

2023 Micro-Grant Symposium

Estimating Best Locations for Piezoelectric Panels

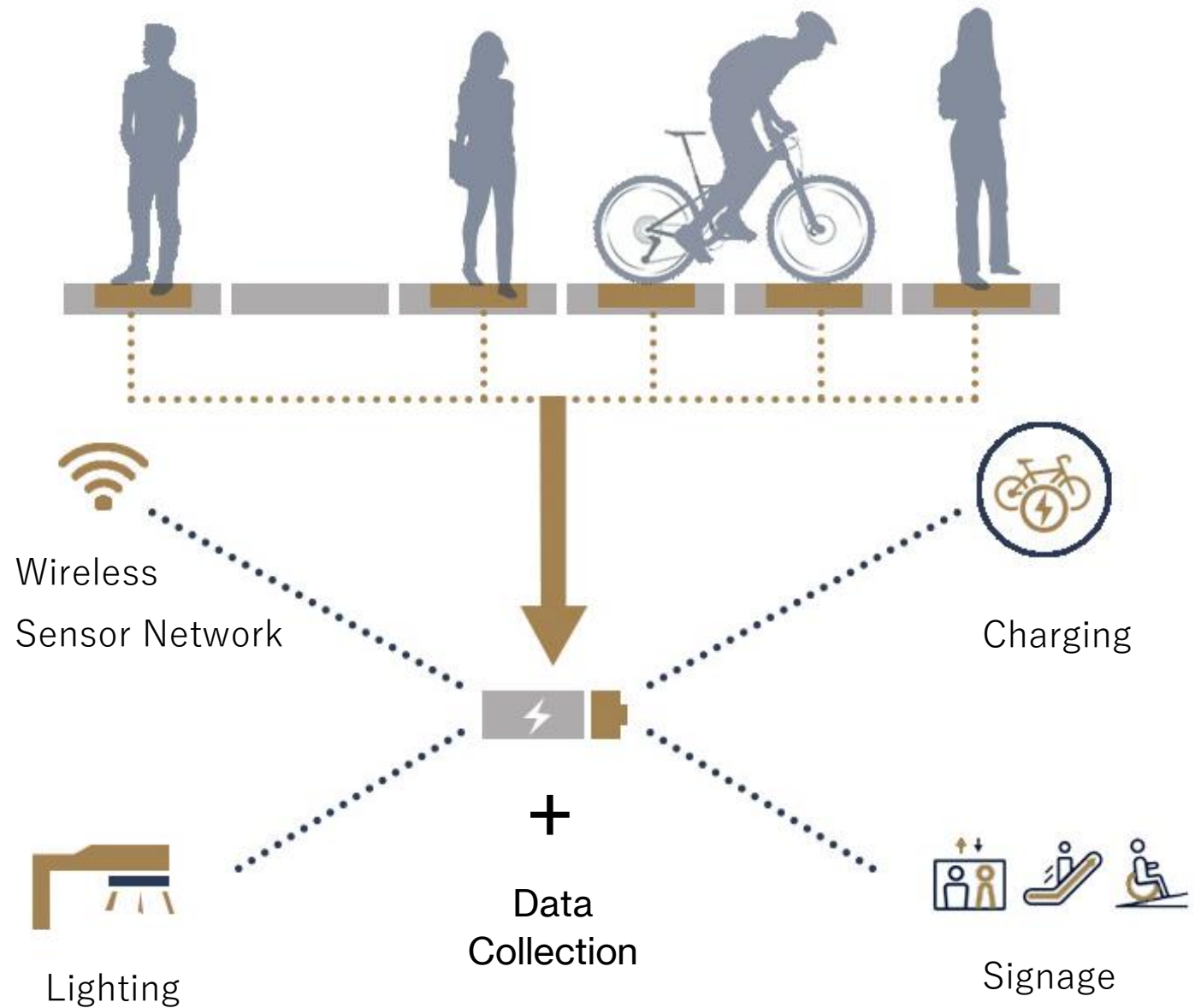
Using campus footsteps to generate electricity

What are Piezoelectric Panels?

Piezoelectric power generation refers to the technology of converting kinetic energy to electricity.

Regenerative Thrust for a Living Campus:

Movement → Electricity



Examples



Japan Railway Company Ticket Turnstiles

135 lbs./ step → 0.1 Watts

Station lighting and Ticketing Machines



Pavegen – London & Hong Kong Quayside

Per Step → 5 Watts

Real-time occupancy and Community lighting



**Kennedy Space Center
Interactive Installation**

**In development under
Library Media Bridge**

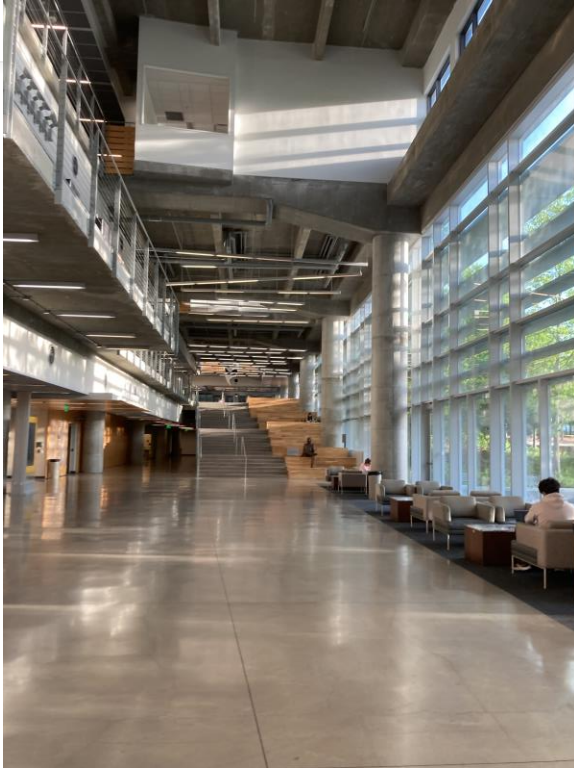


How do we Identify the Best Locations?



The Nodes

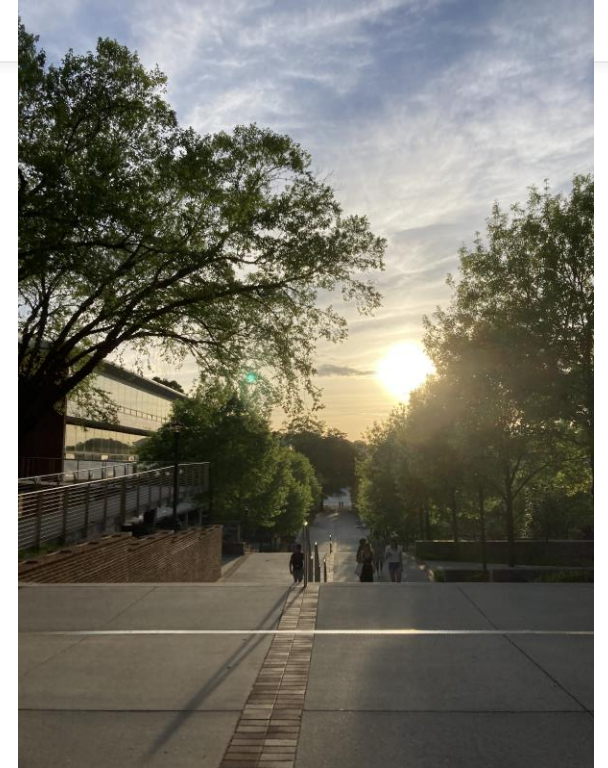
Visual Assays.



Clough Commons Commons



Tech Green Perimeter



Student Center Walkway

Comparison of Methods

Entrance Sensor Estimation



- Privacy
- Accuracy
- Indoor / Outdoor

GPS Individual Tracking



- Privacy
- Accuracy - Outdoors
- Indoor / Outdoor

Building / Route Density Estimation



- Privacy
- Accuracy
- Indoor / Outdoor

Building Density Estimation

Kendeda Spring 23

Class Time & Volume Data



Segregate by Start & End Time



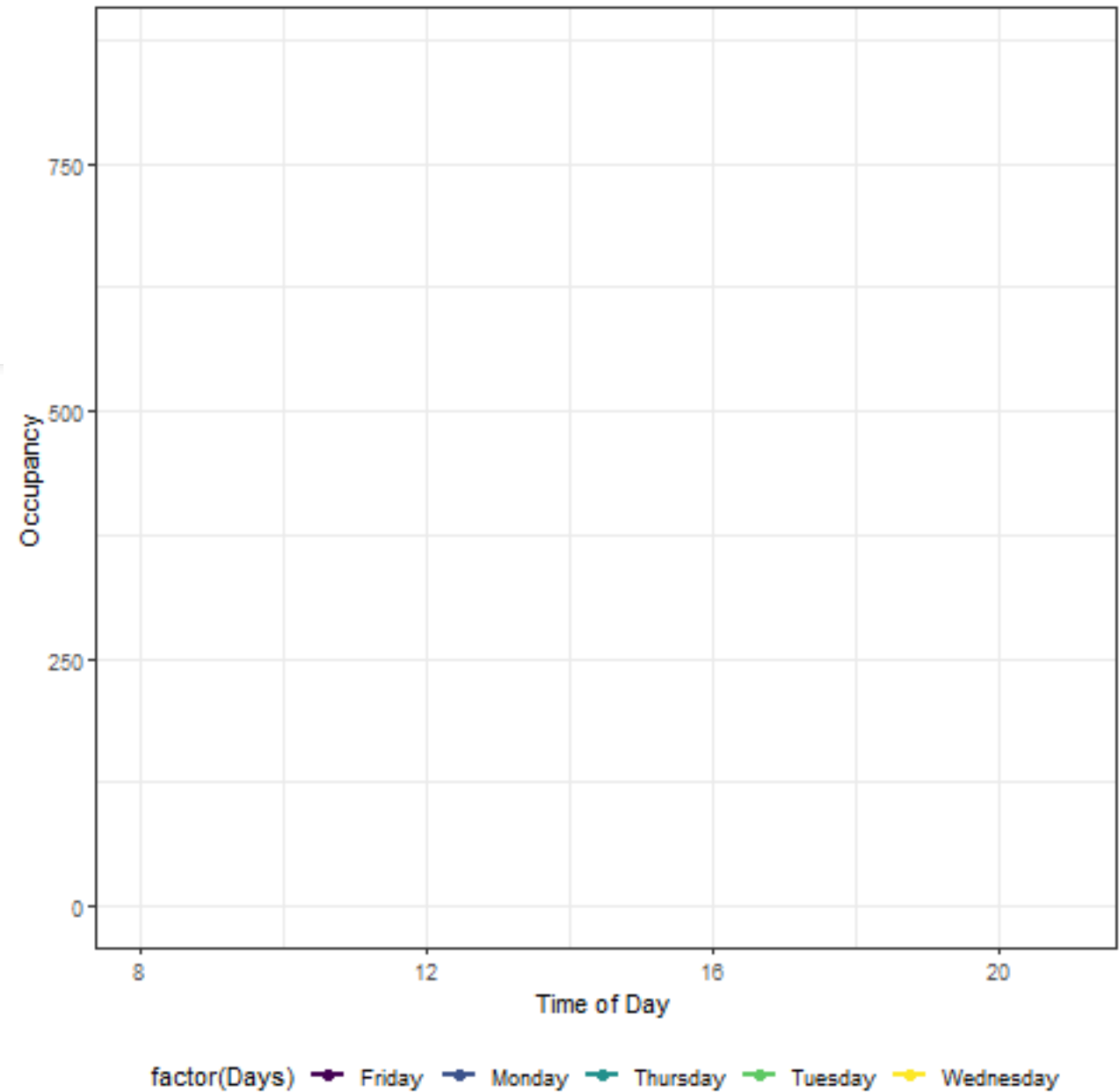
Collate by Hour



Ingress & Egress Volume in Steps **X**
Generation Capacity of one Panel

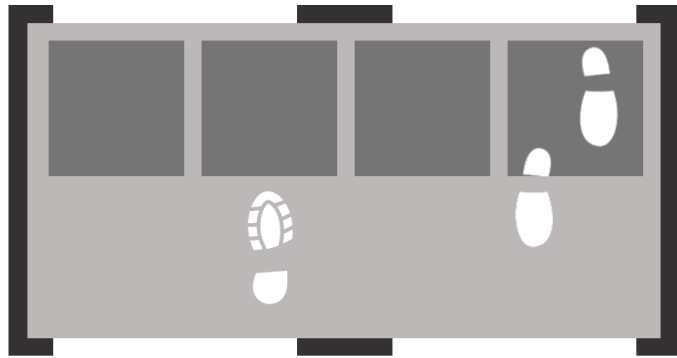


Hourly Generation Capacity



Building Density Estimation

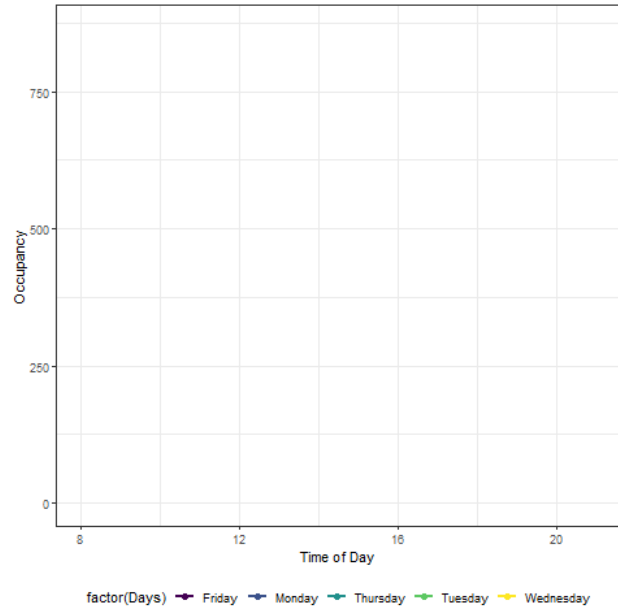
Kendeda Spring 23



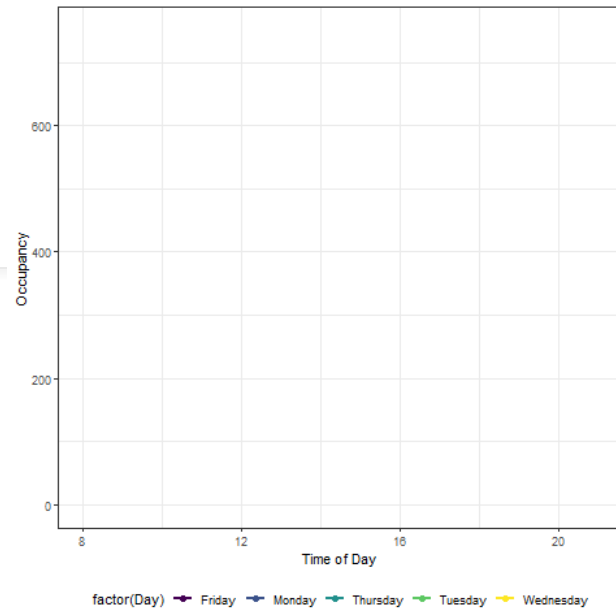
Maximum force on Piezo-panels in a foyer can be estimated with certainty to be highest at times of egress and ingress



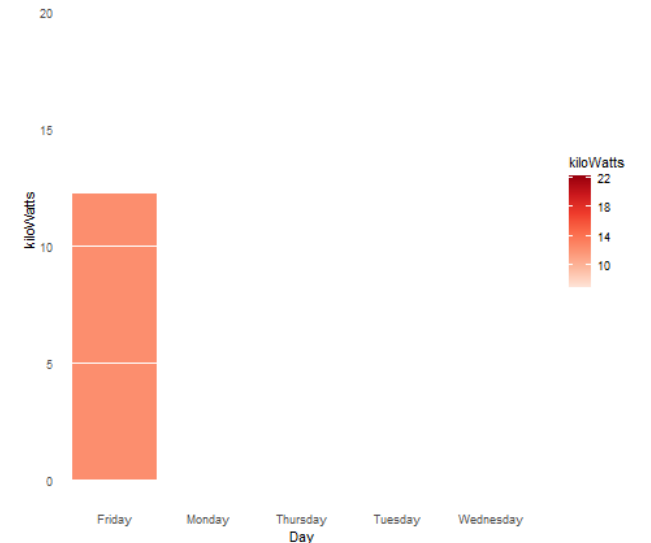
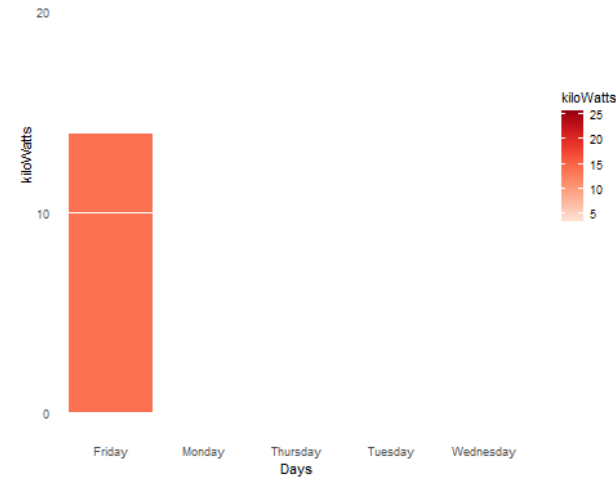
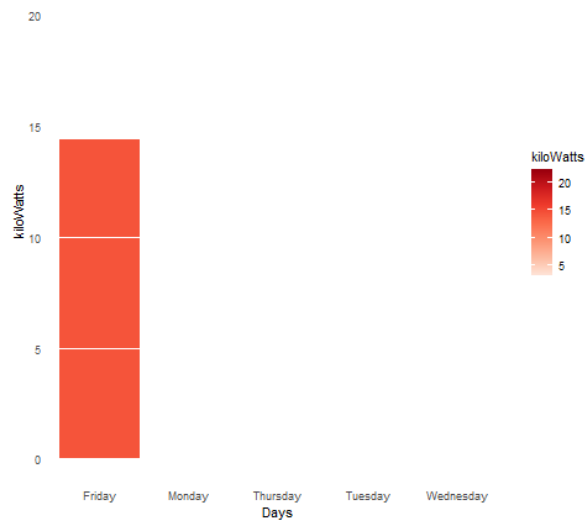
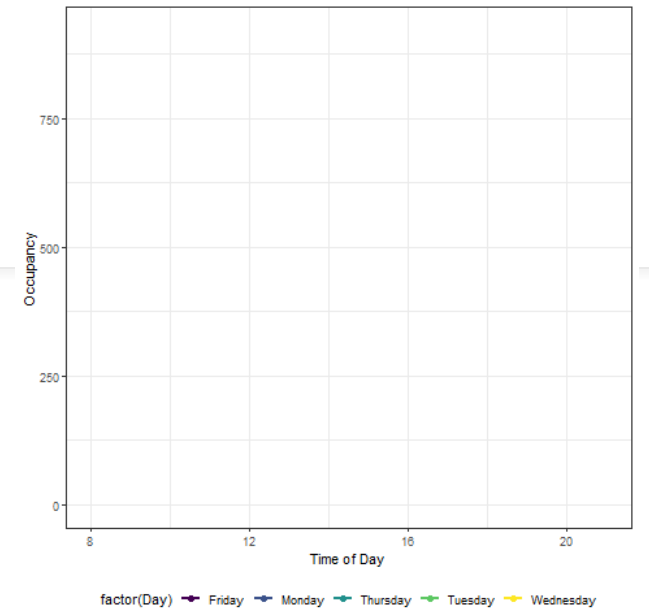
Spring 22



Fall 22



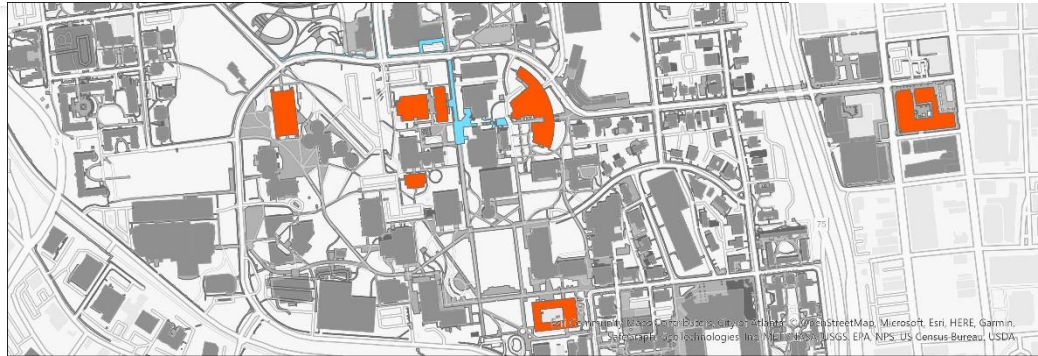
Spring 23



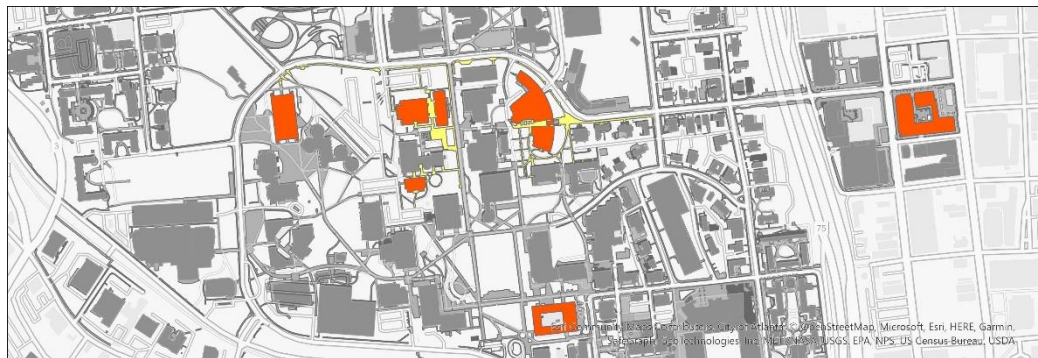


The Edges

Shortest Routes



Friday



Mon / Wed

Individual Student Schedule



Extract Time & Location Data



Create Shortest Paths



Stineman Interpolation of Intermediate Locations

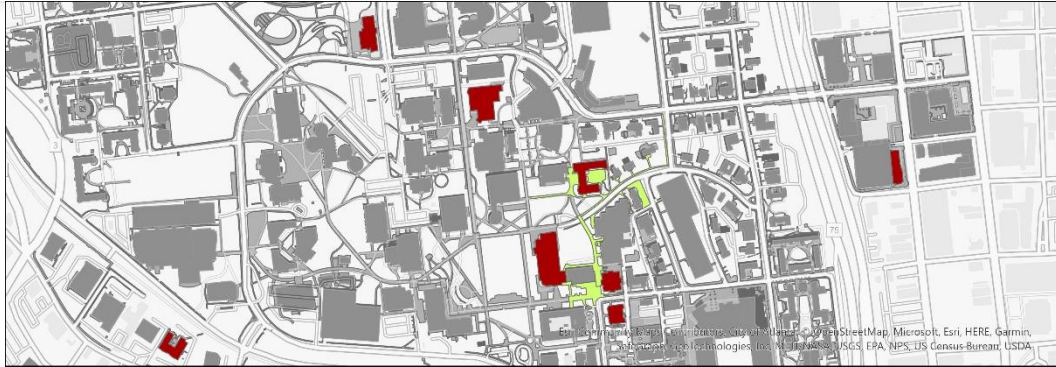


Overlay Paths by Time

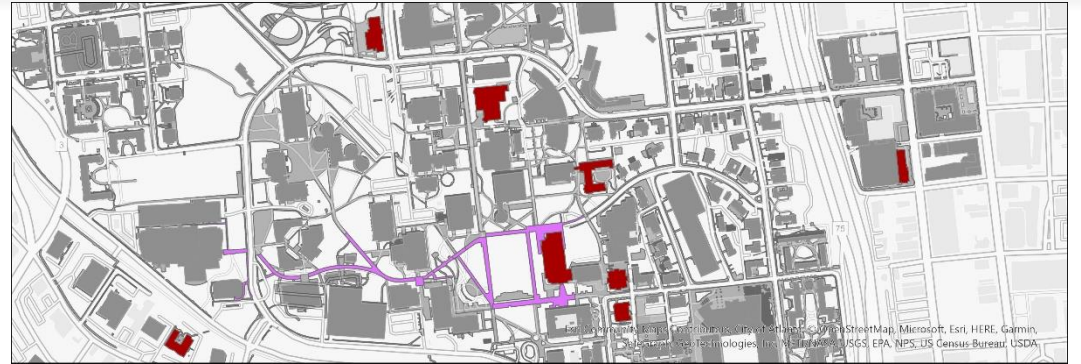


Identify Dense Intersections

Shortest Routes



Tue / Thurs



Monday

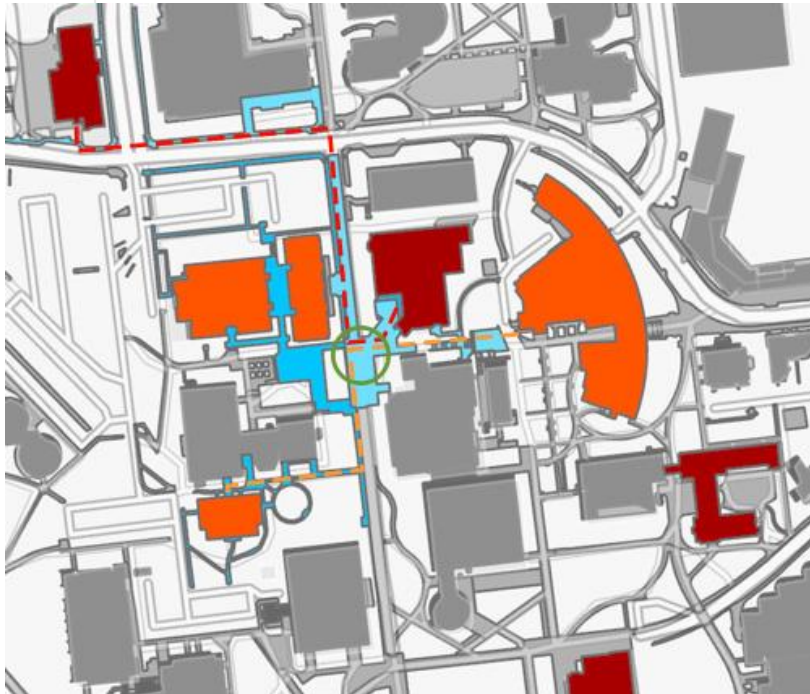


Friday

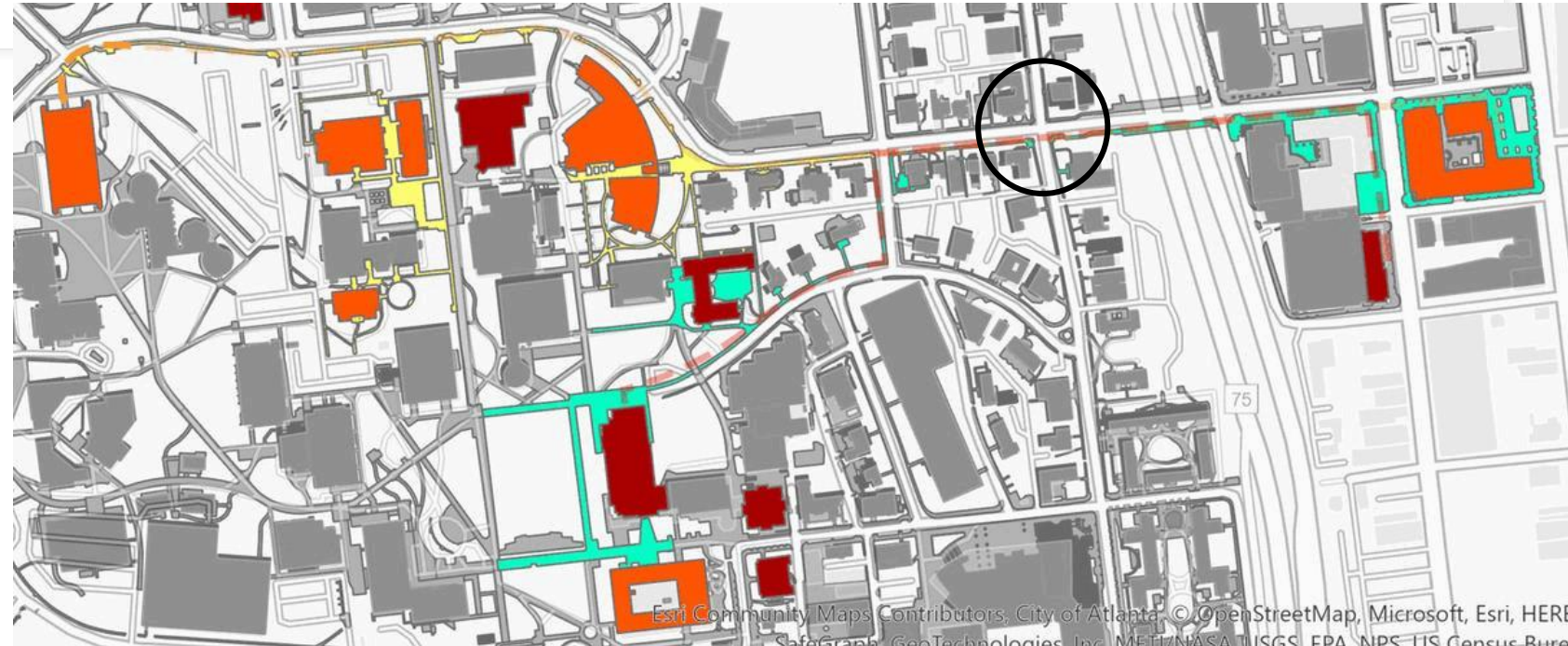


Mon / Wed

Route Density Estimation



Spatial (Friday 1 – 2 PM)



Spatio – Temporal (Mon / Wed 12 – 1 PM)



= Density Map for Sidewalks

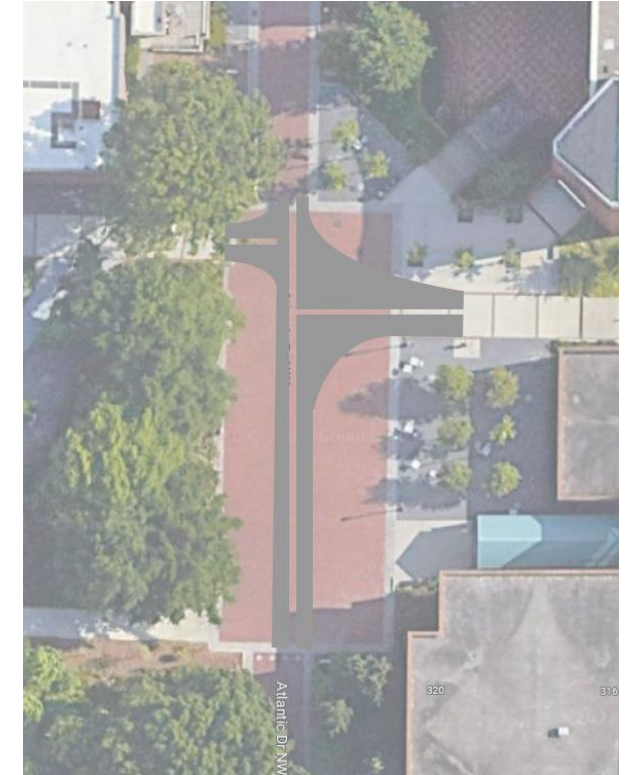
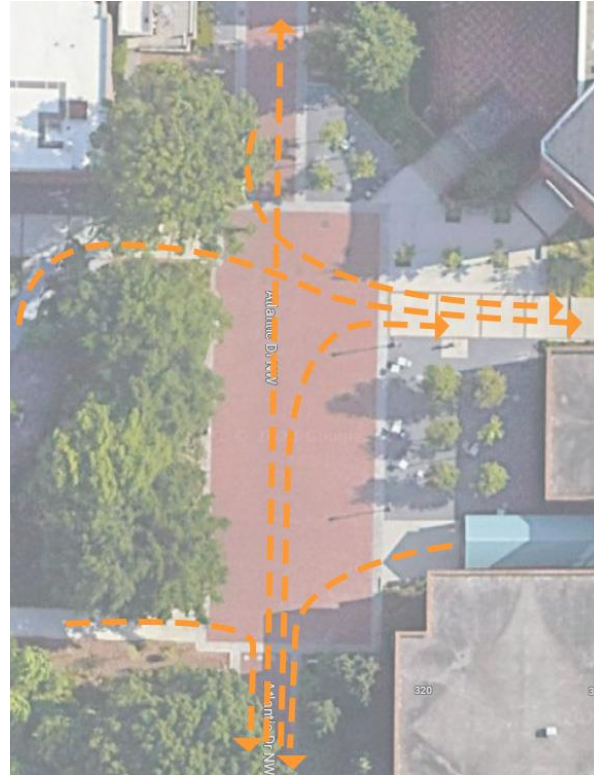
Macro-Scale



Meso-Scale



Micro-Scale



Piezo-Electric Panel Layout as Desire Paths



Georgia Tech: What else can we do with it?

Event Planning / Outreach Programs

Safety Planning

Shading & Public Seating -
Micro Scale Factors

Create a Sensor Feedback Loop



Acknowledgements

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