Will Mobility as a Service (MaaS) offer the same freedom and flexibility as private cars to the point that people give up ownership?
Method to quantify the factors that will determine people travel mode choice

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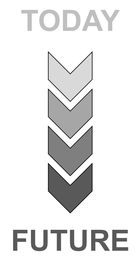
Identified Problem

- 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?

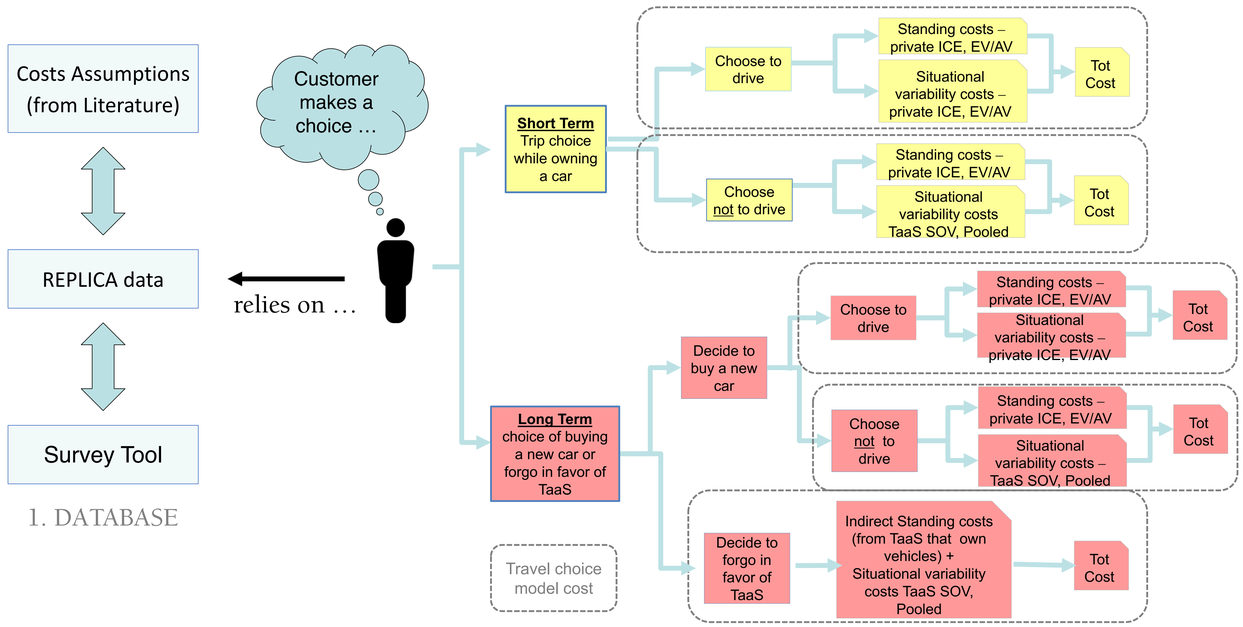
Intuition, "hedonics"

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 This will build on:
   - 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
- EV, AV/EV maintenance assumed 80% of ICE
- AV insurance is now assumed to be the same as non-AV car
- AV 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)

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