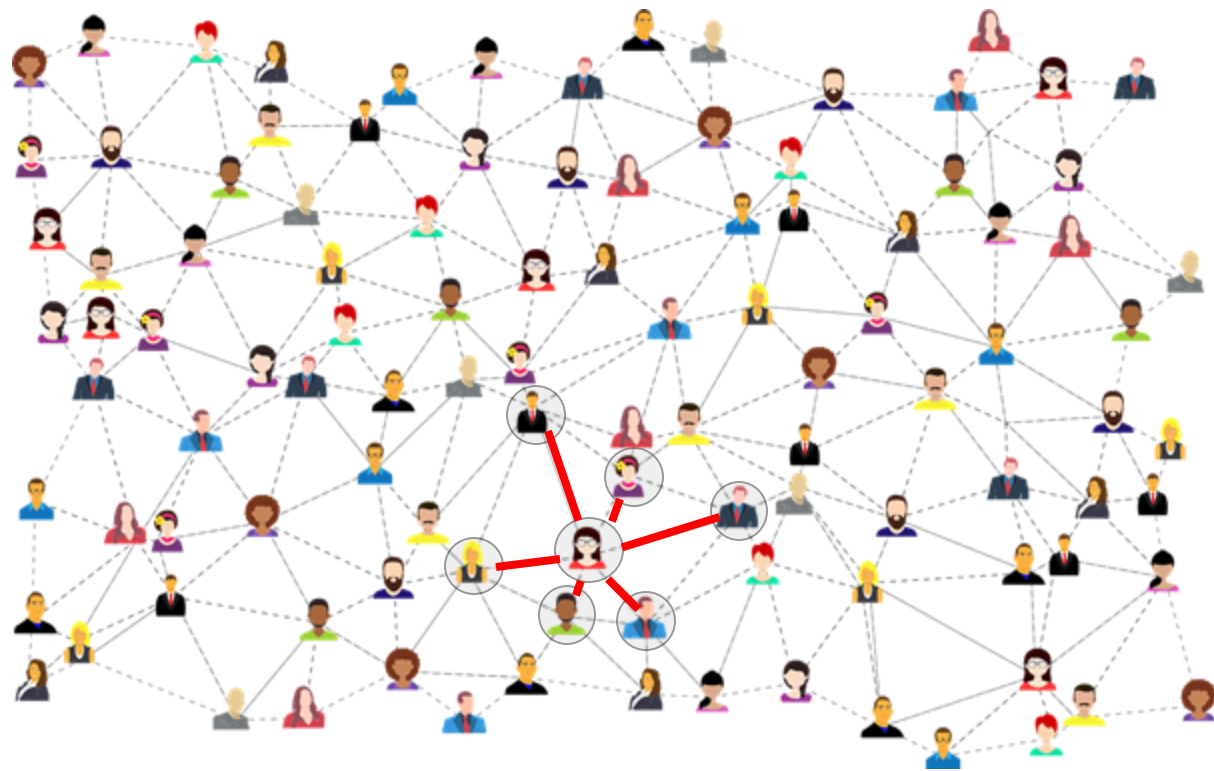


Social Networks



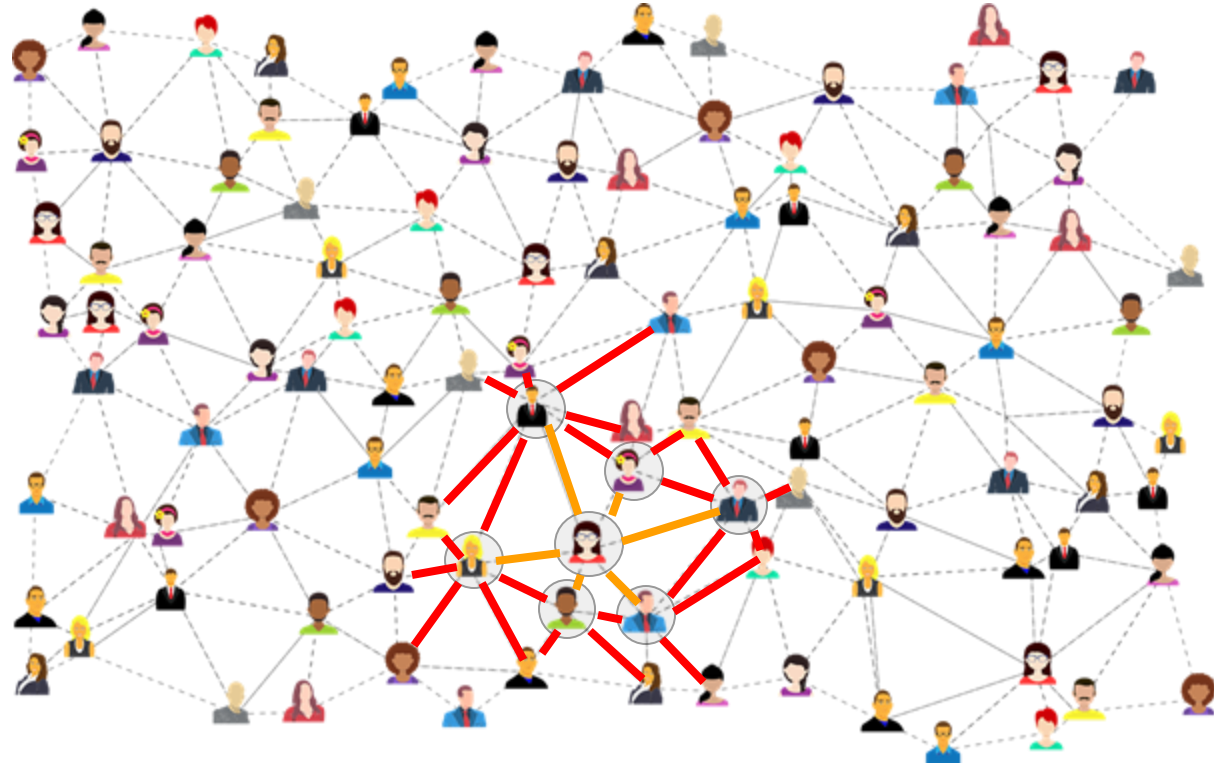


Social Networks





Social Networks



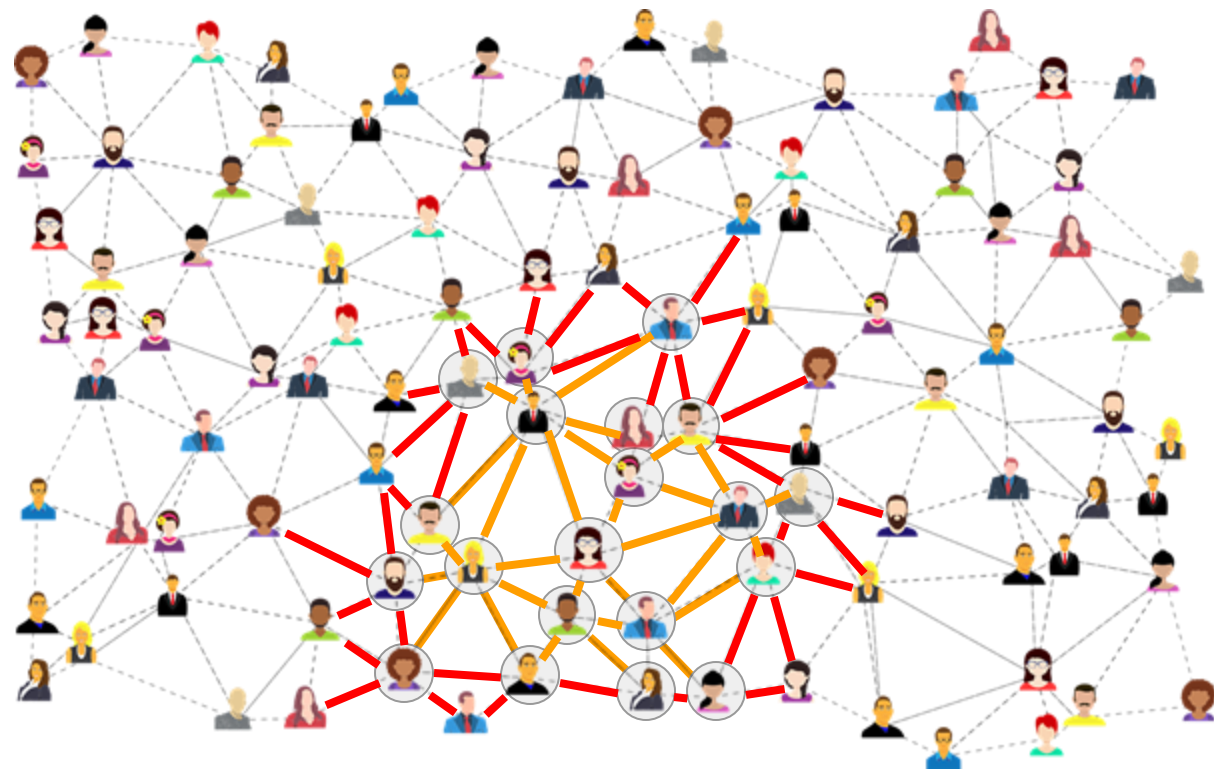


Social Networks



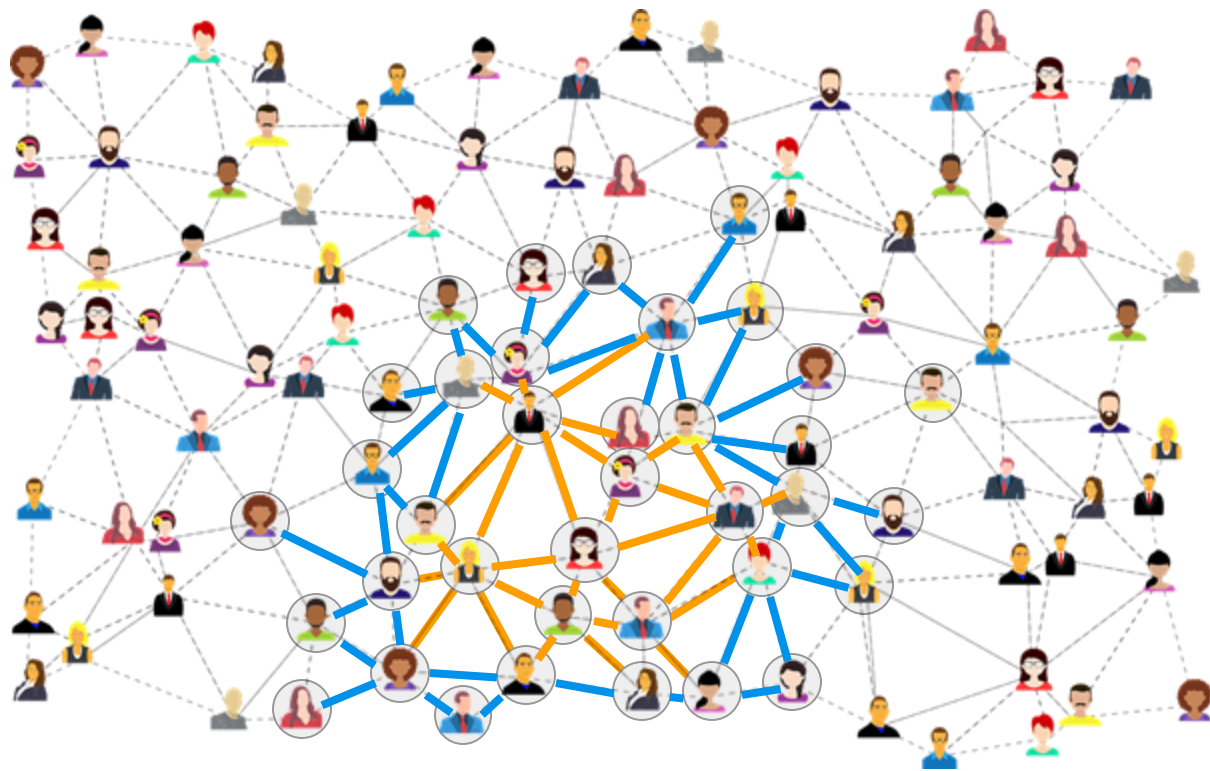


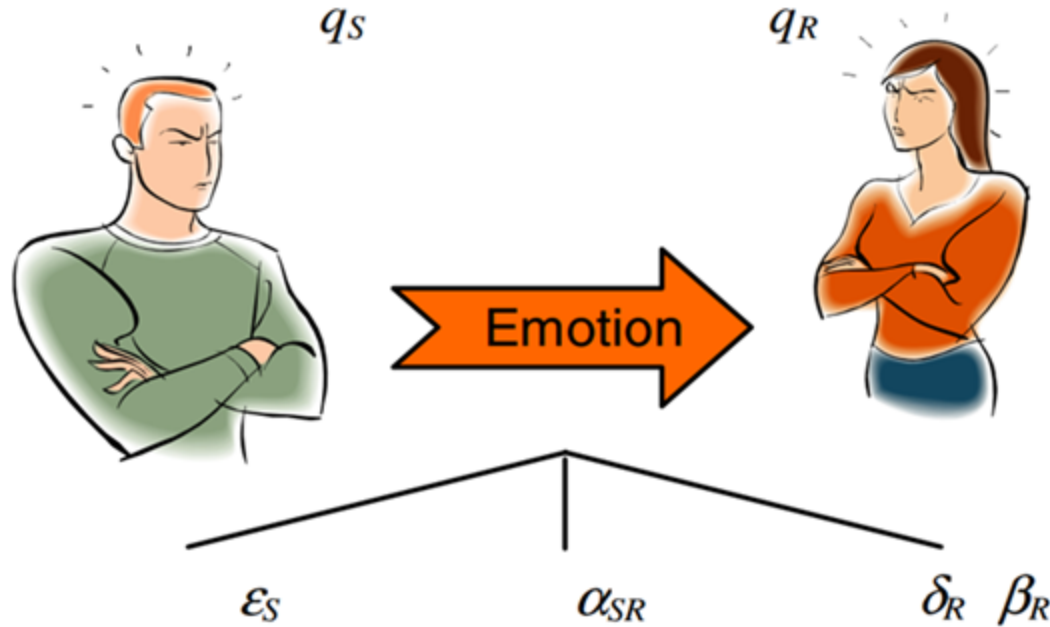
Social Networks





Social Networks





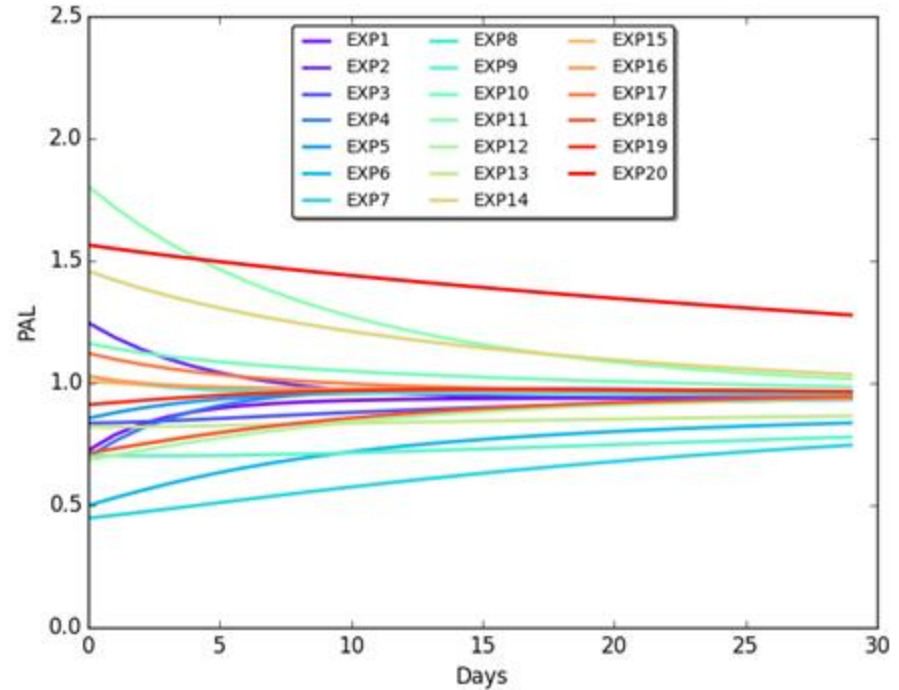
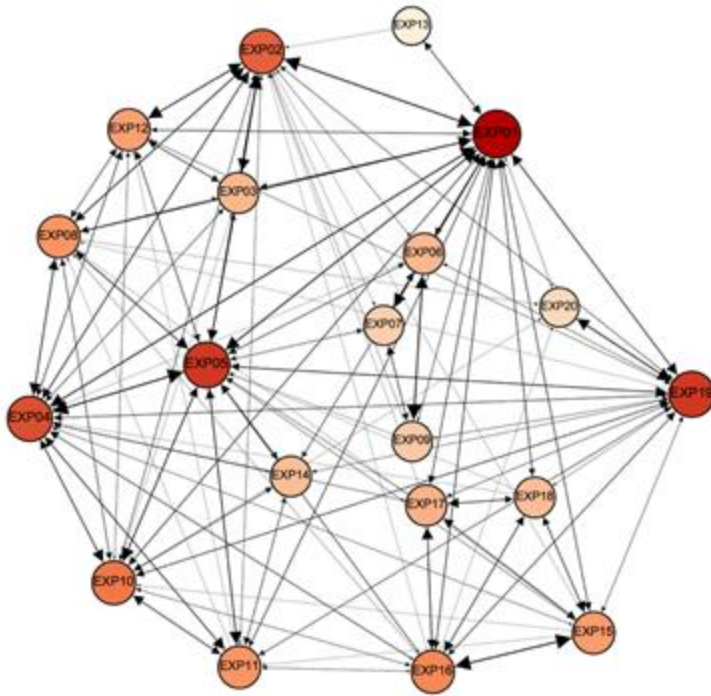
Bosse, Tibor, et al. "Modelling collective decision making in groups and crowds: Integrating social contagion and interacting emotions, beliefs and intentions." *Autonomous Agents and Multi-Agent Systems* 27 (2013): 52-84.



Contagious

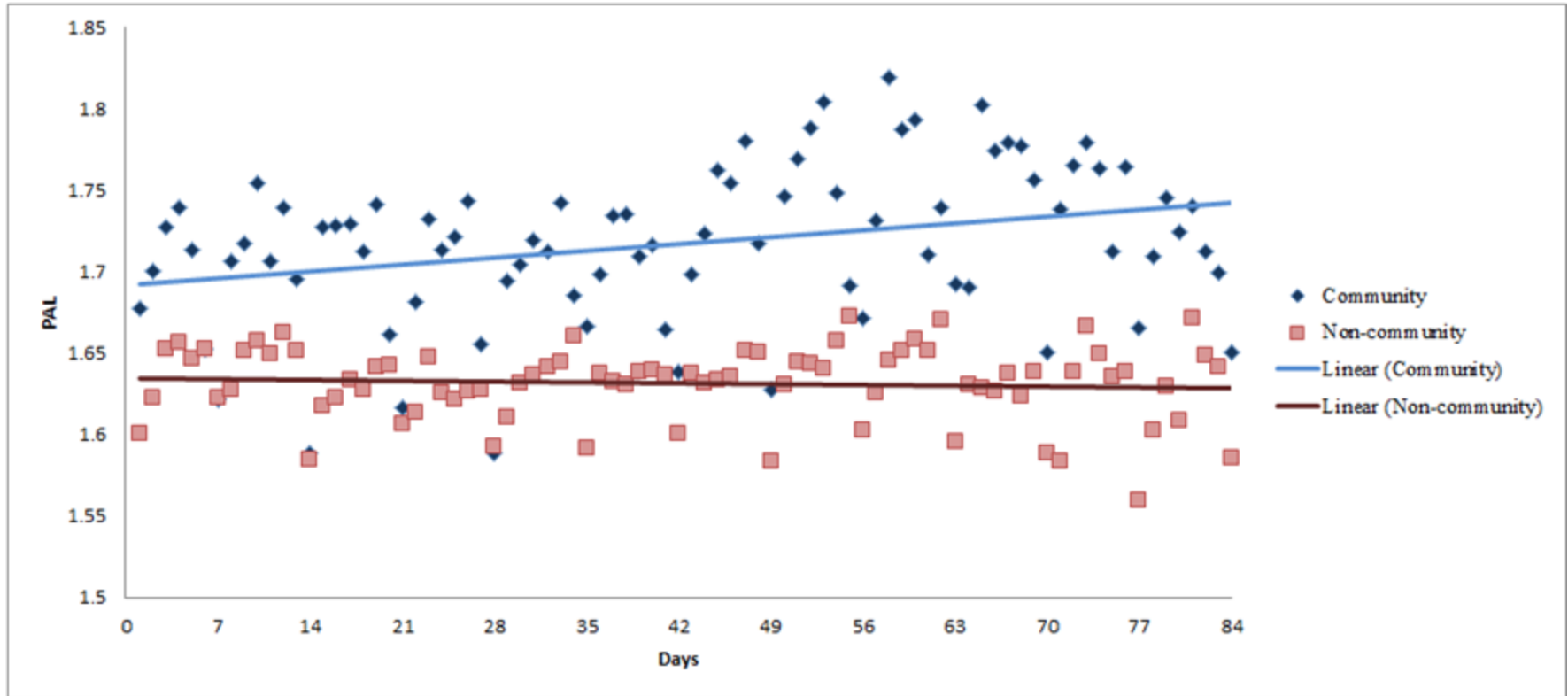
**MODELING THE
SPREAD OF
BEHAVIOURS,
PERCEPTIONS
AND EMOTIONS
IN SOCIAL NETWORKS**

ERIC FERNANDES DE MELLO ARAÚJO



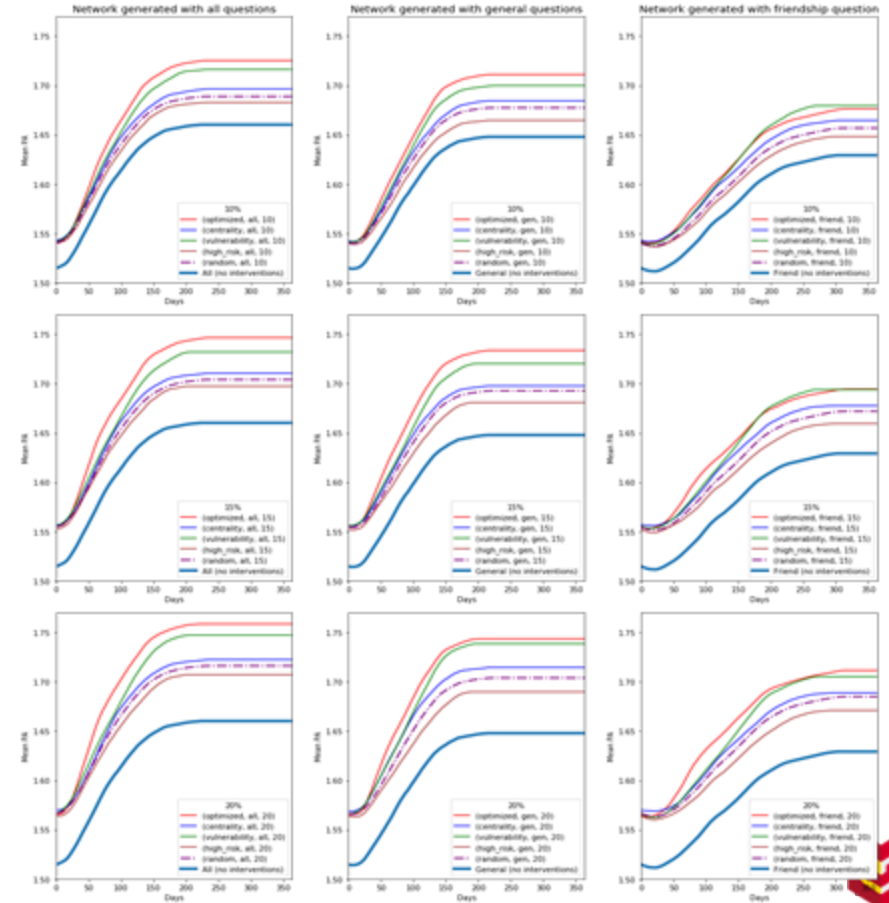
Araújo, Eric FM, et al. "Analysis and evaluation of social contagion of physical activity in a group of young adults." *Proceedings of the ASE BigData & SocialInformatics 2015*. 2015. 1-6.



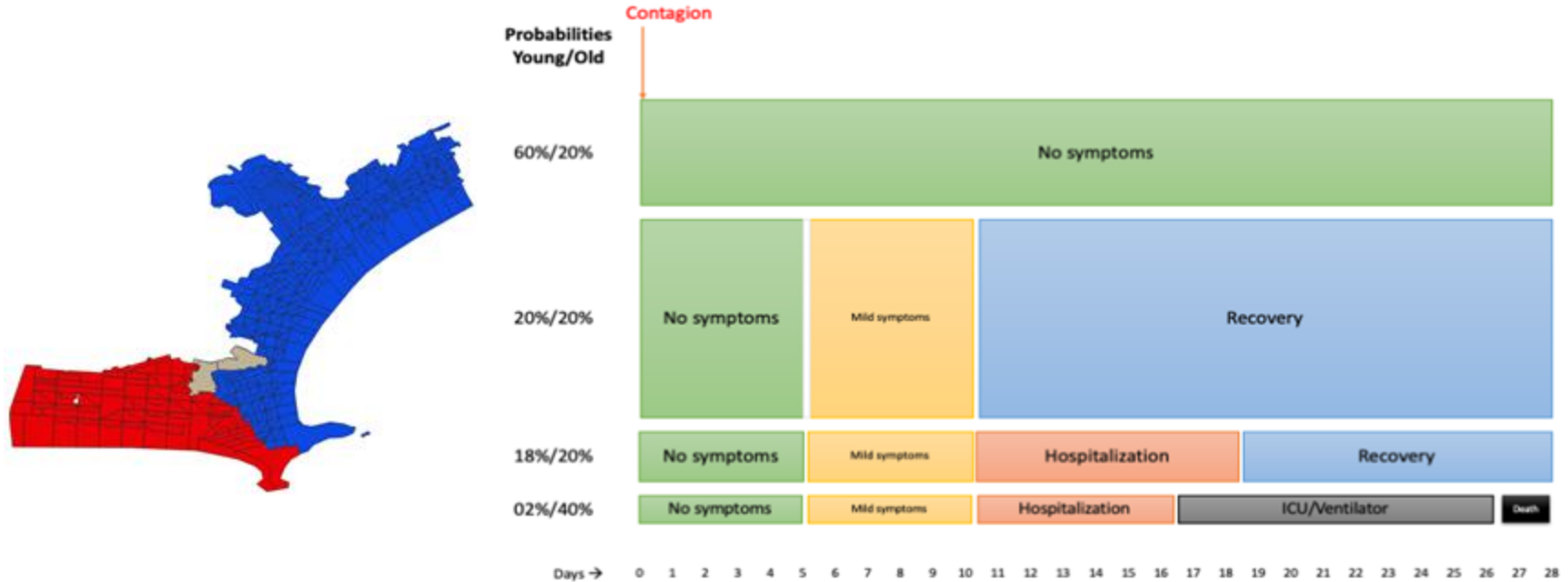


Manzoor, A., Mollee, J. S., Araújo, E. F., van Halteren, A. T., & Klein, M. C. (2016, October). Online sharing of physical activity: does it accelerate the impact of a health promotion program?. In 2016 IEEE International Conferences on Big Data and Cloud Computing (BDCloud), Social Computing and Networking (SocialCom), Sustainable Computing and Communications (SustainCom)(BDCloud-SocialCom-SustainCom) (pp. 201-208). IEEE.



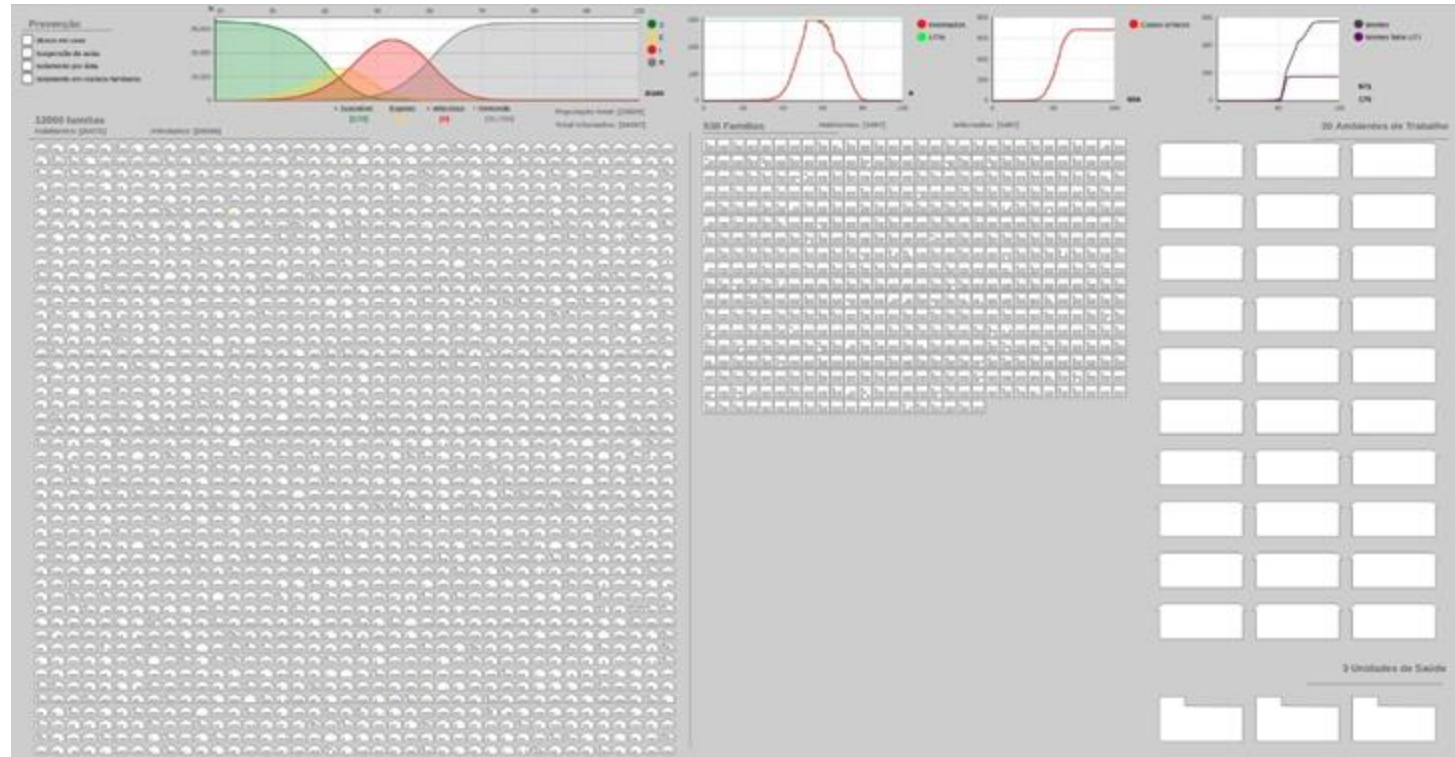


Van Woudenberg, T. J., Simoski, B., Fernandes de Mello Araújo, E., Bevelander, K. E., Burk, W. J., Smit, C. R., ... & Buijzen, M. (2019). Identifying influence agents that promote physical activity through the simulation of social network interventions: agent-based modeling study. *Journal of medical Internet research*, 21(8), e12914.



Klôh, V. P., Silva, G. D., Ferro, M., Araújo, E., de Melo, C. B., de Andrade Lima, J. R. P., & Martins, E. R. (2020). The virus and socioeconomic inequality: An agent-based model to simulate and assess the impact of interventions to reduce the spread of COVID-19 in Rio de Janeiro, Brazil. *Brazilian Journal of Health Review*, 3(2), 3647-3673.





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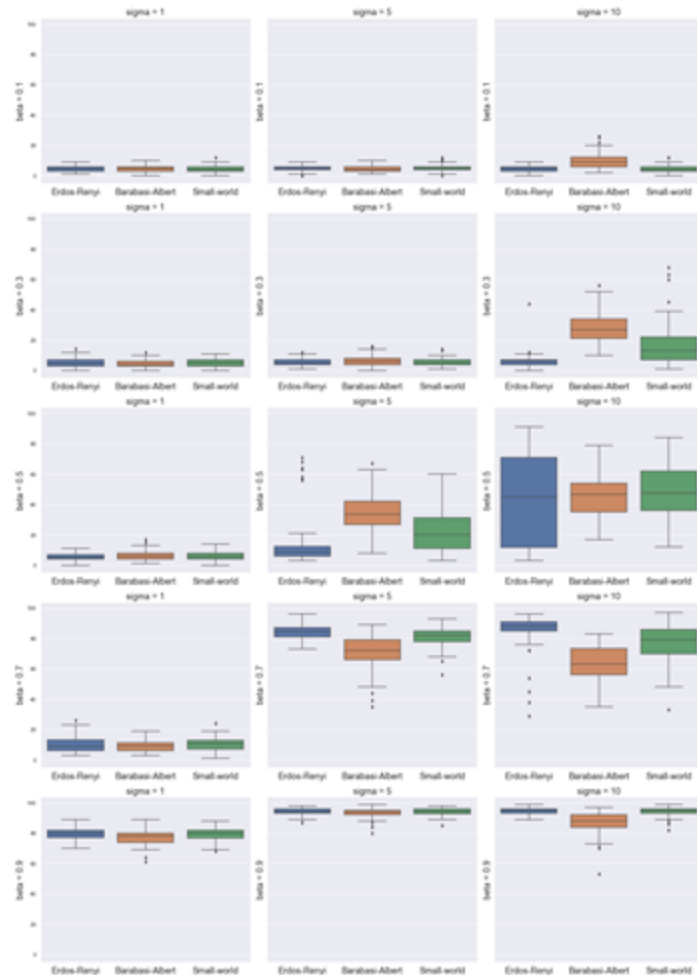
699,24%

An increase in people's overall opinion regarding adherence to health protocols if 10% of the network becomes fully convinced that the protocols are important and make a difference.

80+% in favor

If the government launches campaigns to encourage people to adhere to health care and virus containment measures.

Araújo, Eric, Mariza Ferro, and Gabrieli Silva. "Disconnecting for the good: A network-oriented model for social contagion of opinions and social network interventions to increase adherence to social distancing." Anais do IX Brazilian Workshop on Social Network Analysis and Mining. SBC, 2020.

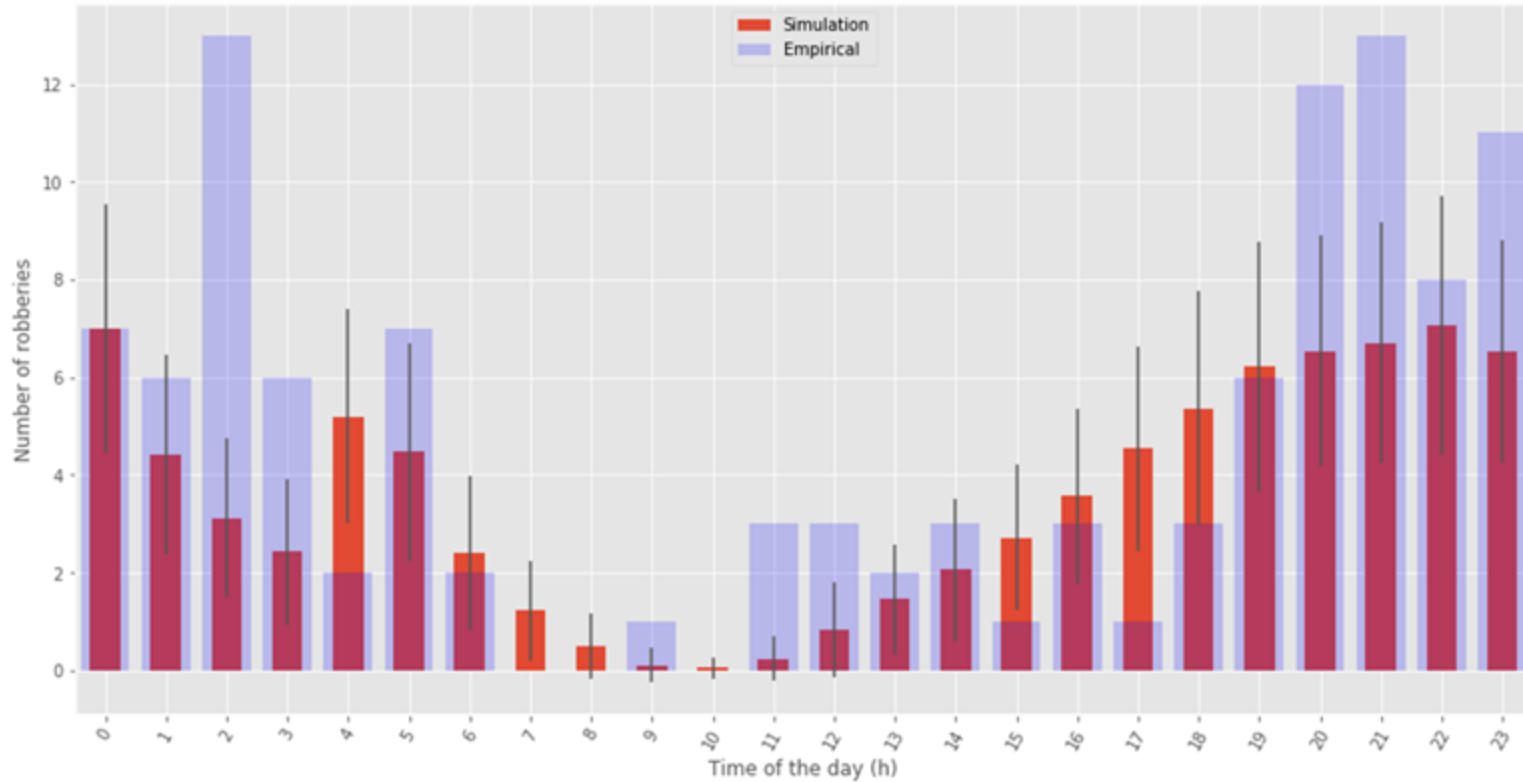


Cohen e Felson (1979): Crime concentrates in space and time and in between the targets.



Araújo, Eric, and Charlotte Gerritsen. "Creating a temporal pattern for street robberies using ABM and data from a small city in South East Brazil." *Agent-Based Modelling for Criminological Theory Testing and Development* (2020): 146.





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Questions for the future:

- How to use agent-based models in a responsible manner, so the results provide useful insights to society?
- What are the ethical aspects of machine learning and other AI tools and models that should be considered when building data-oriented models?
- How to build a Christian reformed framework for data analysis and model conception in such a way that non-Christians also find it attractive and relevant?
- How to use data to solve critical problems in society mitigating bias and enhancing transparency and consistency?





"I have received no assurance that anything we can do will eradicate suffering. I think the best results are obtained by people who work quietly away at limited objectives, such as the abolition of the slave trade, or prison reform, or factory acts, or tuberculosis, not by those who think they can achieve universal justice, or health, or peace. I think the art of life consists in tackling each immediate evil as well as we can."

— C.S. Lewis

The weight of glory



Thank You!

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