Research Title:

Big Data Analytics to Evaluate and Improve Policies of Shared E-scooters and Micromobility

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The rising popularity of micromobility and specifically dockless shared e-scooters are creating opportunities for better accessibility and sustainability. However, its business models and quick growth disrupt the urban landscape, leading to safety concerns and questionable impact. While the offerings are mostly private (i.e., shared micromobility and privately owned micromobility), municipalities may regulate and legislate their use. To control the phenomena, municipalities are iteratively test-trialing different policy tools – for example controlling the number of operators of shared micromobility, corral-based parking and speed-reduction requirements. However, such trials yielded diverse and unforeseen effects. Concurrently, digital shared-micromobility operations produces and stores abundant operational data, both at the hands of the monitoring municipality and the operators. In this research we attempted to utilize the extensive data of usage and users, provided by our industry partners, to improve policy design and impact. With the assistance of our research partners, we evaluated the impacts of experimented policies and their contextual anchoring, through big-data analytics of usage-patterns. Exploring changes in these patterns can ultimately allow deeper understanding of each policy effect. Such insights and the developed tools may enable better policy design and more predictable outcomes.

Our big-data spatio-temporal analytics of e-scooters data of multiple years show promising potential on the research topics: 1. E-scooter parking in the city and specifically corral policy design and impact; 2. The contribution of shared e-scooters to urban mobility; 3. The role of e-scooters during crisis; and 4. Adaptation of usage patterns during urban and environment changes. We produced an innovative

framework for discussing corral parking, practical success measures, demonstration of city-wide patterns and location-specific results and common pitfalls. Improved design and policies include corral-centered monitoring, redistribution policy, resilience estimation, and better space utilization.

Using travel time as the primary mobility indicator we assessed the efficiency of shared e-scooters of recurring origin-destination pairs compared to walking, driving a car, using public transportation and using shared e-scooter. We showed that for shorter trips e-scooters provide an alternative which is viable and more time-wise reliable compared to cars - particularly when parking time is considered. It also offers faster alternative to public-transport, mitigating the slow pace of the bus-based network rather than serving as first- last-mile option. Our emergence analysis shows that while short trials fail to capture the mode potential, self-emerging patterns arise, and e-scooters can improve mobility by complementing public-transportation shortfalls at multiple time scales. Specifically, at crisis time, their agile redeployment can supply alternative just-in-time solutions.

Our results could benefit municipalities, operators, and monitoring tools suppliers as well as future research.