[Intro]

* We took inspiration from airline fleet optimization because battery charging is equivalent to aircraft maintenance.
* We split our team into 3 parts: fleet optimization, fleet assignment and front-end design.

[Fleet optimization]

* For fleet optimization, we used linear programming for a top-down approach
* For the objective function, we minimized the fixed costs and operating costs. Optimizing fixed costs led to the best minimization as operating costs did not differ much. Fixed costs included prices of buses, batteries on bus, and charging ports.
* For the constraints, we ensured that the buses met the frequency requirements, passenger capacity requirements, and did not deplete their battery.
* After testing, we found that timeslot\_1 was the bottleneck which determined the max fleet size.
* \*show demo results for timeslot\_1
* The algorithm primarily recommends HP-with-C-charge. However, recommendation changes to MP-with-b-charging if battery cycle lives were the same.

[Fleet assignment]

* For more granularity needed for actual assignment, we attempted a multi-agent simulation treating buses as objects and routes as graphs.
* With this visibility, we could inform buses in the individual actions at each timestep.
* This also allows dynamic fleet management if demand changes.
* \*show demo\*

[Front-end]

* In this part we focus on the user experience and the integration of the algorithm in a complete solution
* Not just the optimization but also managing the day to day system like real time information about the fleet, alert system, line status
* The administrator should be able to tune the algorithm according his business constraint.
* Also a vision of the future cost based on the time before replacing the battery