Socially Informed Services Conflict Governance through Specification, Detection, Resolution and Prevention

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Project Challenge

1. Design a socially informed conflict management theory in an uncertain environment to address city service conflicts, including resource conflicts, environment conflicts, and human conflicts.
2. Ensure social inclusion and equity when managing service conflicts for city operators, service providers, and residents.

Intellectual Merit

1. **Community-assisted Requirement Specification** via (1) dashboard tools and (2) formal specification.
2. **Diversity-aware Conflict Detection** via (1) deliberation panel and (2) multi-task learning.
3. **Equity-aware Conflict Resolution** based on (1) multi-stakeholder tradeoffs and (2) learning and robust control
4. **Participation-augmented Conflict Prevention** by (1) focus group study and (2) dynamic hybrid stochastic game
5. **Inclusion-oriented Technology Dissemination** through (1) training sessions and (2) data literacy outreach for citizens.

Major Outcomes

1. Conflict Specification: An intelligent assistant system for requirement specification via a translation model enhanced through requirement synthesis and online learning [**Best Paper Award Nomination** at SMARTCOMP'22]

2. Conflict Detection:
•A novel Spatial Aggregation Signal Temporal Logic for the efficient runtime monitoring of service safety and performance requirements. [IoT-J'21]
•Transfer learning-based frameworks for service risk prediction [CIKM'23a] [CIKM'23b]

3. Conflict Resolution:
•A decentralized negotiation and conflict resolution framework for smart city services [**Best Paper Award** at ICCPS'21]
•Human behavior-aware service scheduling [**Best Paper Award** at CIKM'23] [ICRA'24]
•Multi-agent reinforcement learning with uncertainties [TMLR'23][IROS'23a]][IROS'23b]

4. Conflict Prevention: Focus group, interviews, and train sessions.

Broader Impact

1. New techniques to boost the understand of socially informed conflict management theory.
2. A centralized view for city officials to monitor and mange running services.
3. New infrastructure deployment for air quality monitoring.
4. Improved citizen awareness for city services and intervention/feedback
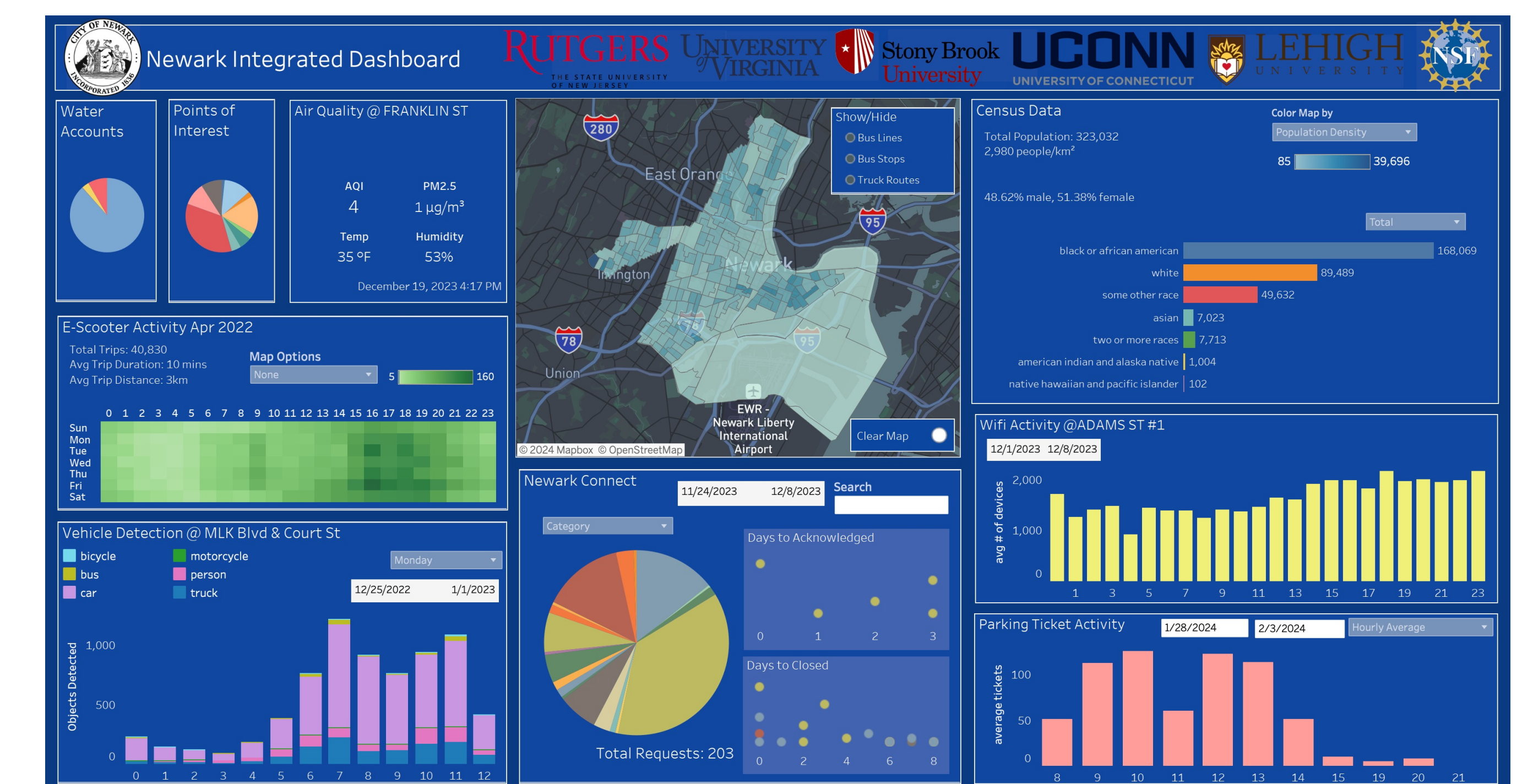
Future Goals

1. Strengthen connections through technique implementation and deployment.
2. Explore the power of large language models and foundational models in service conflict management.
3. Identify new community challenges for future research directions.