



# ECET: Empowering Community-centric Electrified Transportation

1952193

Hao Zhu, UT-Austin

PG, FY2020

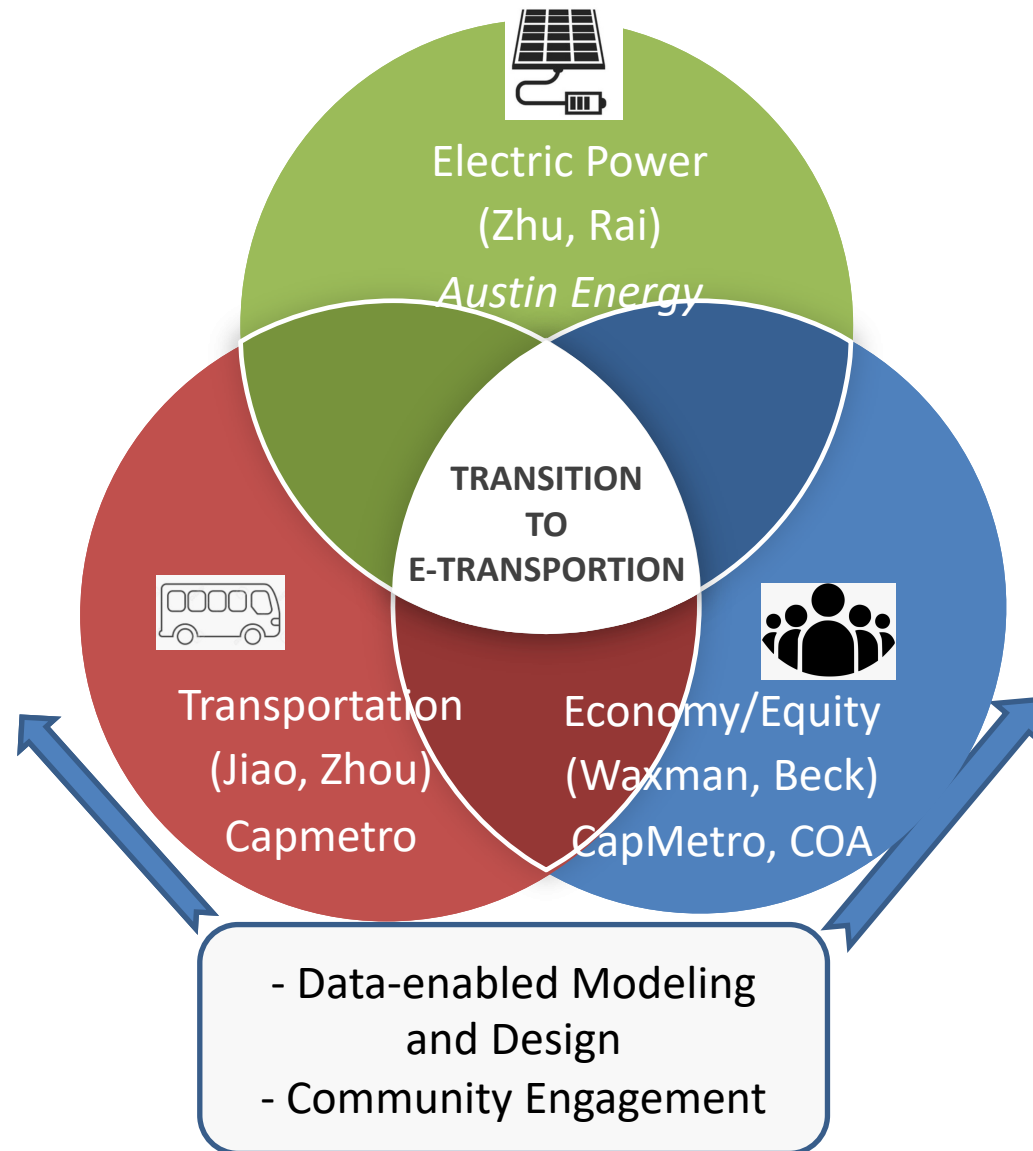
## Principal Research Investigators

- Hao Zhu, ECE, UT-Austin
- Junfeng Jiao, SOA, UT-Austin
- Andrew Waxman, LBJ, UT-Austin
- Ariane Beck, LBJ, UT-Austin
- Varun Rai, LBJ, UT-Austin
- Mingyuan Zhou, IROM, UT-Austin

## Community Partners

- Rob Borowski, CapMetro
- Karl Popham, Austin Energy
- Cameron, Freberg, Austin Energy
- Zach Baumer, City of Austin

# Project Overview



## Project Vision

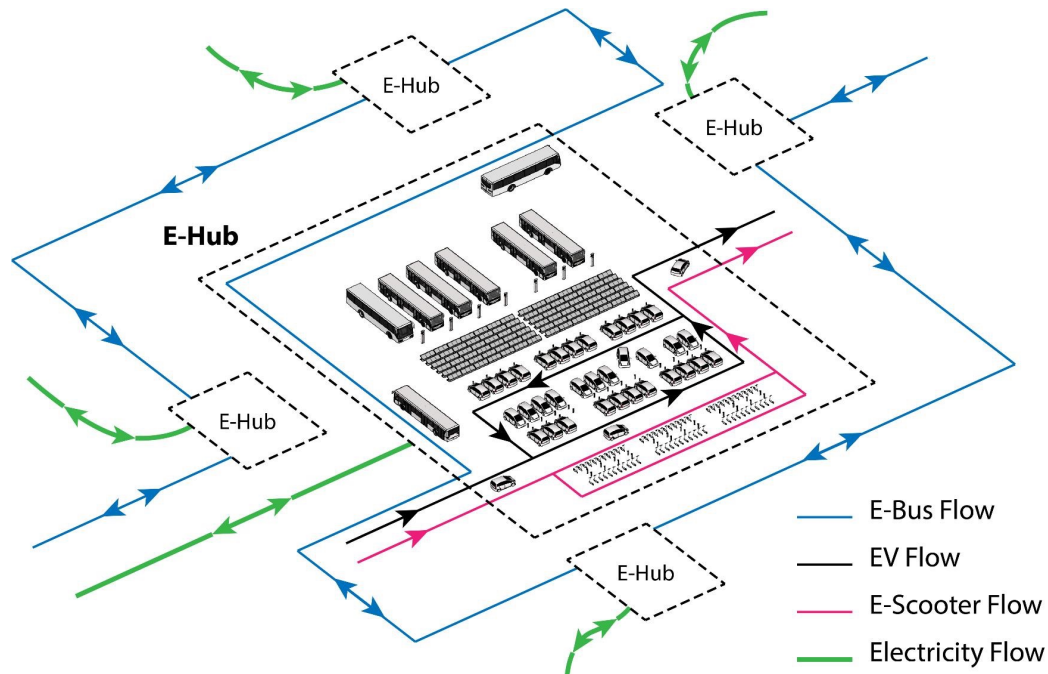
- (i) Telework transition: investigating the impact of future working modes in the wake of pandemic;
- (ii) Ubiquitous connectivity: integrating emerging sensors and connectivity for human-in-the-loop;
- (iii) Real-time learning: enabling scalable decision making using online learning from streaming data.

# Project Overview

- As a fast-growing metro, Austin is witnessing continued investment into electrified (E-) transportation from public transit agency (CapMetro, City of Austin), individuals, and e-mobility companies.
- This project aims to build a multi-disciplinary team to study a new E-hub concept to support urban transit and electricity infrastructure (AustinEnergy), as well as investigate its socio-economic impact.

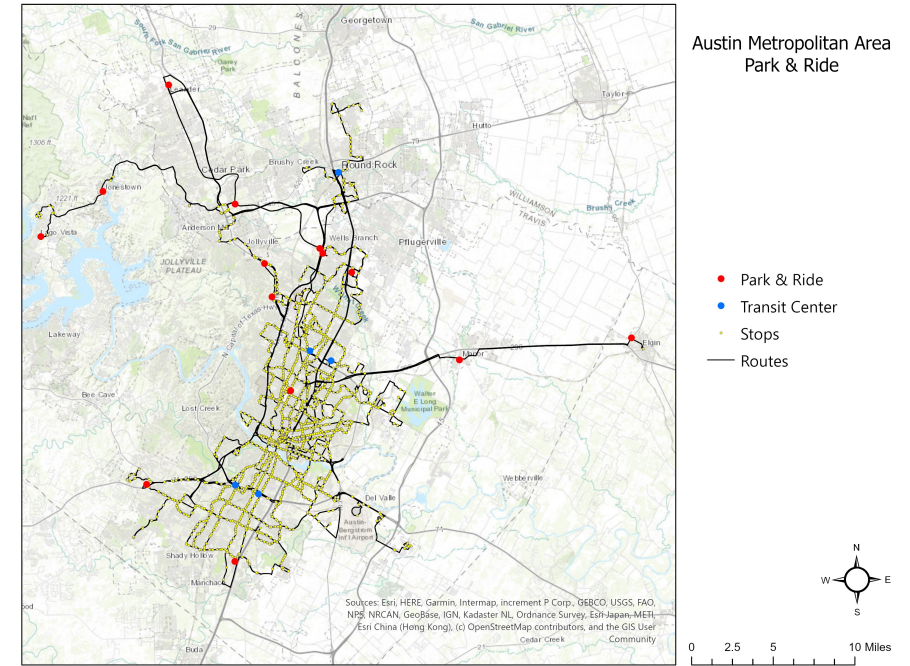
## PG Activities

- Collected and organized public transit data
- Developed solar + storage financial modeling tools
- Designed learning-based E-hub operation algorithm
- Examined the trade-offs in transit investment plan
- Discussed with AustinEnergy on public EV planning
- Regular team meetings
- Analyzing metro travel patterns for placing E-hubs
- Analyzing key factors for energy resource valuations
- Improving the efficiency of learning algorithm
- Examining transit accessibility by income, race, ethnicity
- Updating results to CapMetro, AE, and City

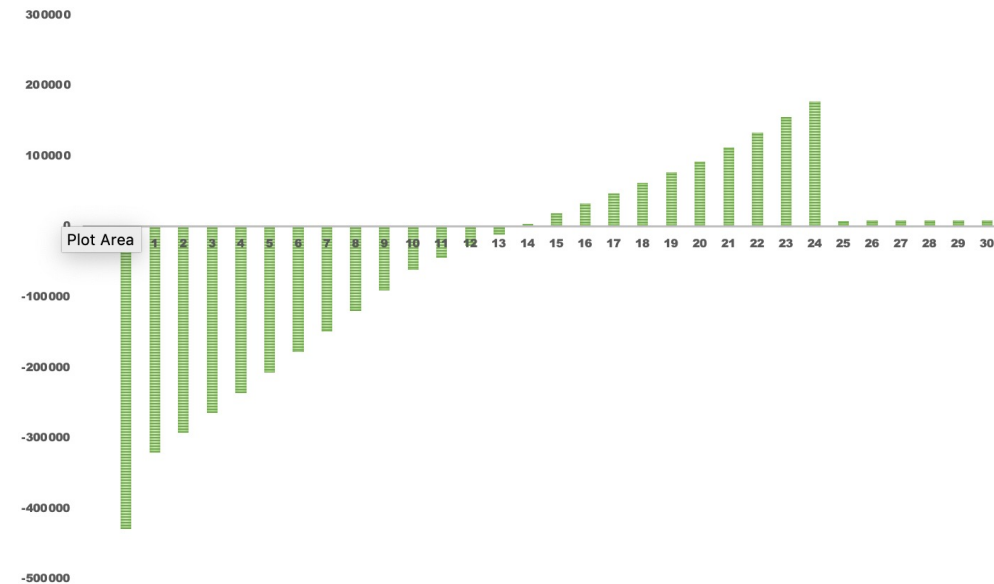


# Project Update

- T1: Locating the E-hubs to Promote Alternative Transportation
  - Based on joint analysis of public transit, E-bike, E-scooter data, we intend to investigate if strategic E-hub locations can potentially increase mobility
- T2: Powering the E-hubs to Support Electricity Infrastructure
  - By analyzing the economic returns and operations at E-hub locations, we want to understand the impact of E-hubs in supporting electricity infrastructure
- T3: Community-level Effects of E-hubs
  - By examining transit accessibility by income, race, ethnicity, we aim to understand the E-hubs' impact on existing issues of transportation inequality and economic growth



PROJECT CUMULATIVE CASHFLOW TO EQUITY



# Project Evolution

- **We learned that several locations of the current CapMetro transit centers have good solar potentials, which make them ideal for E-transportation development sites.** Specifically, projects sized between 500 kW and 1MW are ideal to take advantage of economics of scale while still qualifying for incentives from AustinEnergy. The peak shaving and arbitrage potentials enabled by intelligent operations could further increase the economic advantages.
- **We learned that the coupling between electrification and transit equity is still unclear, as the two objectives could be separately pursued.** Meeting mobility needs with electrified transit in urban area under very limited electricity distribution capacity can be challenging, while the City has started a full light-rail and bus rapid transit expansion plan (ProjectConnect).
- The COVID-19 pandemic has visibly changed the transit/traffic patterns in Austin. This opens up some potential for the team to explore the impact of telework transition on urban transportation needs.