



Carnegie Mellon University

Transportation Decarbonation

Mar 15, 2024

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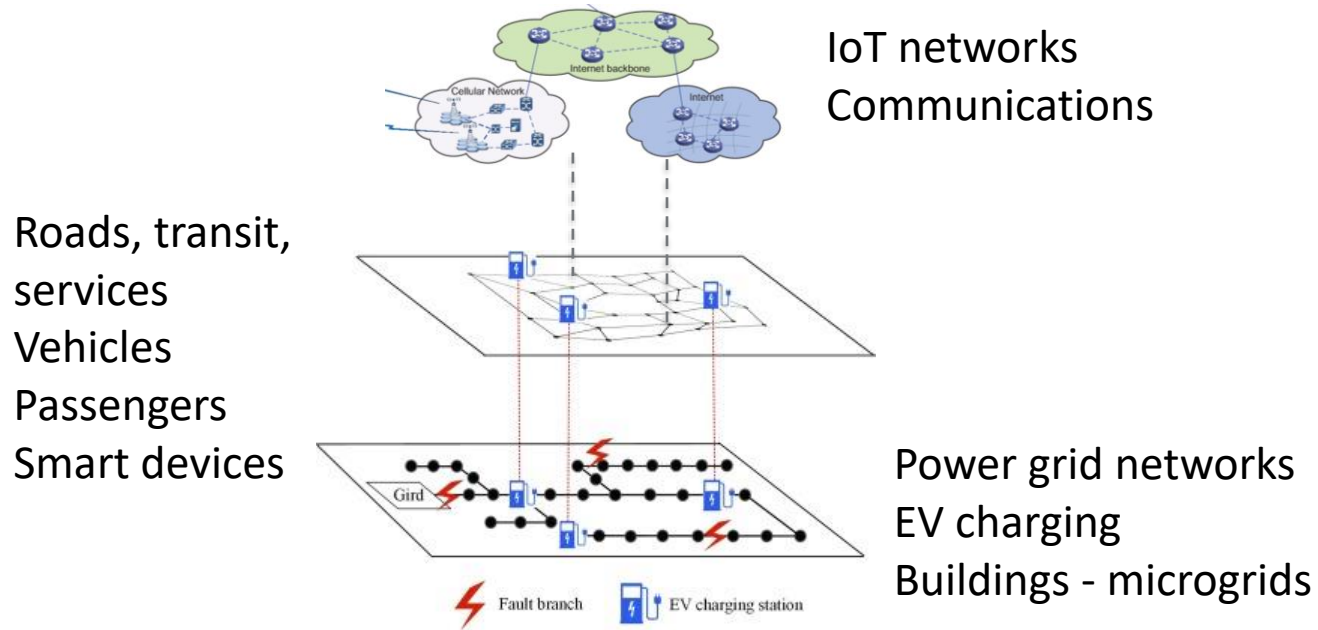
U.S. National Blueprint by U.S. DOT, 2023

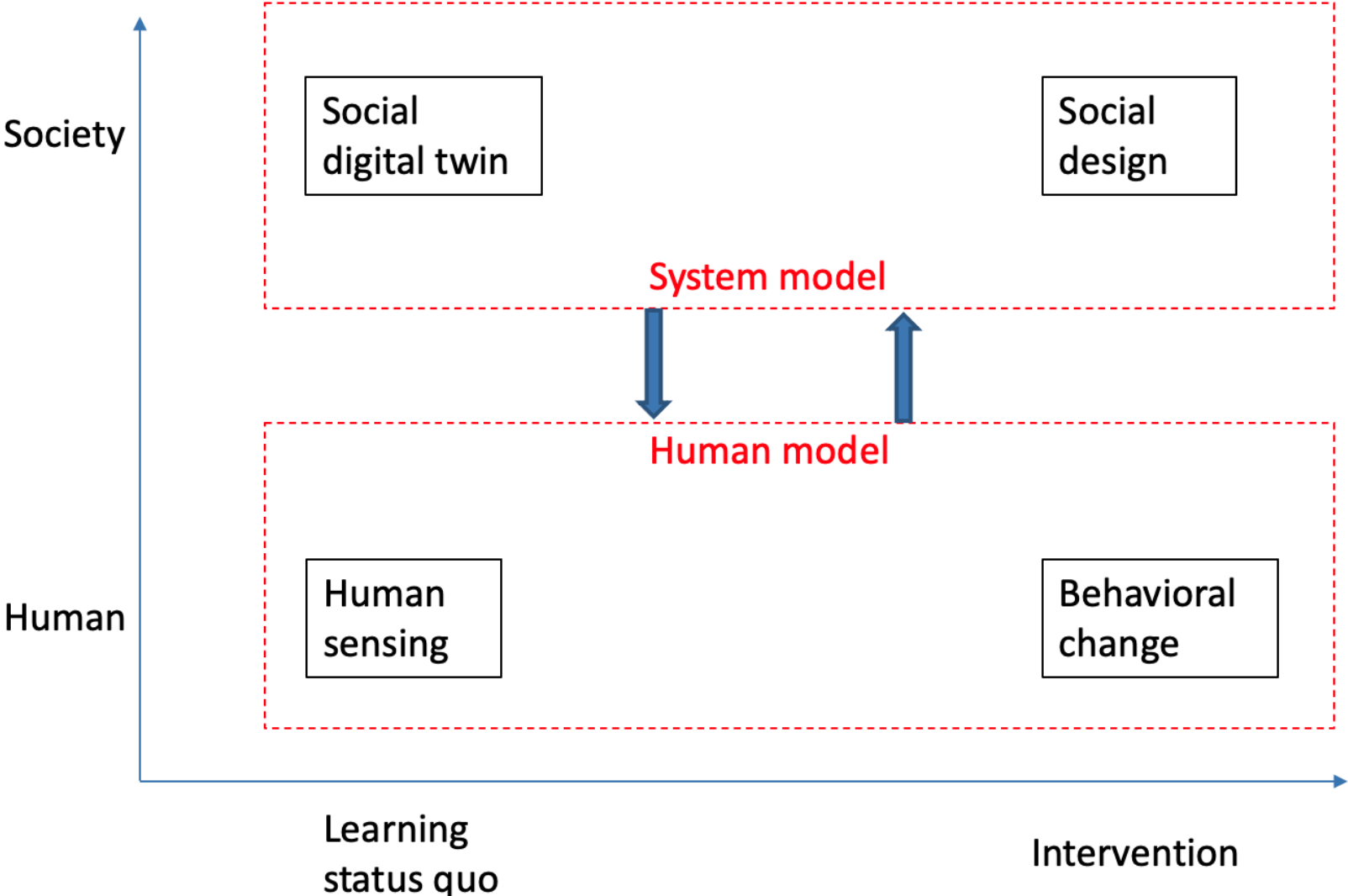
- Implementing **System-Level** and Design Solutions
- Improving Efficiency through **Mode Shift** and More Efficient Vehicles
- Deploying **Zero-Emission** Vehicles and Fuels



Inter-connected networks/systems

Mobility, Power Grid, IoTs, Water.. – super networks



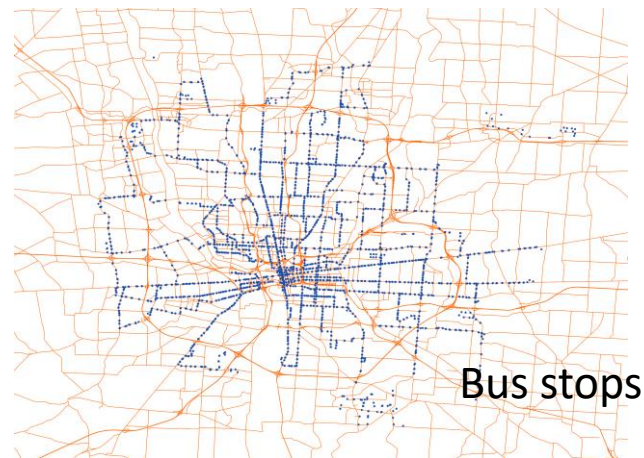
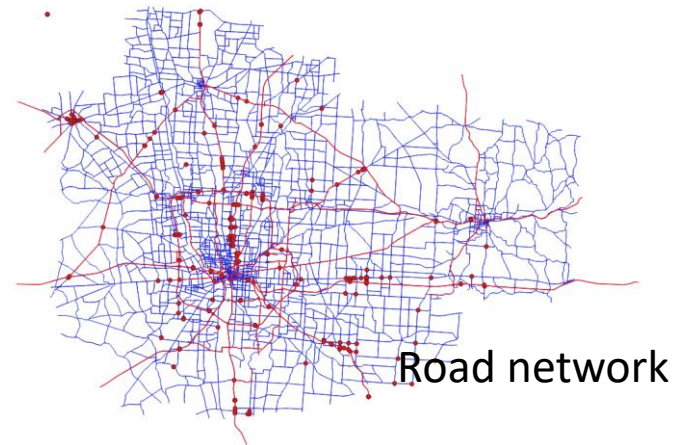


Shift to climate-friendly modes

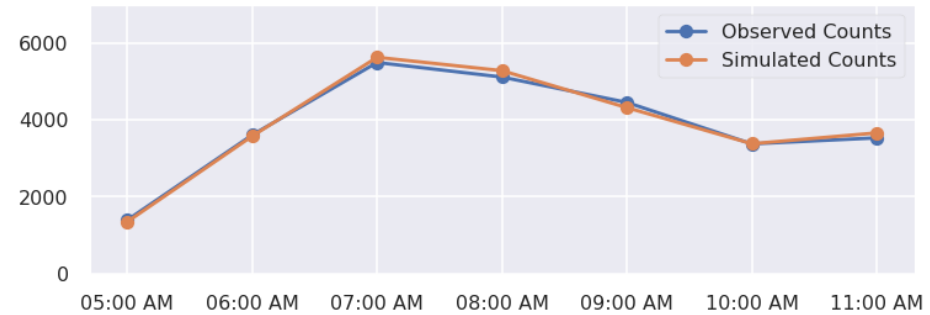
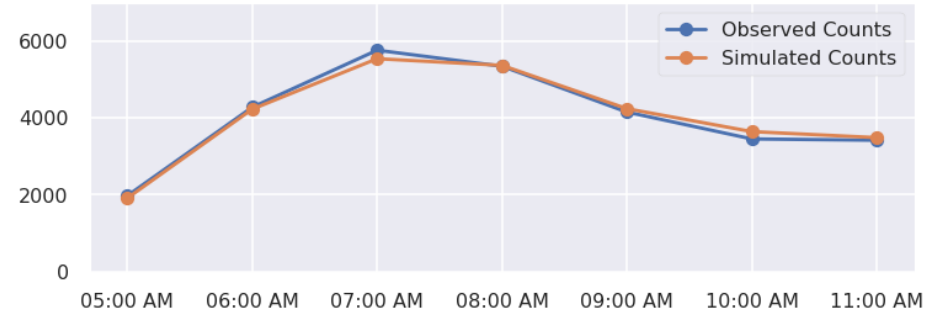
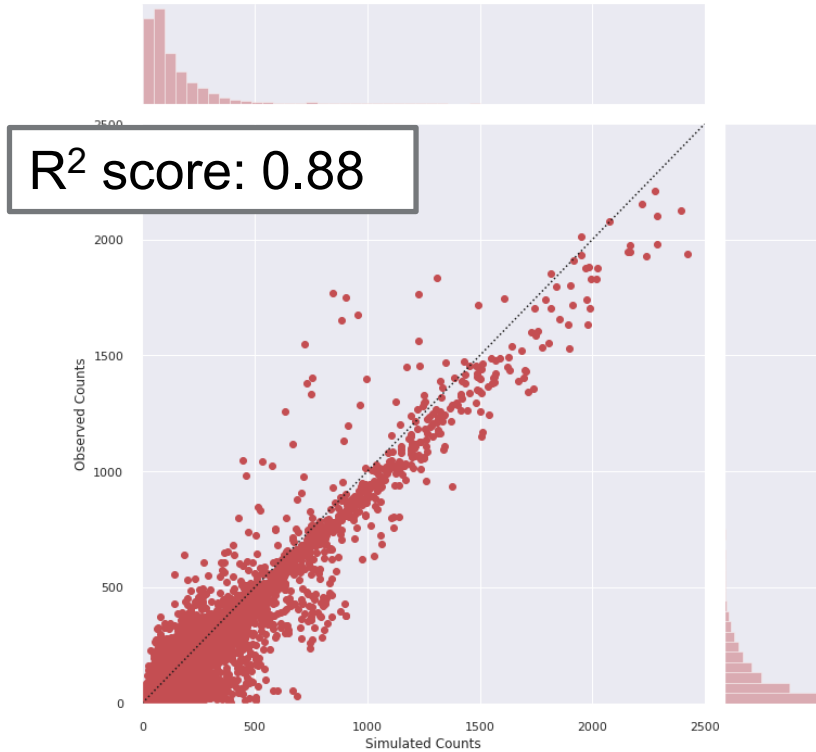
Table 1: Network parameters

Name	Value
Studying period	5:00 AM - 12:00 PM 1:00 PM - 8:00 PM
Simulation unit interval	5 s
Length of assignment interval	15 min
Number of intervals	28
Number of links	26,357
Number of nodes	8,706
Number of origins (destinations)	543
Number of O-D pairs	138,560
Number of bus routes	60
Number of bus stops	2,504

Multi-source data



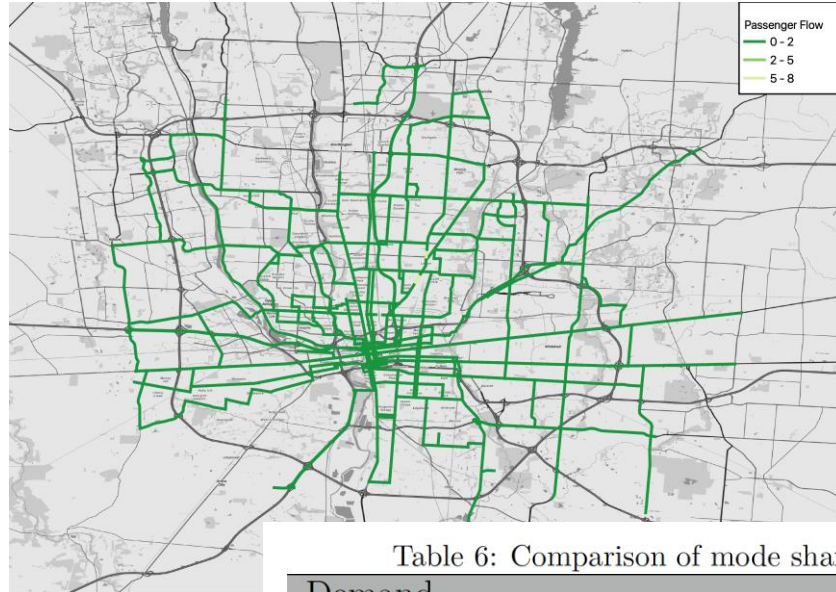
AM Hours (5AM – Noon) – Network simulations



Traffic Count Calibration on I-270 in AM Peak

System-level GHG emissions; granular metrics

w/o mobility service



w/ mobility service

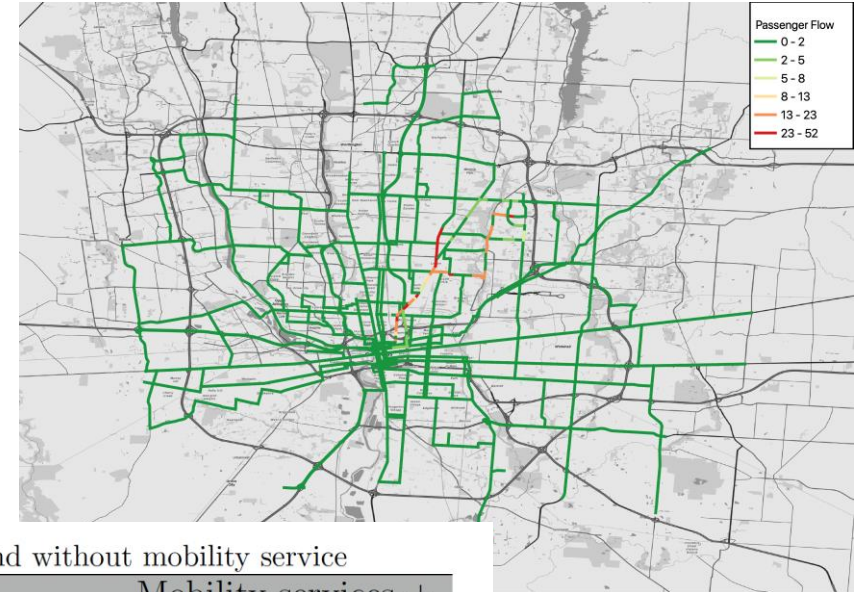


Table 6: Comparison of mode shares with and without mobility service

Demand multiplier		Driving	Bus transit	Mobility services + Bus transit
1	w/o mobility services	99.67%	0.33%	-
	w/ mobility services	86.84%	0.29%	12.87%
1.2	w/o mobility services	99.66%	0.34%	-
	w/ mobility services	86.93%	0.29%	12.78%

GHG down 4%



Other strategies

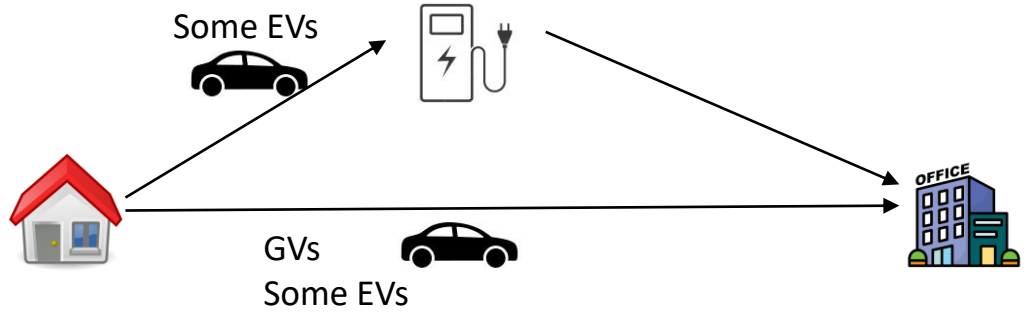
- Urban and rural: emerging mobility options
- Carrot or stick?



Charging behavior of EVs

Estimate EV charging behavior to support infrastructure decisions
Public? Private?

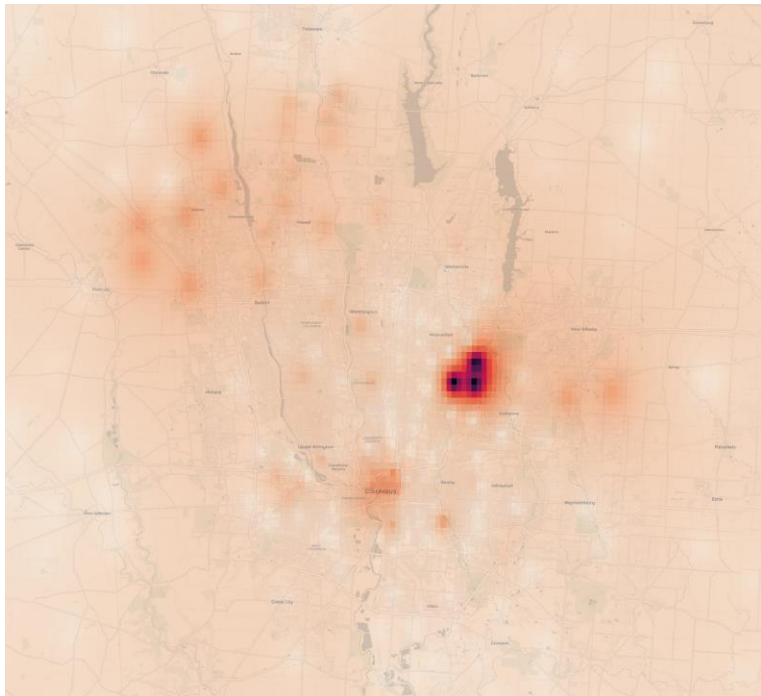
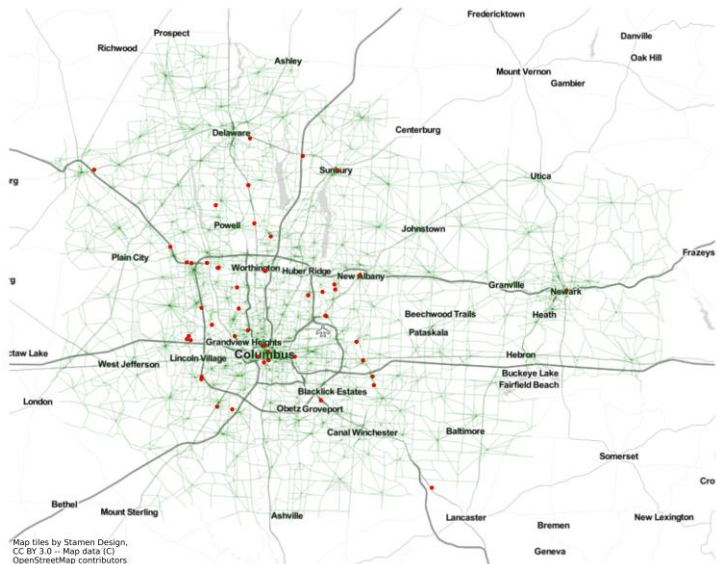
Commuter traffic



Commercial/delivery traffic



Network representation



61 DC fast charging stations

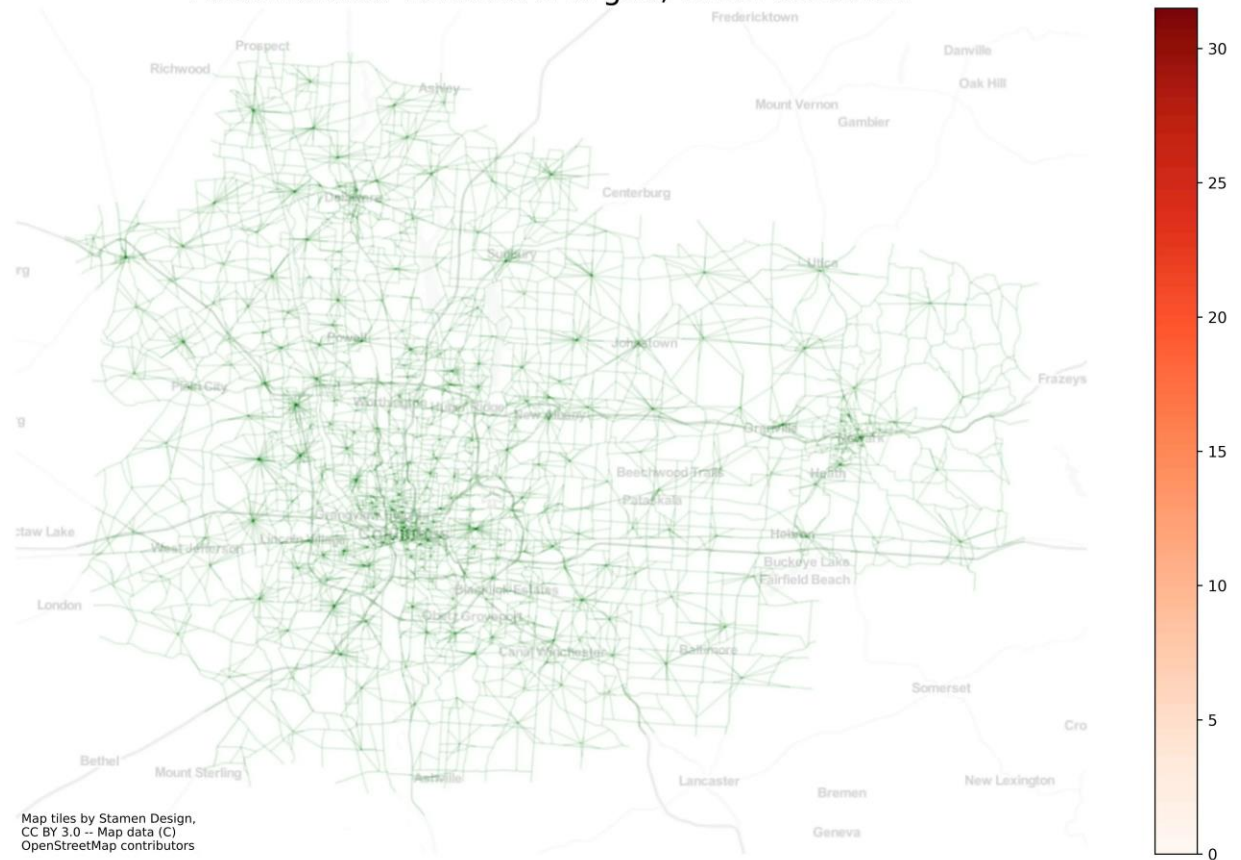
Statewide VINs

10 – 15 min per session: \$20-25, 200 miles



EV Charging

Accumulated vehicles charged, Time: 05:00:00



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OpenStreetMap contributors



Pricing grid to influence traffic

Morning peak arrivals

- Solar panels
- Ramping up/down cost

Grid pricing + EV

- Optimizing grid operation AND traffic patterns

