Worker-in-the-loop Real-time Safety System for Short-duration Highway Work Zones
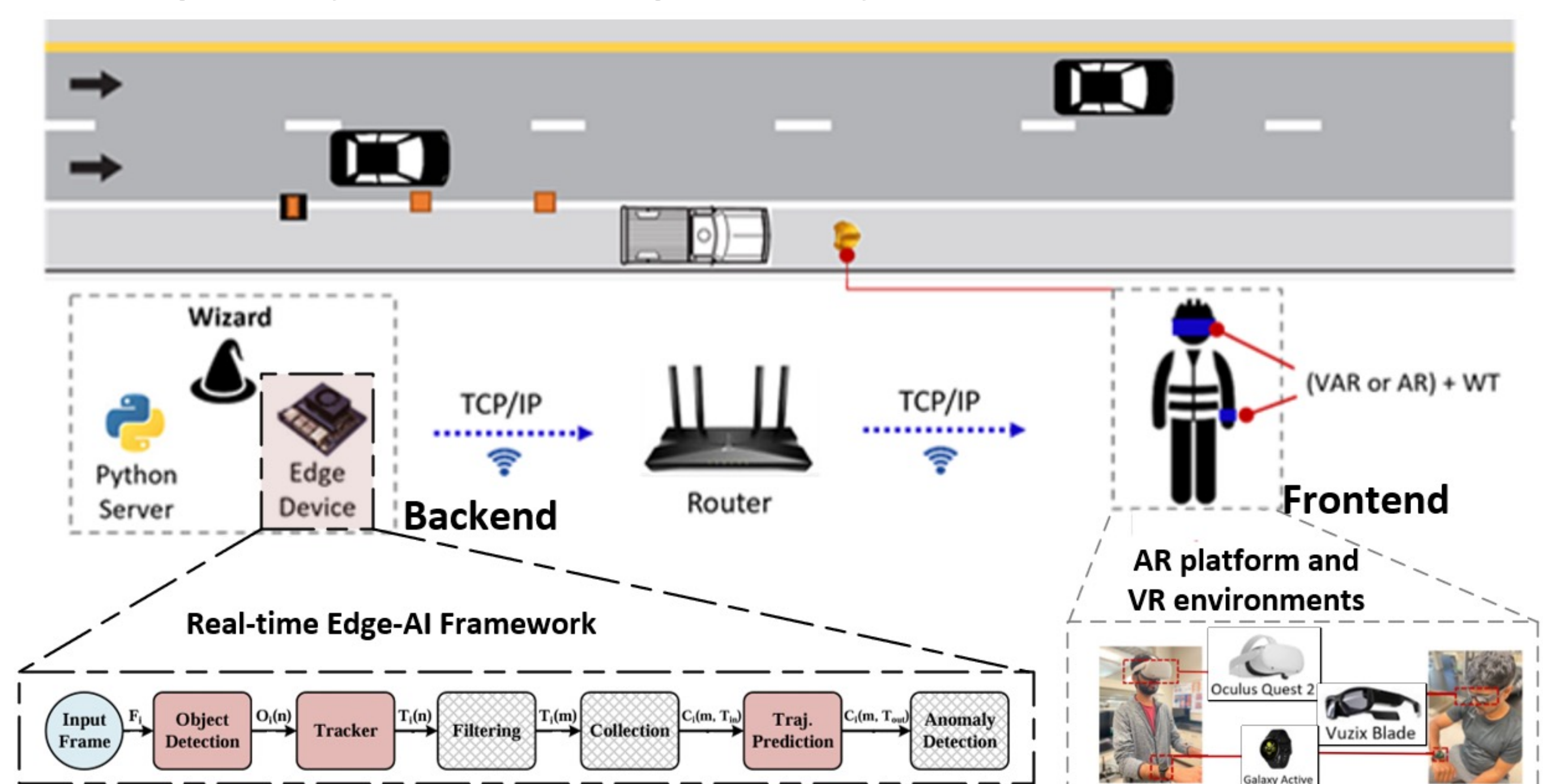
Hamed Tabkhi, Ph.D., University of North Carolina at Charlotte

Project Challenges:

- Climbing injury and fatality rates in work zones.
- Limited solutions in highway work zone safety.
- Lack of AR/VR platforms for safe training and evaluation of new tech in highway work zones.
- Almost no AI framework using IoT devices for highway-based edge analytics.

Major Outcomes:

- **Worker Engagement**: Conducted worker usability, and acceptance testing of AR alerts in work zones.
- **AR Platform and VR Work Zones:** Created VR work zone for worker training and evaluated the effectiveness of multi-modal (AR+WT) alerts.
- **AI Framework and Path Prediction**: Developed AI framework and vehicle path prediction models for real-time edge analytics and alerts.
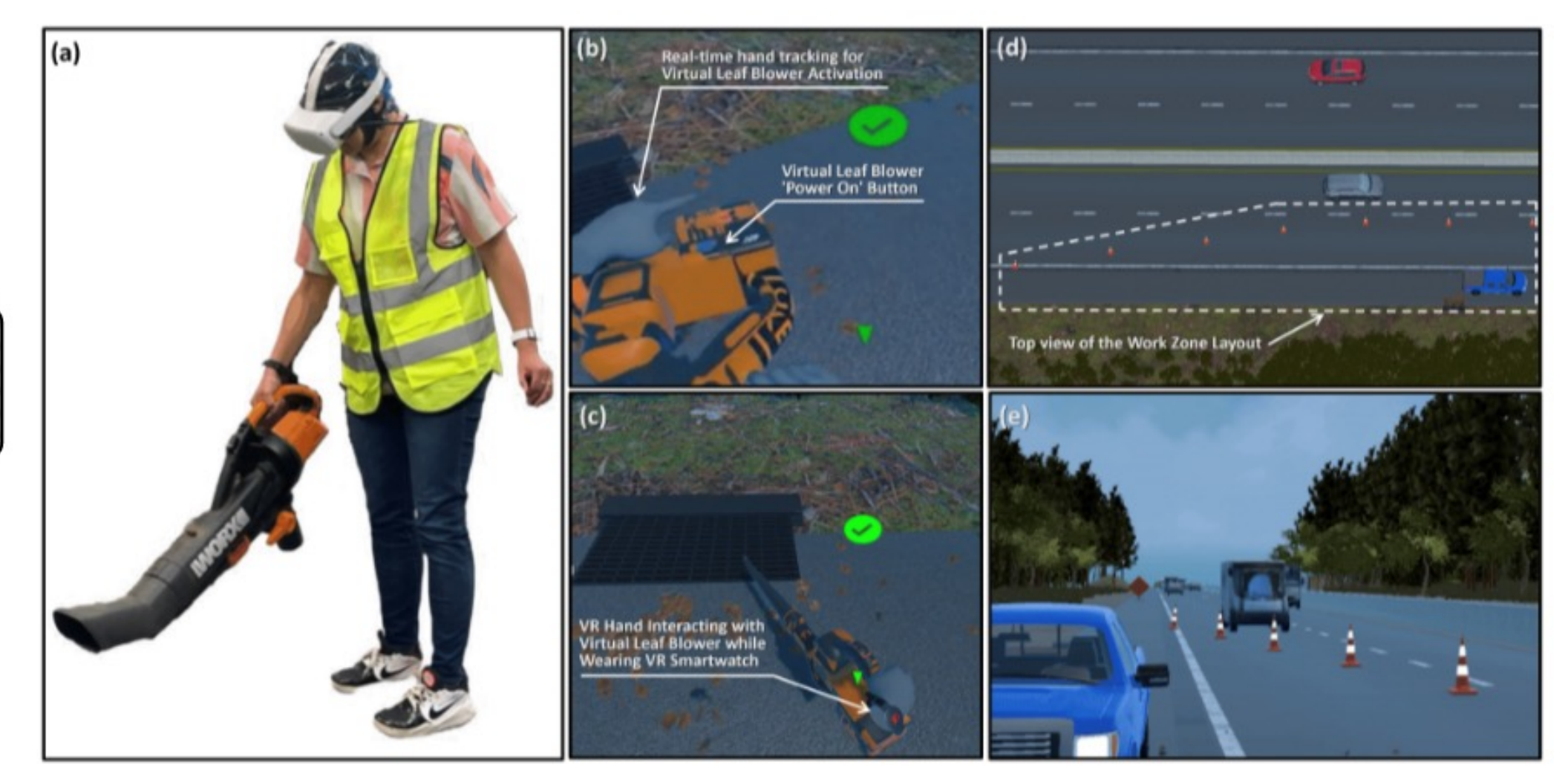
Scientific Impact and Key Innovations:

- SOTA vehicle path prediction model in highways.
- Novel end-to-end AI framework for reckless driving detection on highways in real-time.
- First-of-its-kind VR environment for safe testing of worker usability and reaction time for AR+WT alerts
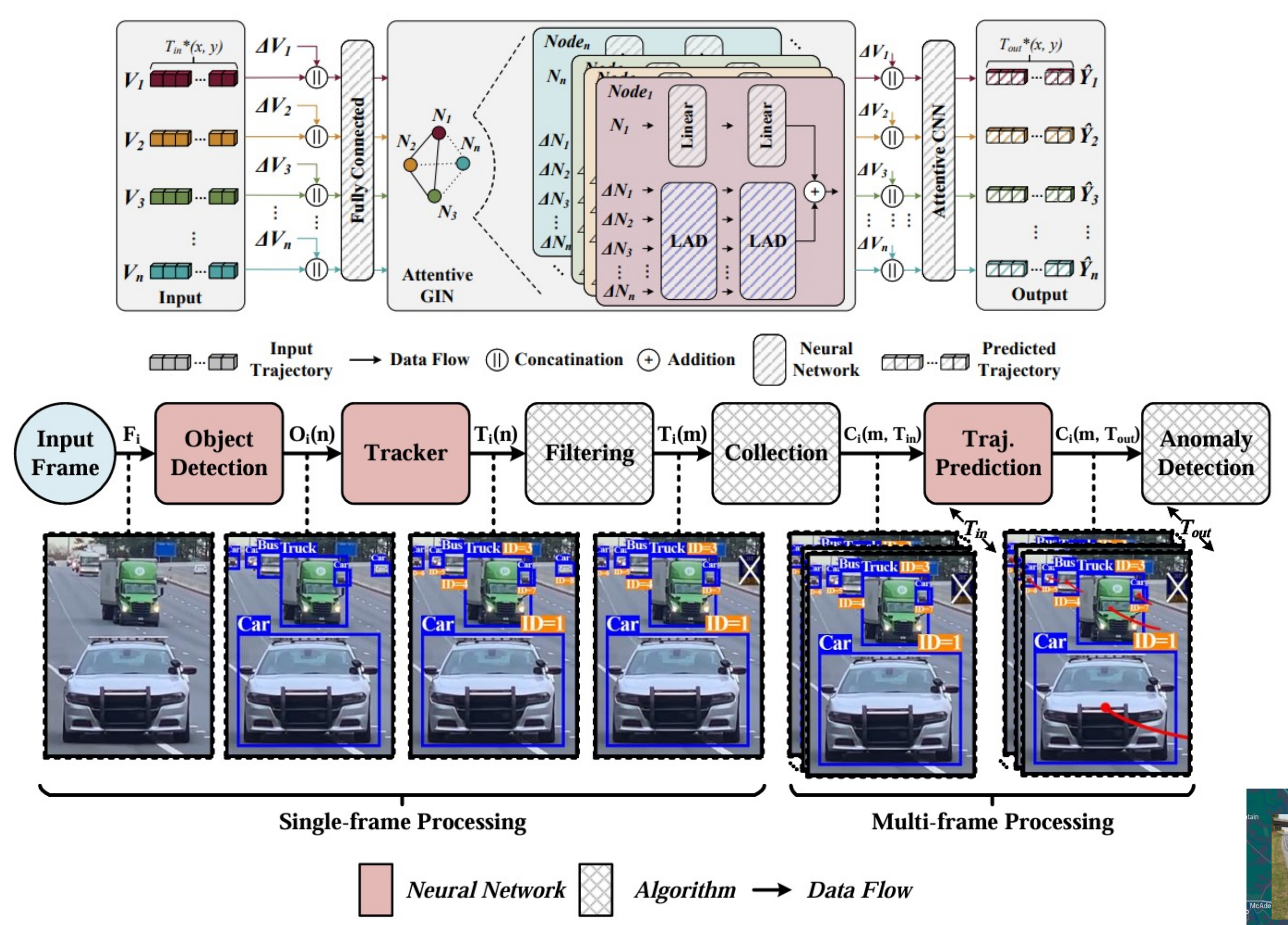
Broader Impacts:

- Conducted work zone surveys to understand AR+VR tech acceptance
- Developed high-quality datasets for highway driving behavior analysis.
- VR work zones developed for safe training and testing of new tech.
- Quantifies the worker usability and reaction times using AR+WT alerts.

CHARLOTTE