Targeting Shutdowns by Repurposing WiFi Logs is More Effective than Moving Classes Online for Controlling COVID-19 on Campuses

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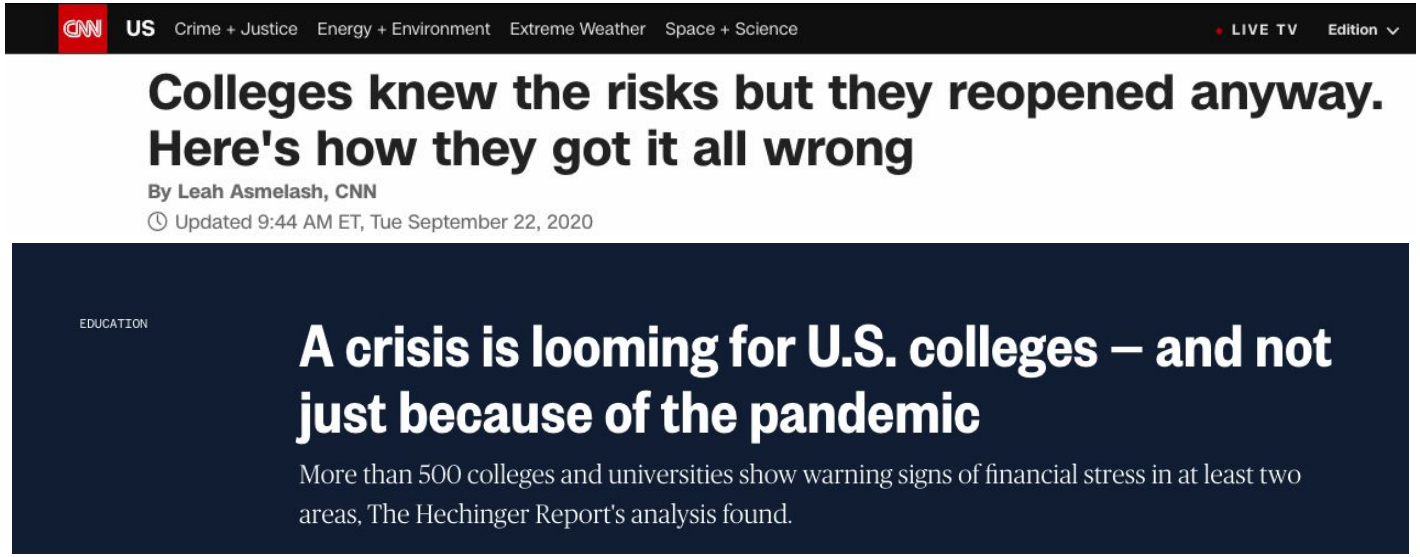
Outline

- ★ Motivation and Goals
- ★ WiFi-based Mobility Data
- ★ Model
  - On-campus agent-based SEIR model with dynamic mobility data
  - Calibration and validation
- ★ Experimental design of policies
  - Measures of success, impacts, and constraints
  - Scenarios
- ★ Results
- ★ Further experiment

Motivation

In general, universities are struggling to reopen during the pandemic caused by Covid-19 because ...



Risk of outbreak

Financial Crisis

To reopen, what universities can do?

- Closure policies
  - Move classes online
    - Can be informed by contact networks generated based on course enrollment data ([1], [2])

- Others

[1] Borowiak, Molly, et al. "Controlling the spread of COVID-19 on college campuses." *arXiv preprint arXiv:2008.07293* (2020).

[2] Weeden, Kim A., and Ben Cornwell. "The small-world network of college classes: implications for epidemic spread on a university campus." *Sociological science* 7 (2020): 222-241.

Great performance in controlling, is it successful?

- Expensive
  - Shutting down too much locations
  - Force too many students away from campus

- Limitations of course-enrollment data
  - Fail to capture the dynamic mobility pattern of individuals on campus
  - Exclude activities outside the classrooms (gym, residence, non-students...)

Proposed Method

- Leveraging the managed WiFi network on campus can **describe proximity outside courses and residence halls**
  - ➢ WiFi access logs can approximate physical collocation of connected users

Research Aims

- To compare insights of proximity based social networks with assumptions of registration networks

- To design and evaluate more efficient policies by simulating disease spread with proximity based networks under reasonable constraints

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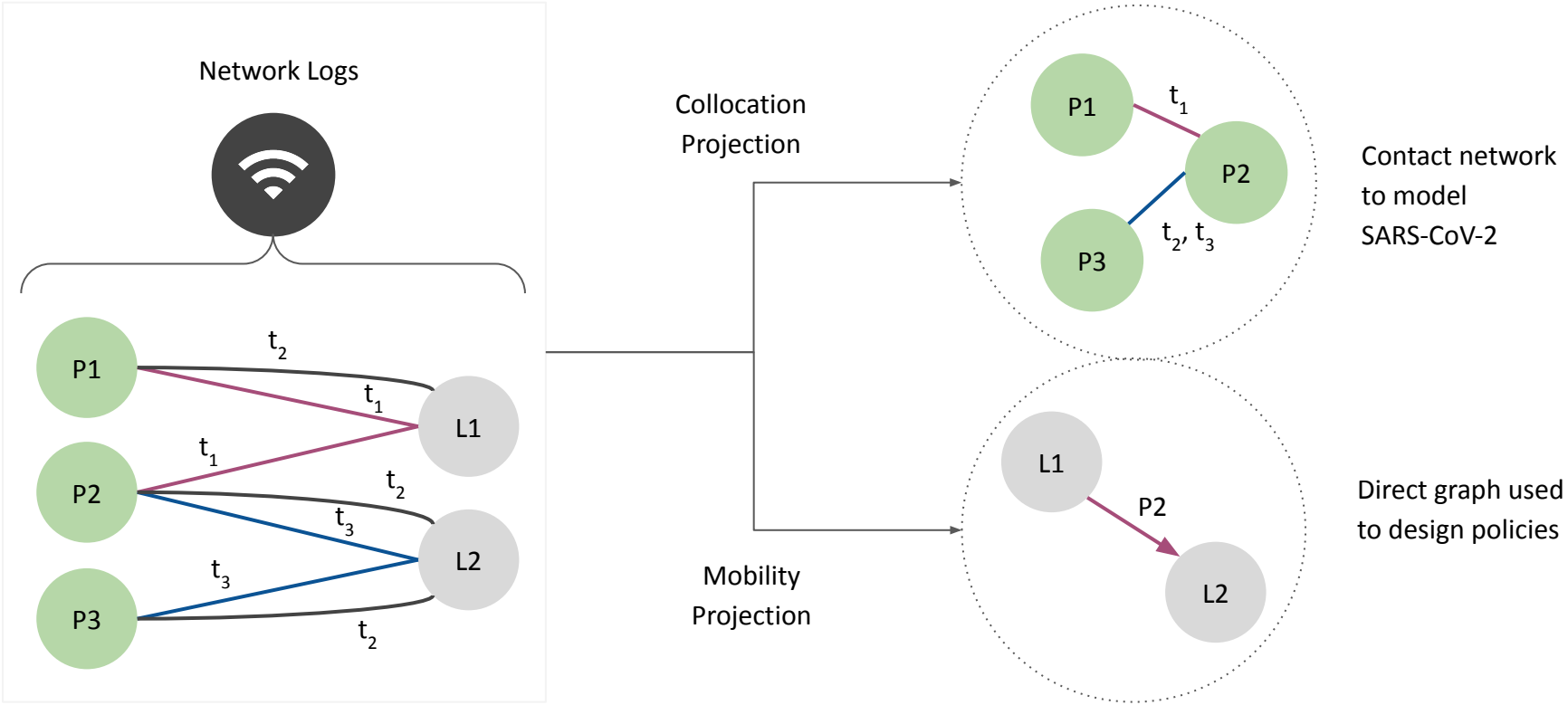
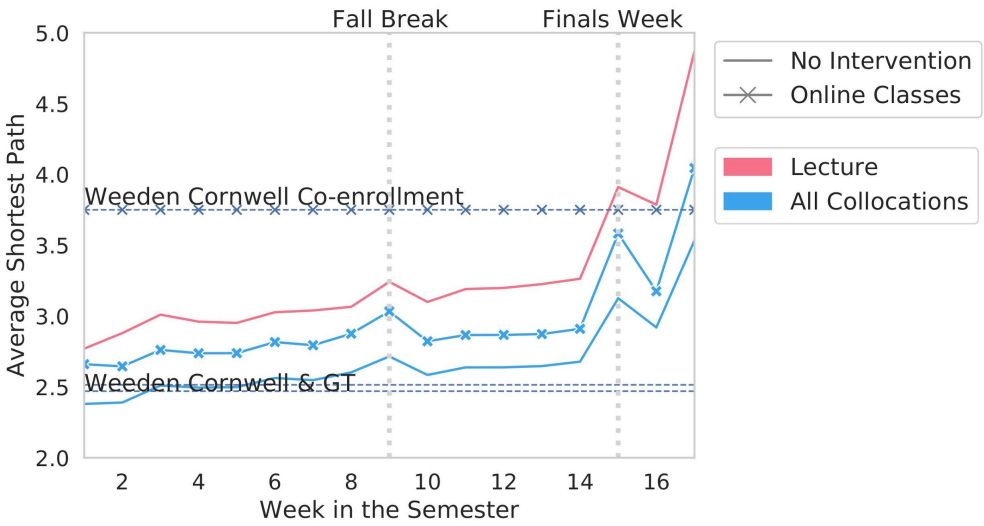
WiFi-based Mobility Data



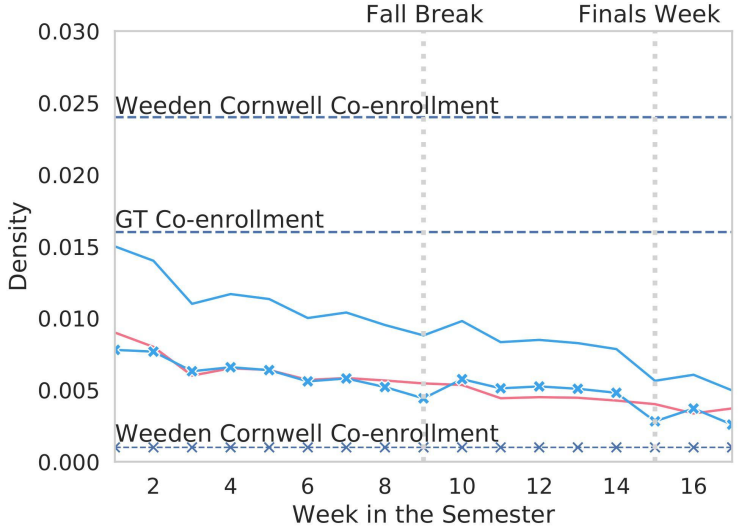
Credit: Sonia Sargolzaei

WiFi-based Mobility Data Vs Course Enrollment Data

Fall 2020 Semester



Fall 2020 Semester



Course enrollment data fails to capture the dynamics of mobility and the inside-outside-classrooms activity as the WiFi-based data

Credit: Sonia Sargolzaei

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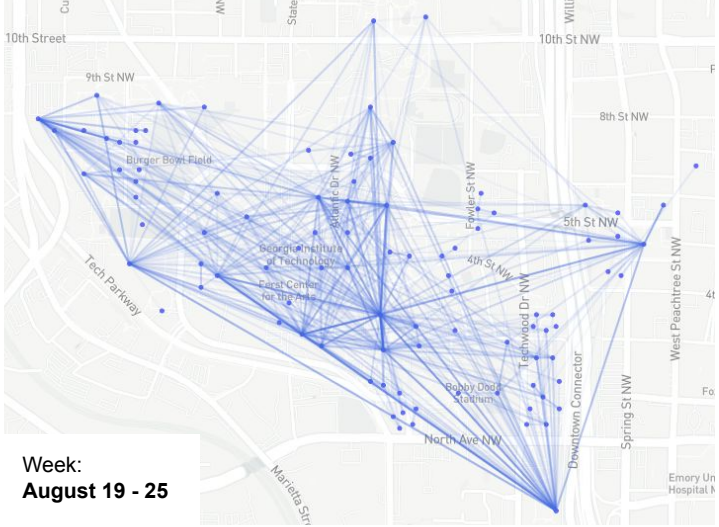
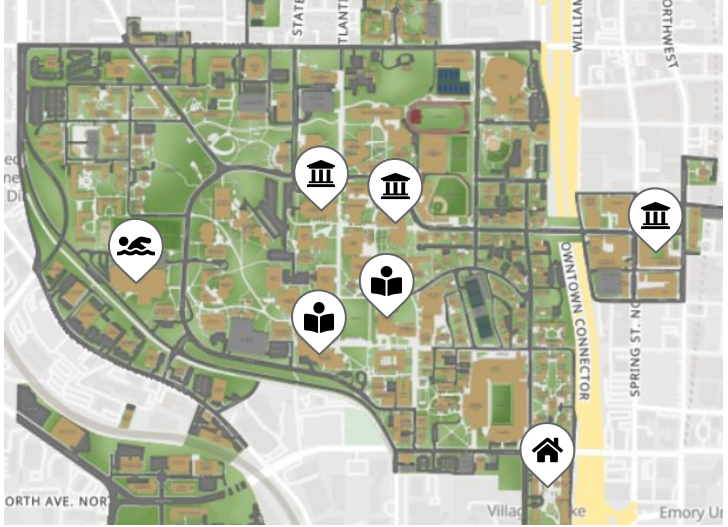
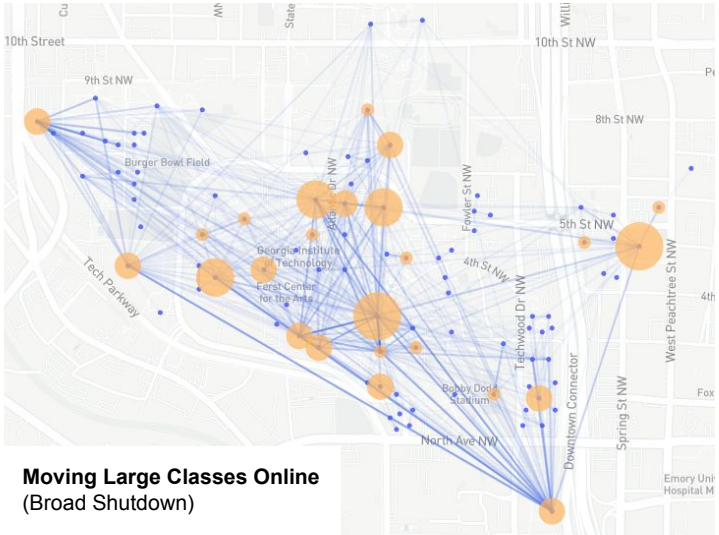


Week:
August 19 - 25

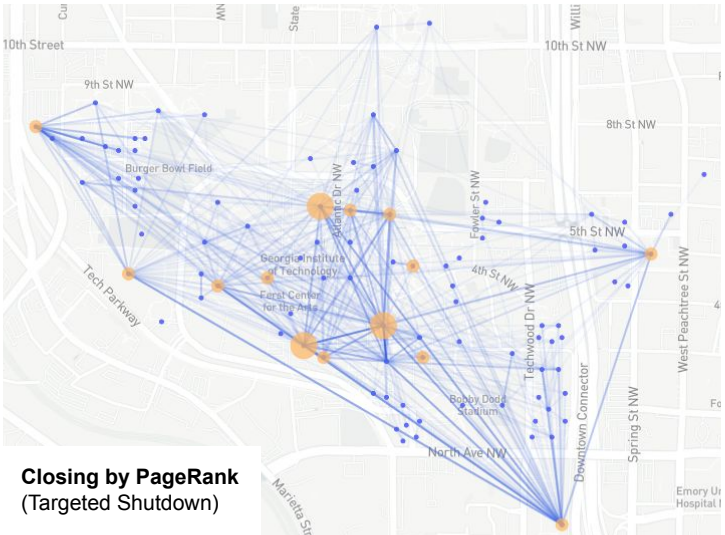


Number of rooms/suites shutdown

- 7+
- 5-6
- 3-4
- 1-2



Moving Large Classes Online
(Broad Shutdown)



Closing by PageRank
(Targeted Shutdown)

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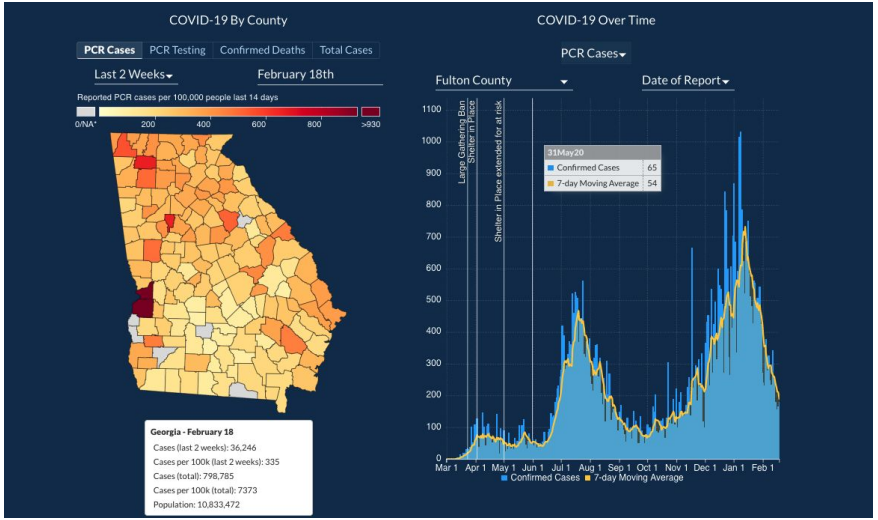
How to model the disease dynamics on campus?

Information refer to ...

- Campus Operation Guideline
  - Surveillance Testing
  - Quarantine in places
  - …
- Surrounding Neighborhood
  - Atlanta
  - Fulton County
  - Georgia
  - ...



https://health.gatech.edu/tech-moving-forward

https://dph.georgia.gov/covid-19-daily-status-report

Asymptomatic and Symptomatic