

Fleet rebalancing strategy

In cities, ride-hailing vehicles often are not located where passengers need them most. While some vehicles remain idle in low-demand areas, passengers elsewhere may face long waiting times. This situation becomes especially challenging during public transport disruptions, such as metro or train breakdowns, strikes, or sudden demand peaks. During these events, demand shifts quickly and unpredictably, and traditional rule-based or manual rebalancing methods struggle to respond in time.

What is the product?

To address this issue, ACUMEN proposes a **fleet rebalancing strategy** based on Multi-Agent Reinforcement Learning. This learning-based approach enables the system to determine where idle vehicles should be positioned in anticipation of future demand.

Rather than relying on static rules or manual interventions, the algorithm continuously learns from system dynamics and adapts its decisions accordingly. By proactively repositioning vehicles, it becomes possible to reduce passenger waiting times, minimize unnecessary driving, and improve overall system efficiency and resilience.

The approach has been developed and tested in simulation environments, where it has demonstrated its ability to outperform traditional rebalancing methods under a variety of conditions. While further development is required for real-world deployment, the results highlight its potential as a key component of responsive, data-driven mobility systems.

Who is it for?

This solution is particularly relevant for:

- **Ride-hailing operators, providers of on-demand mobility services, and public transport authorities** that seek to integrate flexible on-demand services as complementary components within broader multimodal transport systems.

