

Understanding and Rewiring Epidemic Networks: A Data-driven Approach Towards Enabling Quarantine in-Motion

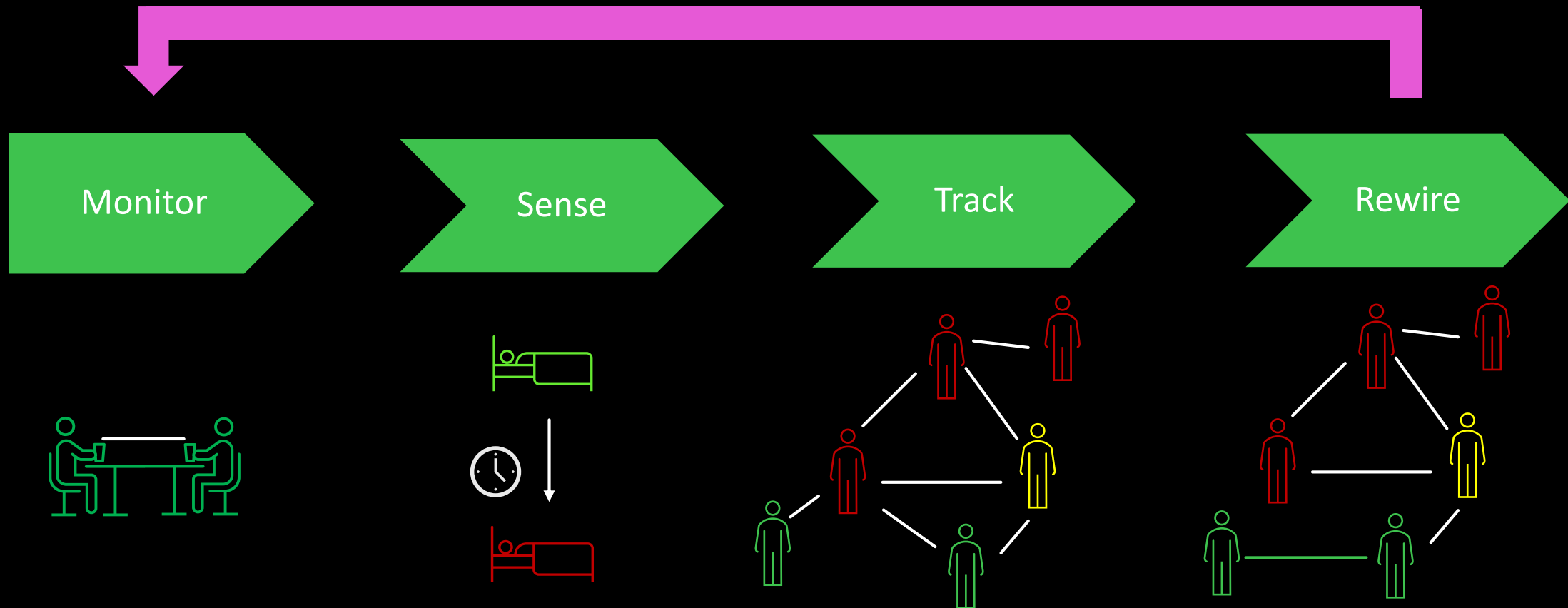
Radu Marculescu

Professor of ECE

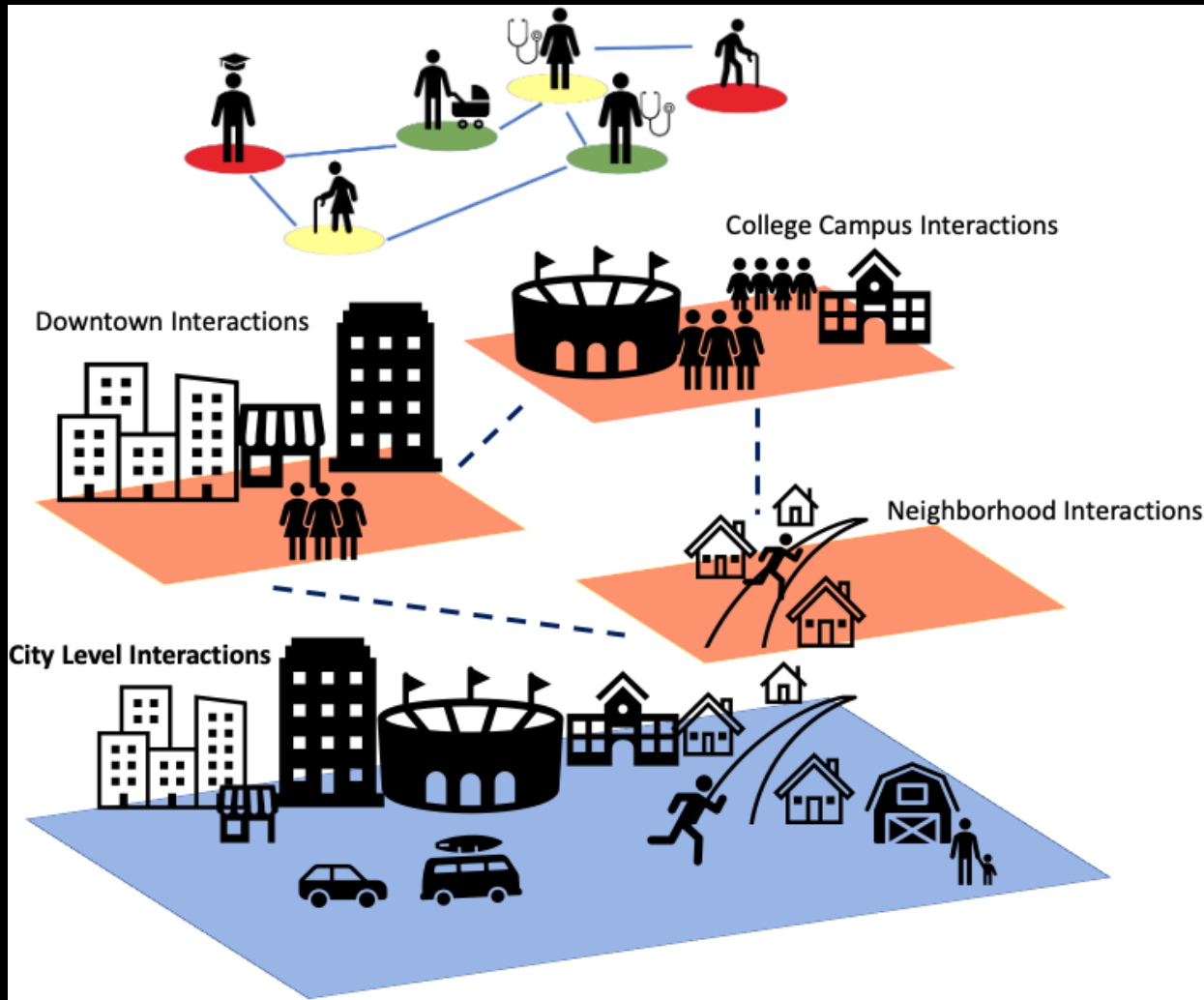
The University of Texas at Austin

COVID-19: From social sensing to contact tracing and to contact rewiring

Testing the ability to use GPS data to sense, track, and mitigate an infectious disease



Multiscale approach to rewire contact networks

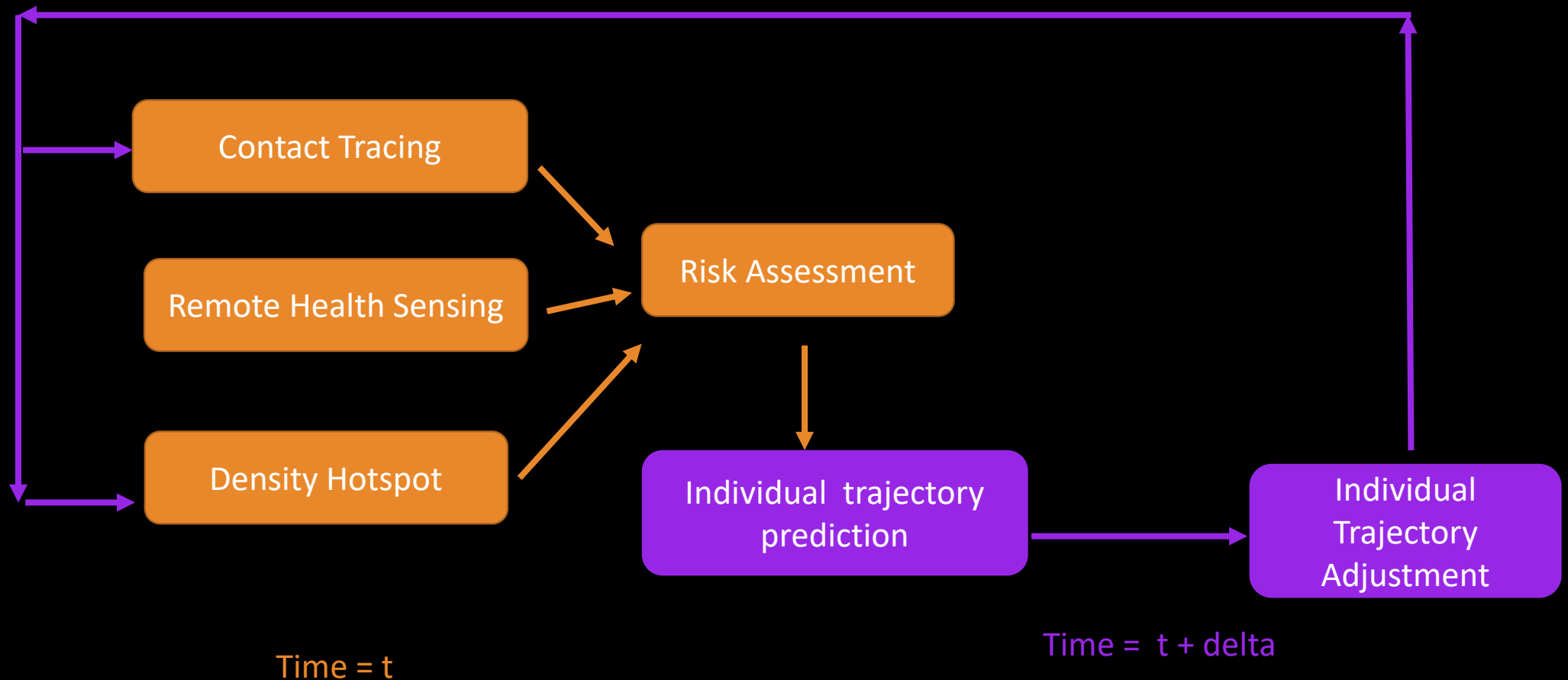


Avoid crossing paths
with infected people

Avoid local hotspots

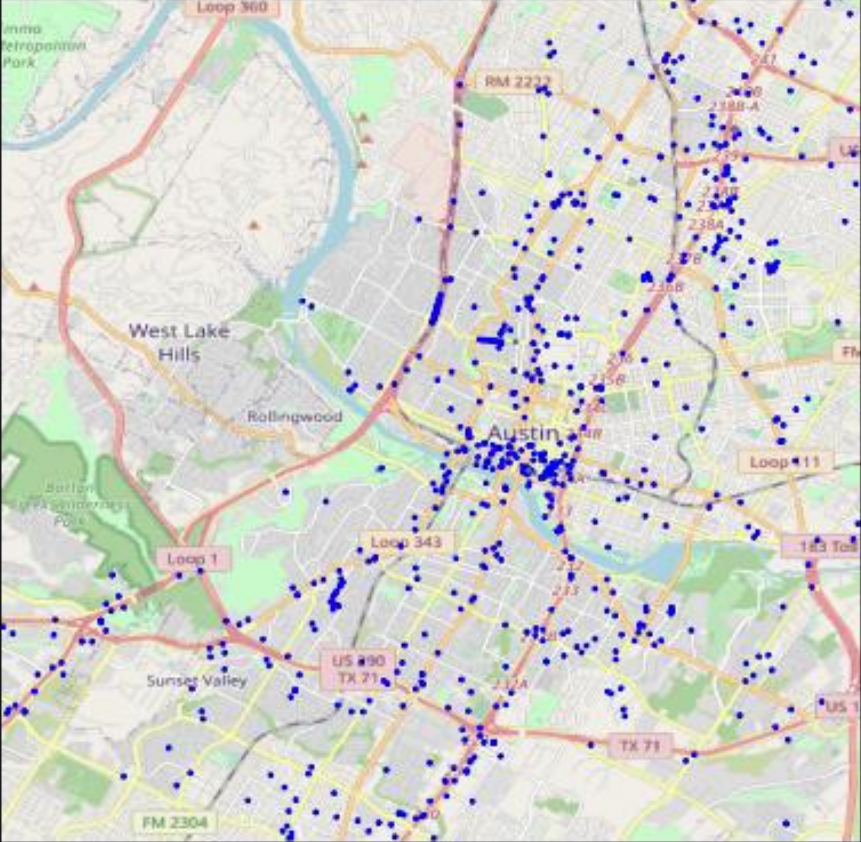
Avoid regional hotspots

'Always on' approach as a closed control loop

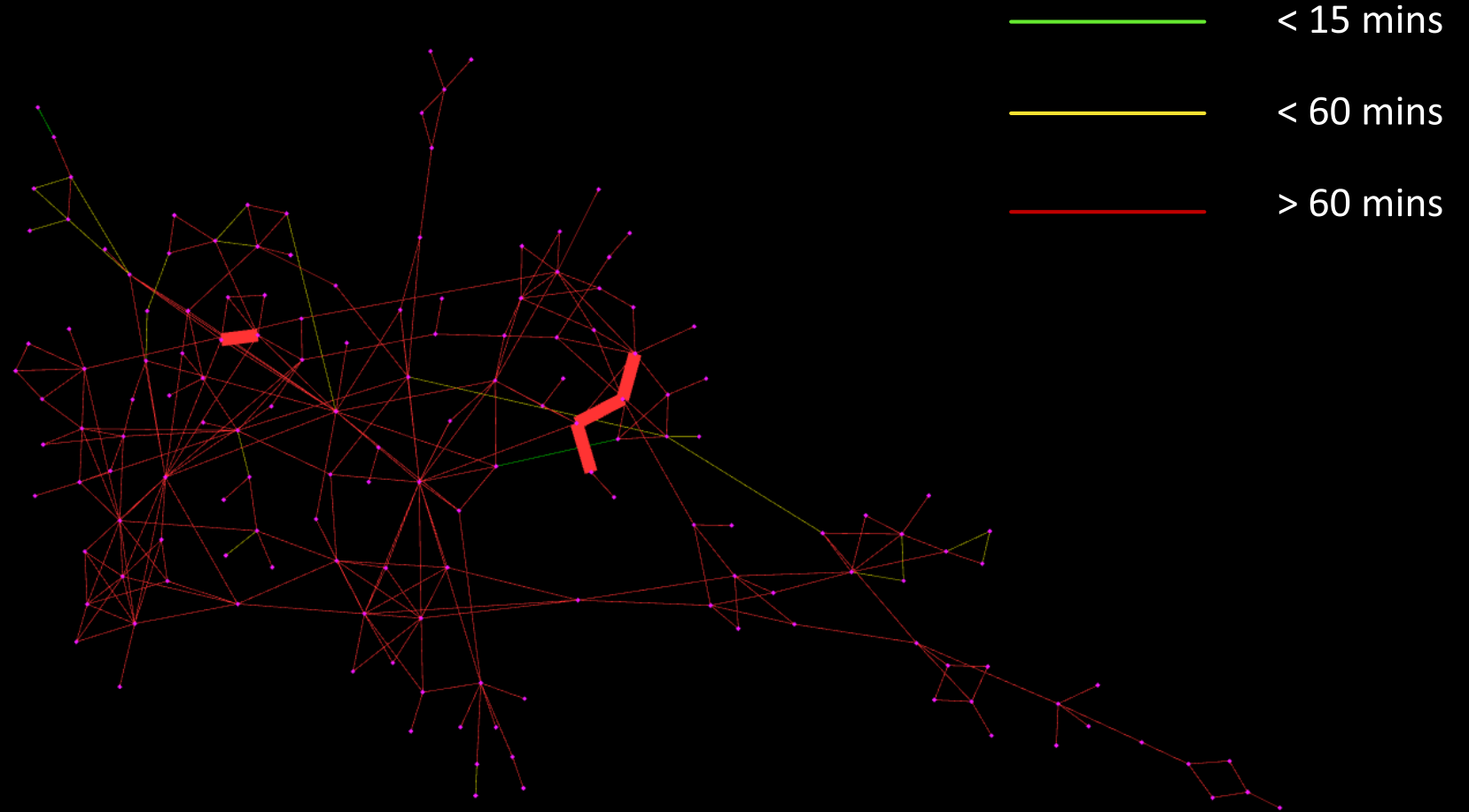
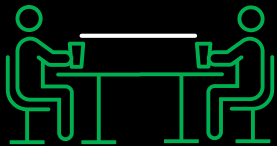


Dynamic contact networks from real GPS data in Austin, TX

Austin, Texas Mobility at time 02/29/2020, 18:01:00

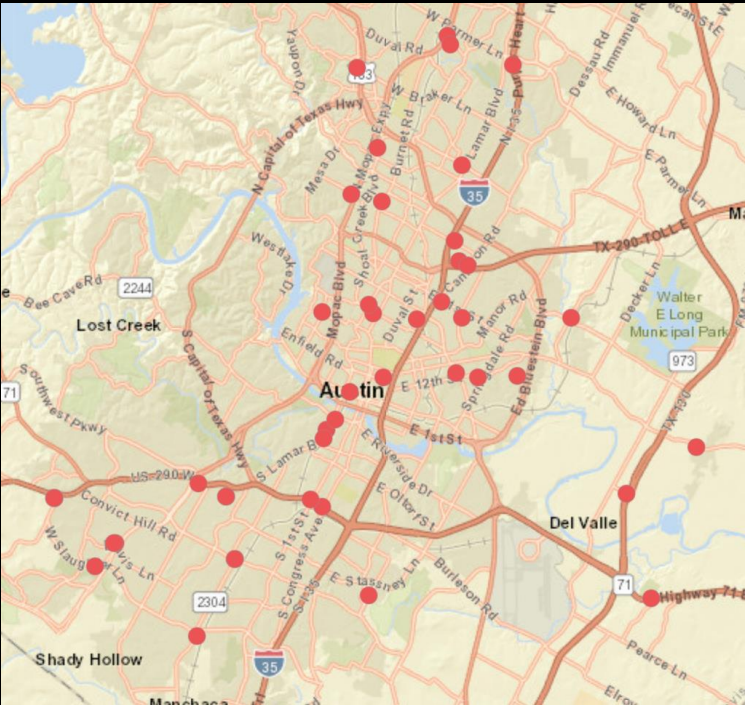


Monitoring interactions between people reveals multiscale temporal nuances

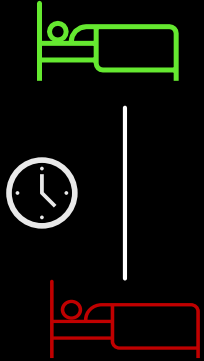
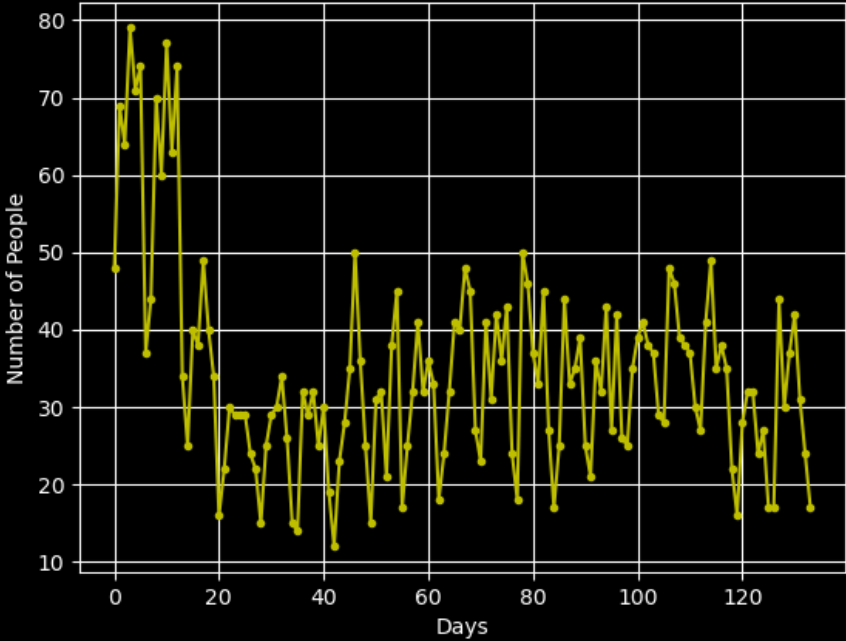


Remote health sensing through mobility

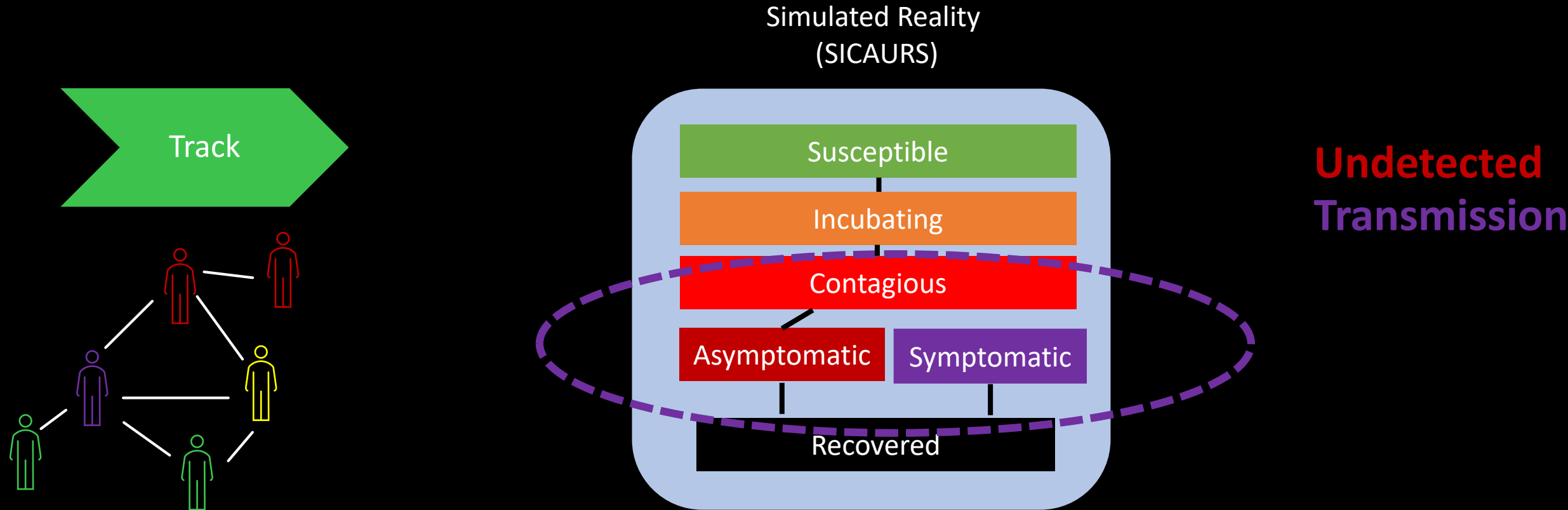
COVID-19 Testing Locations and Hospitals



Number of People at a Covid19 Testing/ Hospital vs Day

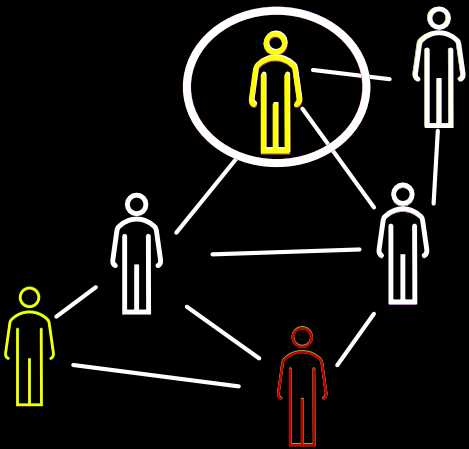


COVID-19 transmission outruns human contact tracers due to the scope of the undetected transmission



How can we predict when secondary transmission occurs before primary contact is confirmed to be sick?

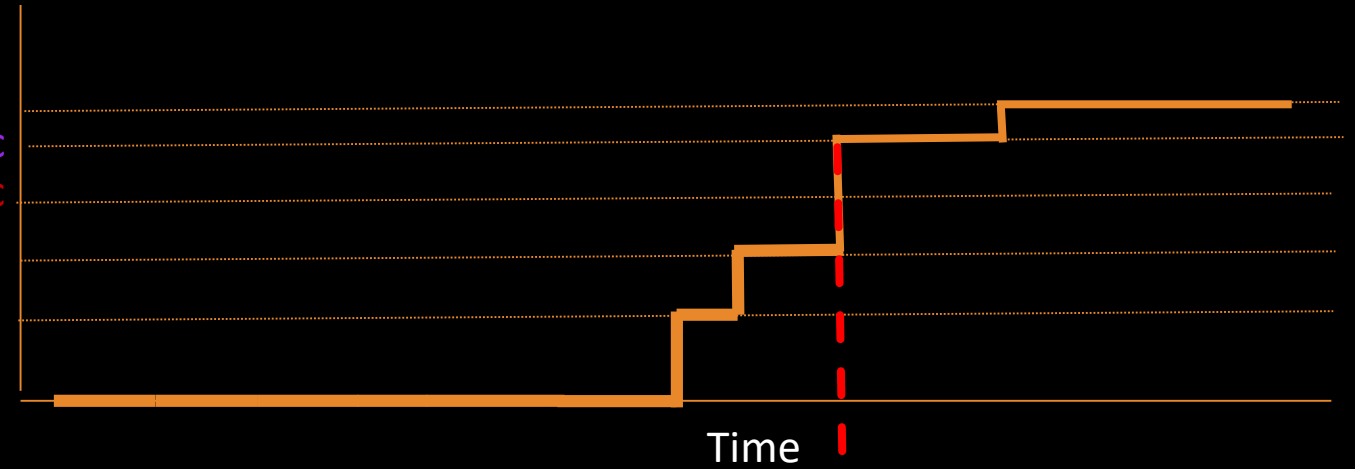
Building a risk model that upgrades aggressively and downgrades when safe



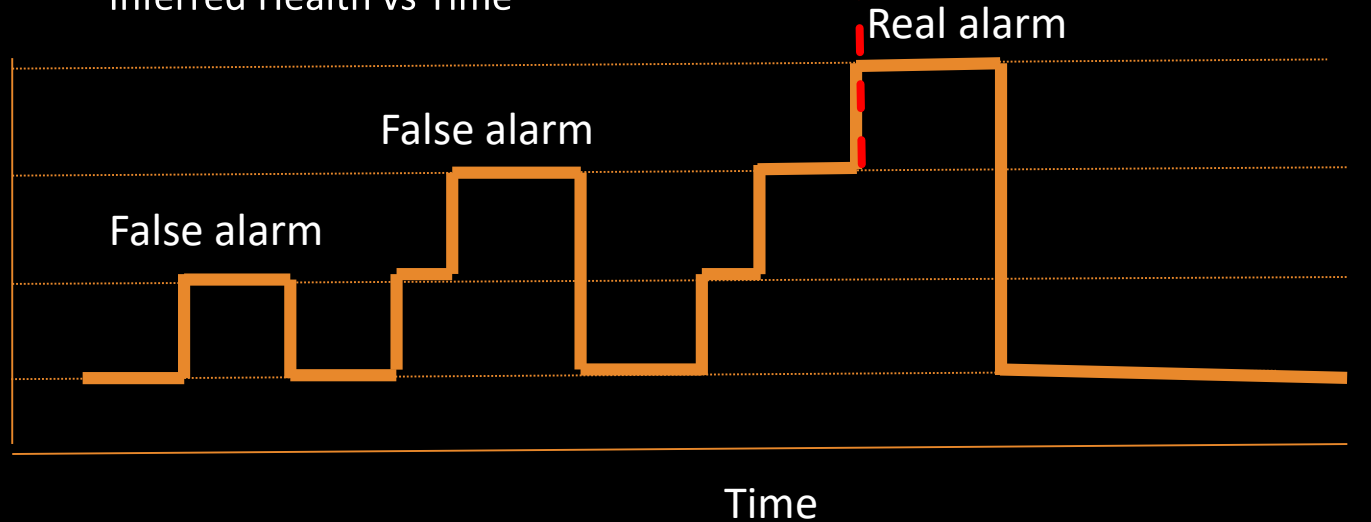
Removed
Symptomatic
Asymptomatic
Contagious
Incubating
Susceptible

Confirmed infected
Likely contagious
Likely exposed
No Risk

State of Health vs Time

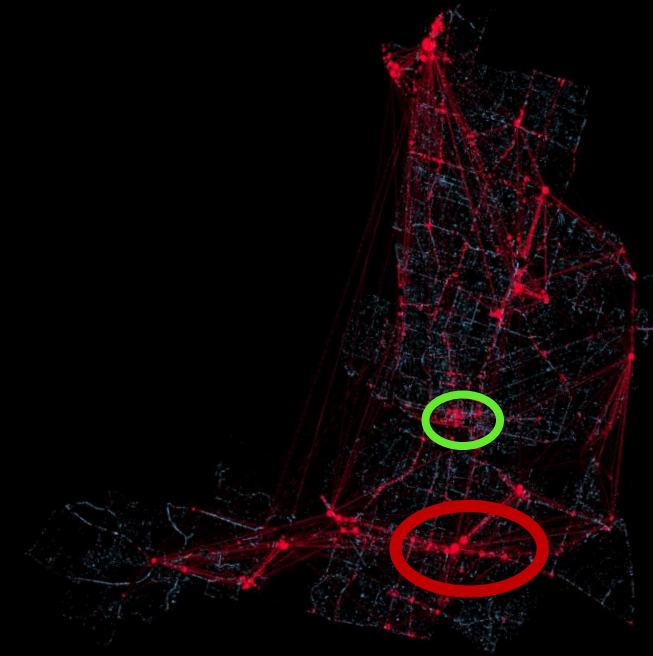
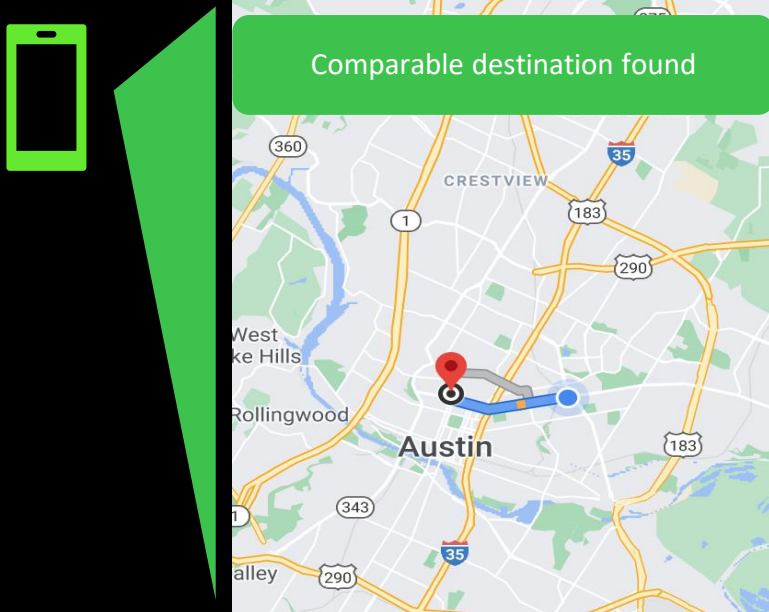


Inferred Health vs Time



Quarantine in Motion: A new paradigm for the 21st century

- GPS data allow us to investigate large-scale human mobility
- SLD@UT Austin aims to discover how modern mobility can grow resilient to infectious disease





Ongoing research at UT Austin by Sofia Hurtado in the Systems Level Design Group (SLD) in collaboration with Drs. Ravi Srinivasan (Dept. of Statistics) and Justin Drake (Texas Advanced Computing Center)

Thank you!