Discussion (Not included in the proposal just for internal idea brainstorming)

Modeling

* Vehicles
  + Vehicle energy dynamics: vehicle type (passenger car, truck), air resistance, weight, length, size, efficiency (among different powertrain models), (regenerative) braking, speed/acceleration
    - Powertrains: BEV, ICE (gasoline and diesel), (FCEV if time allows)
  + Platoon dynamics: headway/following distance, (lane switching?), number of vehicles, response/delay to change in speed and acceleration → communication/information
* Infrastructure/signals
  + Network properties: lanes, volume, existing traffic/congestion, intersections
  + Signals timing: settings, time of day
  + Route design (if used for simulation)

Optimization

* Objectives: minimizing **energy usage** and **travel time** for fixed powertrain in (urban, freeway) setting
* Variables: headway, vehicle dynamics parameters, signal control
* Constrains: following distance (no crashing), network properties (lane config?, capacity, speed limit), time (avoid trivial solution), and some others to reduce search space

Optimal Control

* Given fixed simulation scenario: platoon configuration and size, vehicle dynamics, route, congestion level, etc
* Control:
  + Speed → acceleration → following distance
  + Signal timing
  + …

Literature

* Energy related optimal control research:
  + 1. [A Review on Cooperative Adaptive Cruise Control (CACC) Systems: Architectures, Controls, and Applications](https://ieeexplore.ieee.org/document/8569947)
  + 2. [Predictive energy-saving optimization based on nonlinear model predictive control for cooperative connected vehicles platoon with V2V communication](https://www.sciencedirect.com/science/article/pii/S0360544219318158?casa_token=jTOVlkl7iFYAAAAA:r4cSqySvhINuldxajTIWkBs3EReL0kitnBDT03IYL7gdBndF5FaCHPx0SwNsOFDayI2Mcjxuw88)
  + 3. [Energy Benefits of Urban Platooning with Self-Driving Vehicles](http://energy-benefits-of-urban-platooning-with-vehicles-mello-bauer/0885e57cc670df377504a9edb8f20619fd2bd82a)
  + 4. [Fuel-Efficient En Route Formation of Truck Platoons](https://ieeexplore.ieee.org/document/7934030)
  + 5. [Energy-aware trajectory optimization of CAV platoons through a signalized intersection](https://www.researchgate.net/publication/343439823_Energy-aware_trajectory_optimization_of_CAV_platoons_through_a_signalized_intersection)
* Optimal Control
  + 1. [An Optimal Longitudinal Control Strategy of Platoons Using Improved Particle Swarm Optimization](https://downloads.hindawi.com/journals/jat/2020/8822117.pdf)
  + 2. [Optimizing Coordinated Vehicle Platooning: An Analytical Approach Based on Stochastic Dynamic Programming Improved Particle Swarm Optimization](https://arxiv.org/pdf/2003.13067.pdf)

Car Following

* IDM: [Intelligent driver model](https://en.wikipedia.org/wiki/Intelligent_driver_model)