**Identified Problem**

- A range of disruptive technologies and new travel business models are emerging:
  - Private ICE
  - Private EV
  - Public transport ICE, EV
  - On-demand semi - “Mobility as a Service” (MaaS)
  - Private driverless electric vehicles (AEV)
  - Other driverless AEV transports (buses, microbuses)
  - On-demand AEV MaaS business models

- This will bring changes in mobility supply and demand
- We need to update modeling to capture the effects of these new trends

**Research questions**

- What are the factors that will determine people’s travel mode choice?
  - (e.g. buy private cars, opt for individual/pooled ride hailing, public transports)
- How will they influence the future of travel demand?

**Intuition, “hedonics”**

Travel choice is largely governed by $$$ cost and time value preferences ... but not only! This project consists of a model to predict the costs of shared mobility, EV and AV integration based on these two parameters and on a more behavior-based factors namely hedonic costs to project the potential market shares and transitions in question up to 2030 and at a urban level in the US. Among them:

- Disutility from stress caused by driving (e.g. arguments with other drivers, getting pulled over, get ticket for travel speed, weight increase)
- Disutility for privacy (sharing a pool on-demand car with strangers)
- Range anxiety (time and proximity to the charger)
- Charger anxiety (time and availability to charge)
- Disutility from segmented trip
- Disutility of not having a car (can’t leave personal belongings in the car)
- Searching for parking
- Disutility from cyber attacks
- Limitations due to customers age (e.g. Generation X vs. Millennials)

**Methods and Data**

1. Create a cost database that includes ownership and operational costs of vehicle technologies (ICE, EV, AV) and travel mode (private vs. MaaS), and hedonic costs
   
   - Ownership and operational cost assumptions gathered from existing sources
   - A new online tool that we will soon build to survey different types of groups (e.g. EV owners, by-age) who will input cost info about their vehicles, and driving habits (e.g. how they value their time, stress, privacy and other hedonic costs (stated preference)
   - “Revealed preference”: travel data such as Sidewalk Labs’ REPLICA synthetic data that describe travel made by individuals in automobiles, bike, transit, on foot …

2. Develop an economic travel mode choice models based on two main criteria (note: short and long term choices can be made either now in 2018 or in the future in 2030)
   - Short run choice: trip choice while owning a private car
   - Long Run choice: decision to buy another car in the future or forego in favor of MaaS

**Key Assumptions**

- EV battery prices assumed $250/kWh in 2018, $150 in 2025
- EV incentives now assumed $2500 for all EV types (no federal considered, though could add)
- Depreciation of EV vehicles is now assumed same as for ICE cars
- Depreciation of AEV/AV vehicles is now assumed same as for ICE cars (68% after 5 years)
- Depreciation of MaaS vehicles is now assumed 90% after 5 years
- AV insurance is now assumed to be the same as non-AV car
- EV components cost now assumed: + $30000 in 2018, +$10000 in 2025, +$5000 in 2030
- Depreciation of AV vehicles is now assumed same as for ICE cars (68% after 5 years)
- Depreciation of MaaS vehicles is now assumed 90% after 5 years
- Purchase price of a car owned by a TNC (fleet) is now assumed to be same of private purchase

**Next steps**

1. Build online survey tool to identify how users value the “hedonics” and Identify method to quantify $$$ “hedonics”
2. Combine the data from (1) with travel data (e.g. Sidewalk Labs’ REPLICA data)