



Axle Tech Exercise: Data

Thanks for your interest in working together. This is meant to be a fun, short exercise which will help you understand what kind of things we might work on together, and to give us a sense of your work. Please let us know if you have feedback - we're always looking to improve our process.

The exercise is in two parts:

1. **Take home component:** A short piece of work, resulting in some code that you send us
2. **Pair programming session:** we go over your submission together and look for ways to improve it

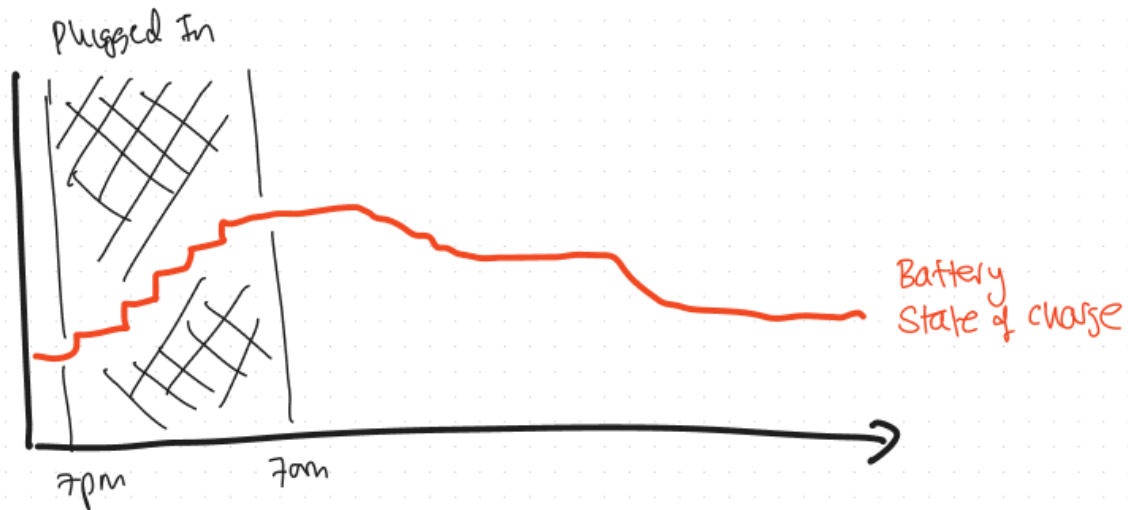
The challenge

One of the core problems that Axle is trying to solve is figuring out how much flexibility is available from the large number of distributed assets that customers bring to our platform. These assets are things like cars, chargers, and heat pumps, and understanding them means understanding consumer behaviour.

Your challenge is to build a simulator of EV driver behaviour.

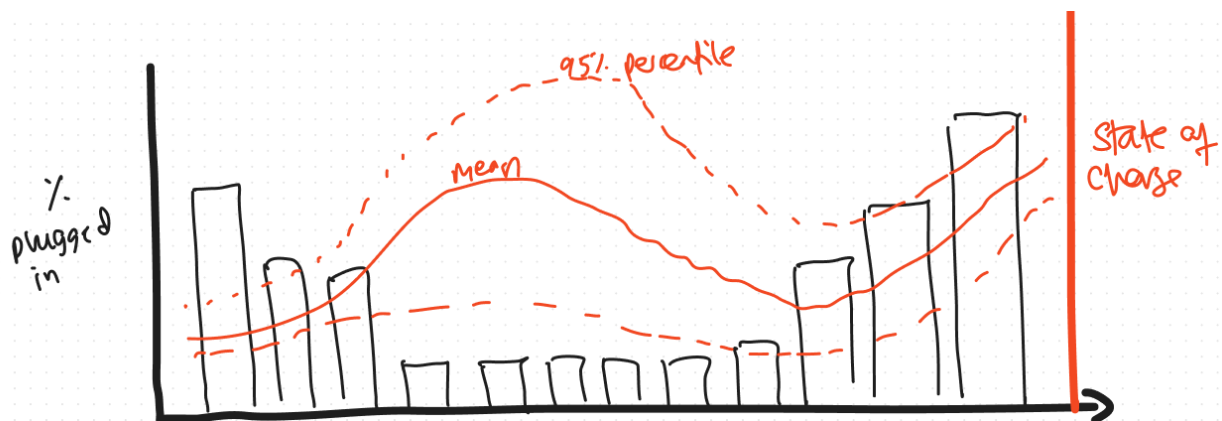
Details

- The simulator should be able to return:
 - when somebody is plugged in
 - the state of charge of the battery when they plug in



This is the kind of data we want to get out for each agent modelled in the simulator. But nicer looking, obviously.

- The simulator should be “agent-based” in the sense that it allows for modelling of individual user behaviour
- Using your simulator, we should be able to recapitulate population-level observations. This might look like a script which runs the simulator with a bunch of preset parameters, for instance representing different archetypes of user behaviour (e.g. the “commute every day” vs. “mostly long trips at weekends”)



We want to be able to use the simulator to capture variation in the population of EV drivers

What we'd like you to submit

- Some runnable code, packaged however you want. This could be:
 - an API
 - a dashboard we can play with

- some scripts which we can run
- brief notes on the decisions you made as you went through the task; these could also be as comments in the code
 - what assumptions did you make?
 - which parts did you choose to spend time on; which bits did you consider less important?
 - how you designed the system bearing in mind its end use

Data sources

Non-aggregated data for EV usage is hard to come by, which is why building a simulator is useful.

One of the best data sources for summary statistics comes from Octopus' Centre for Net Zero. This report is interesting:

<https://www.centrefornetzero.org/wp-content/uploads/2022/05/Intelligent-Octopus-CNZ-Report-May-2022.pdf>

We've used this to formulate a series of archetypes for EV charging, representing the population in terms of 6 patterns. You should use this as the basis for your simulation.

<https://docs.google.com/spreadsheets/d/1CN6lwHuyec2kd2s1MjttKT1wUlycW0fWFA9KillrNlo/edit?usp=sharing>