

A Programmable and Participatory Sensing Testbed using Micromobility Vehicles

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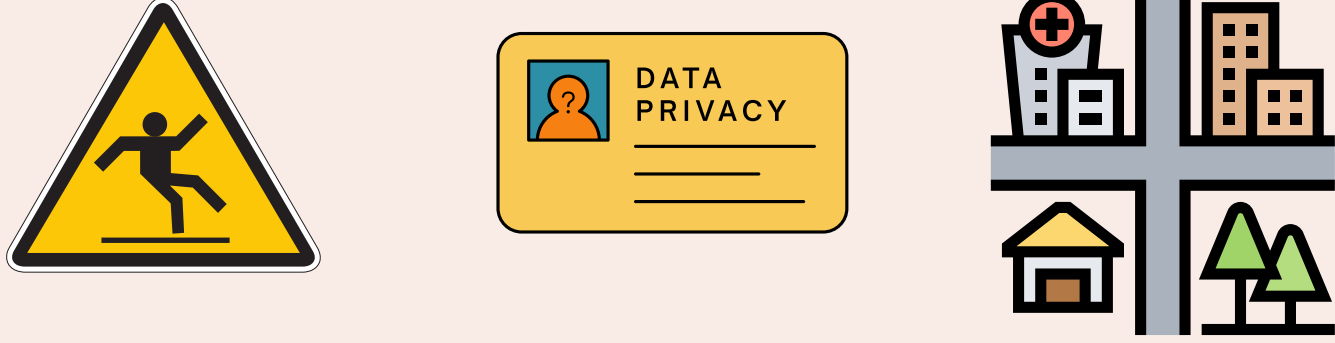


scooterlab.utsa.edu

What is ScooterLab?

An NSF funded community research infrastructure initiative, currently under development at UTSA. This publicly-available micromobility testbed and crowd-sensing/crowd-sourcing infrastructure will provide researchers access to a community of riders and a fully operational fleet of customizable dockless e-scooters.

Issues & challenges in micromobility



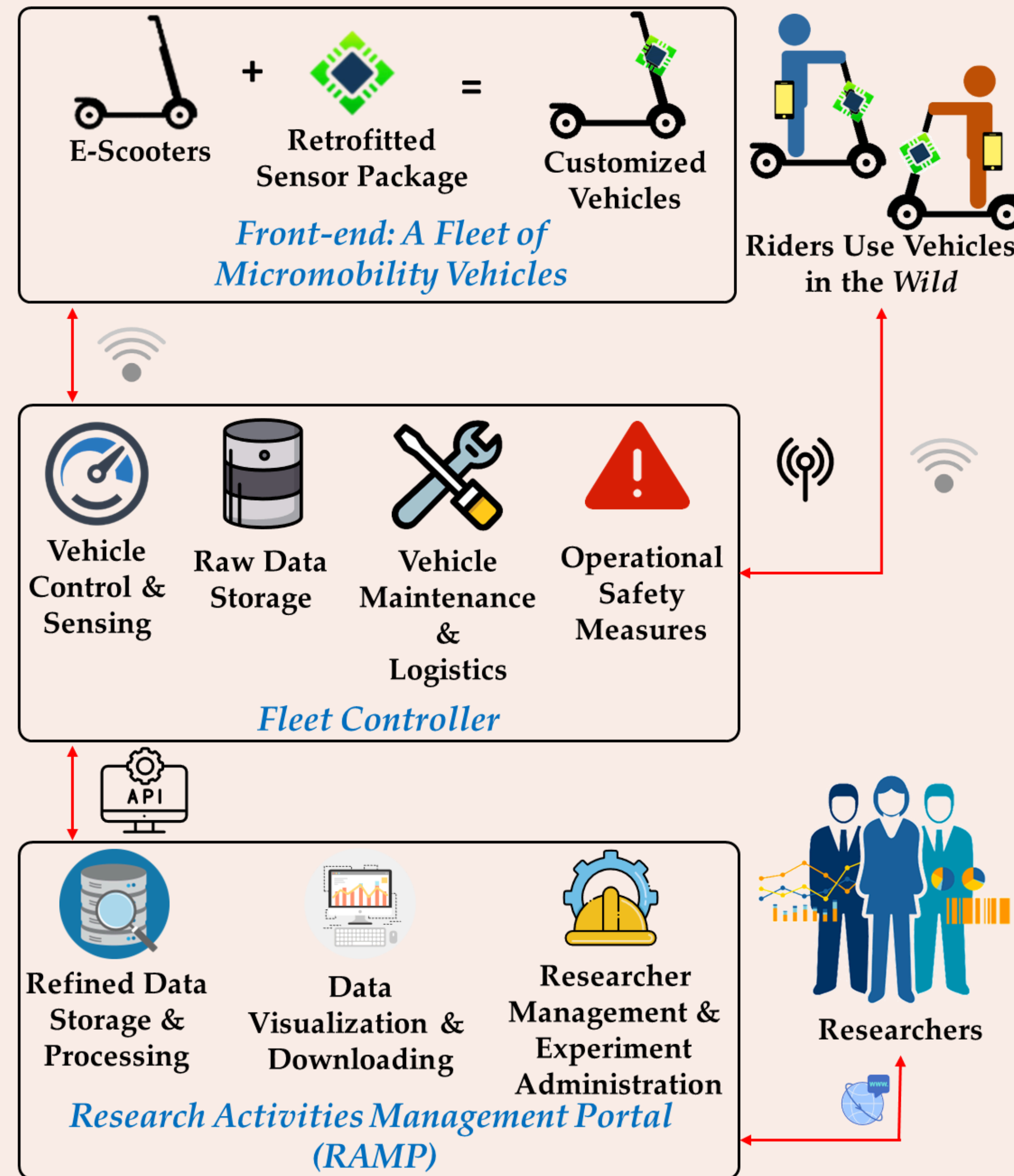
Why ScooterLab?

- Provides space for researchers to address multidisciplinary challenges
- Bypasses commercial service providers who may be unwilling to share data for research
- Offers more customizable sensors
- Creates infrastructure necessary to collect diverse rider, mobility, and contextual data in realistic settings

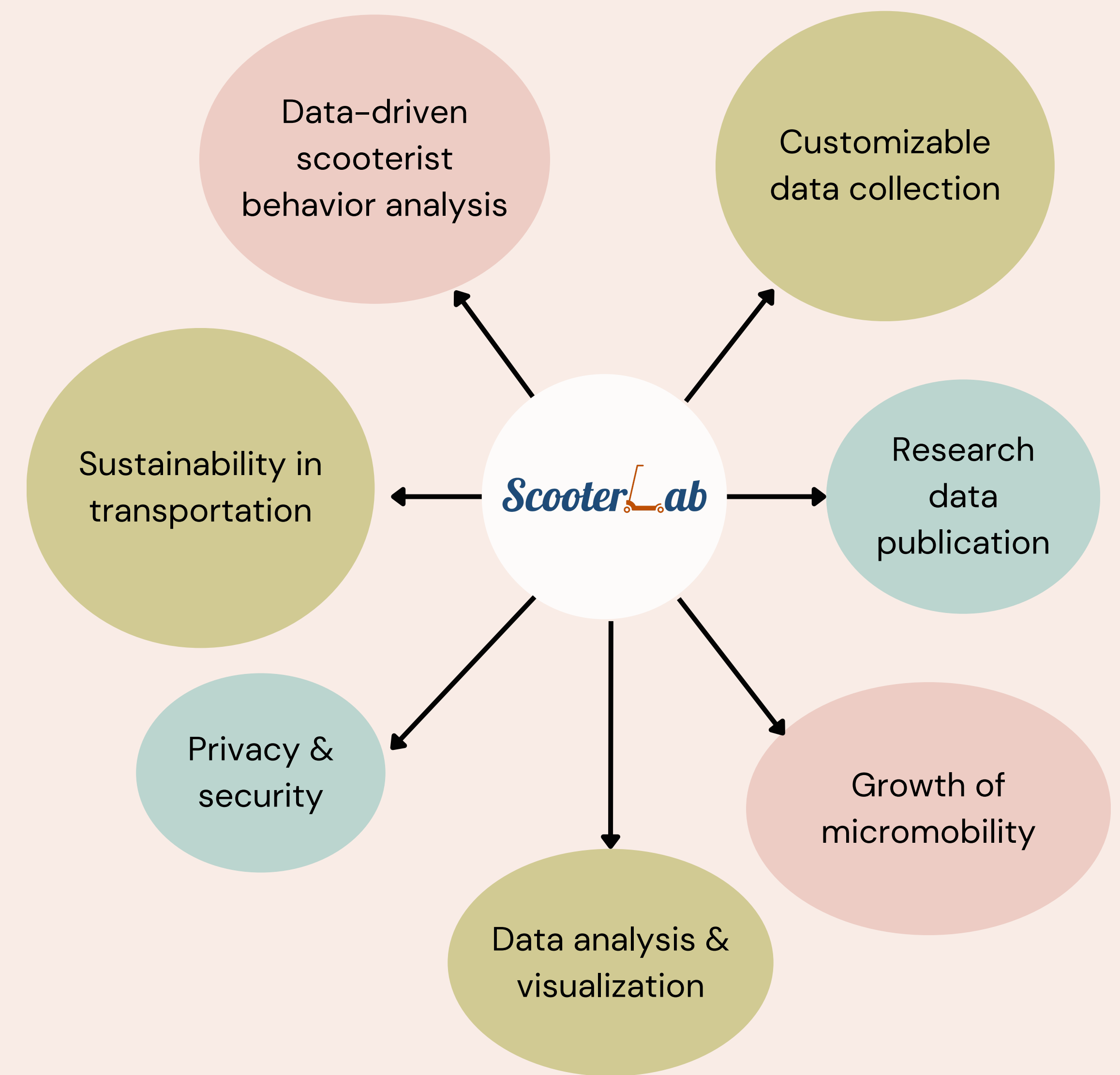
Broader impact:

- Rider/pedestrian safety
- Urban routing & infrastructure planning
- Public policy
- Transportation engineering
- Data privacy

The ScooterLab Architecture

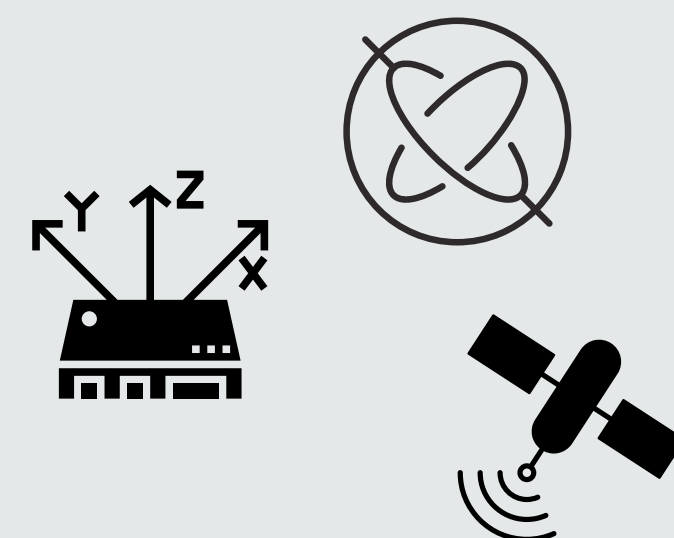


A Collaborative Data Science Research Agenda



Vehicle & Front-End Development

- Initial Prototype E-Scooter - SLP1
- Rigorous testing under realistic conditions
- Prototype E-Scooters (SLP2 - SLP4)
- Partial deployment fleet assembled



Features:

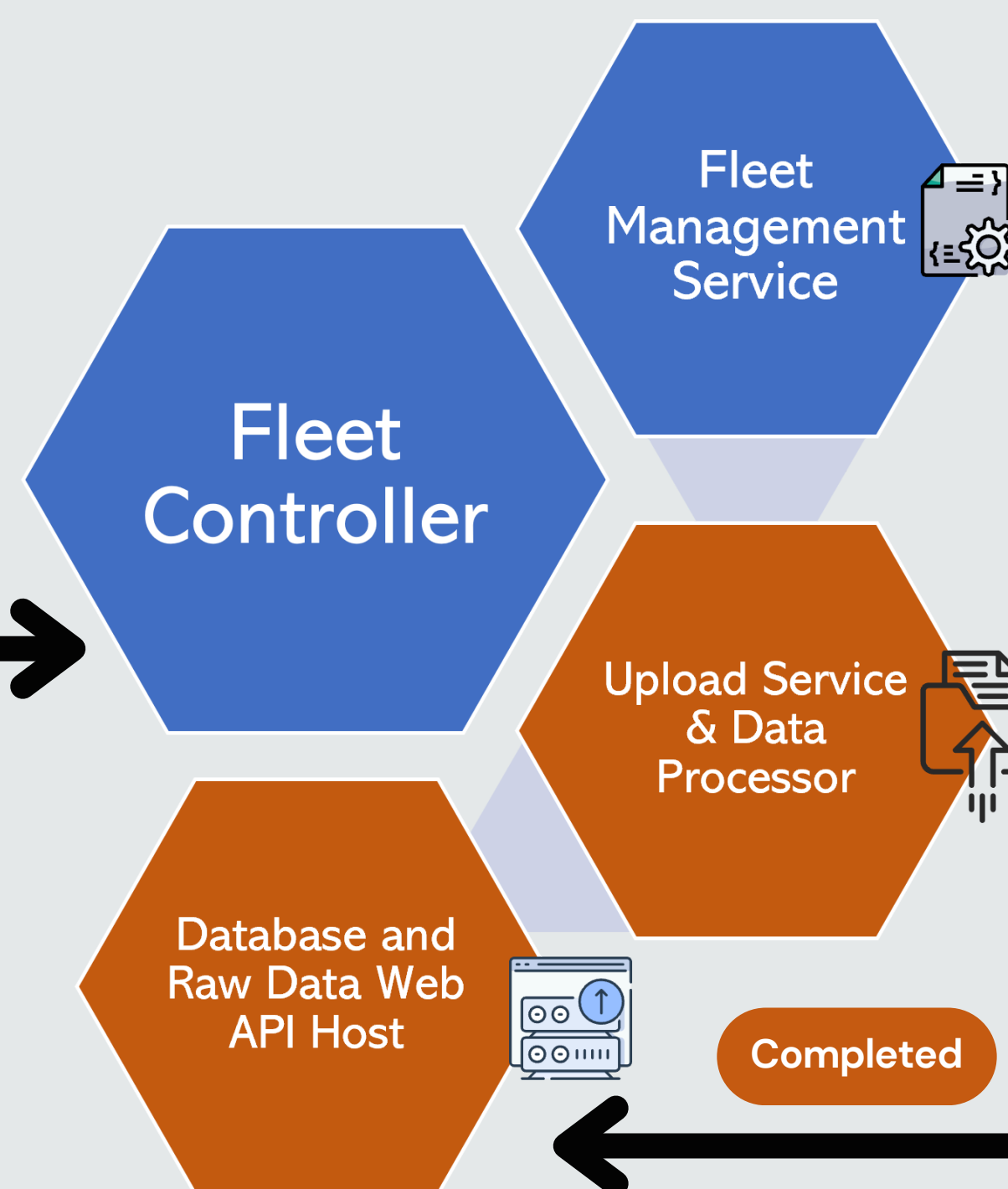
- Communication with users via smartphone app
- Sensing: Temperature, Humidity, Pressure, Accelerometer, Gyroscope, Orientation, Magnetometer, GPS, Camera
- Future/Customizations: Light, Acoustic, Lidar, IR Camera etc.

Testing:

- Weather resistance
- Waterproofness
- Heat dissipation
- Riding terrains
- Riding times
- Portability



Fleet Controller



Fleet Controller Server Acquisition

- 24-Core
- 512GB Memory
- 720TB Storage

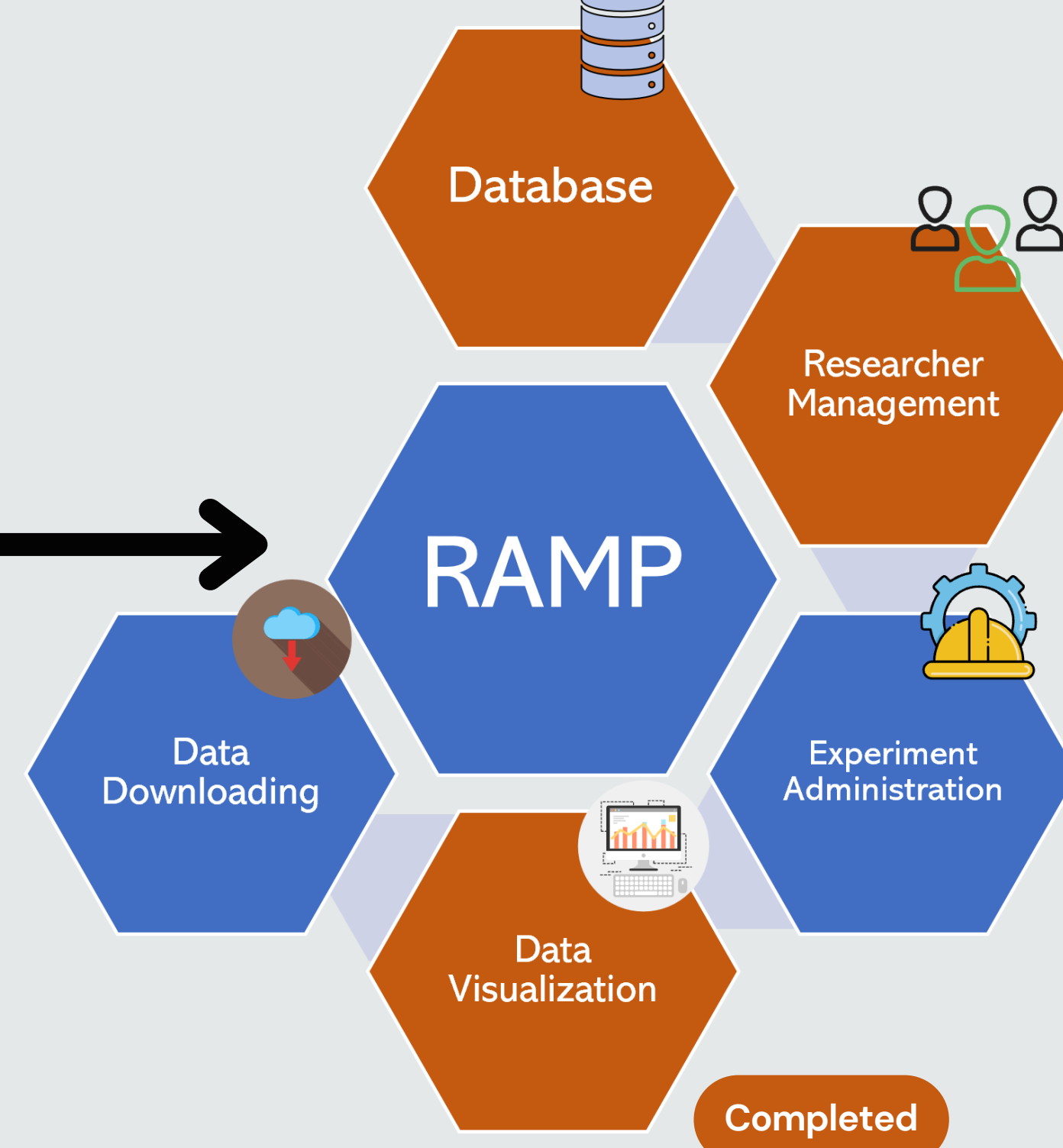
Scooter - Fleet Management Service Communication

- Config file prototyping
- Local data queuing
- Fault tolerant uploading

Upload Service & Data Processor

- External Data Collector: Traffic & weather data
- Data processing & queuing
- Database entry drive

Research Activities Management Portal (RAMP)

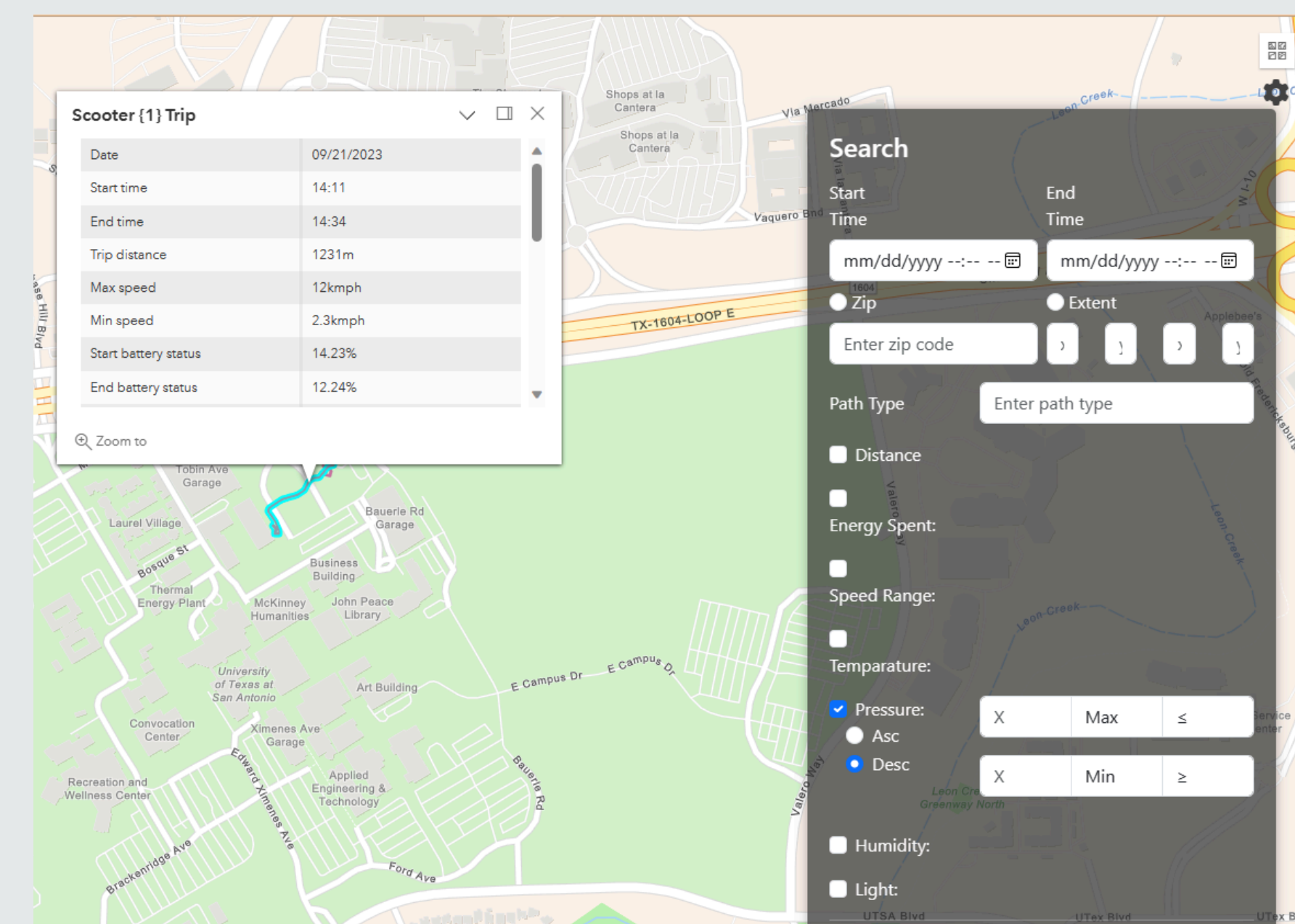


Data Visualization

- Visualize trip data & sensor data on a base map
- Display statistical data
- Data filtering
- Heatmap generation

RAMP Server Acquisition

- 2x48-Core
- 1.5TB Memory
- 4xNvidia L40S



Progress

Next Steps

Partial fleet deployment Summer 2024

Final refinements based on partial deployment feedback

Full fleet deployment Spring 2025

Fleet Management Service

- Reconfiguration Service
- Authentication Service
- Maintenance & operational safety

Database & Raw Data Web API Host

- APIs for experiment based data queries

Researcher Management

- Secure connections to RAMP & data downloading

Experiment Administration

- Allow users to check research experiment progress & manage relevant data

Data Downloading

- File formats: TXT, SHP, CSV, GPX, JSON, GeoJSON