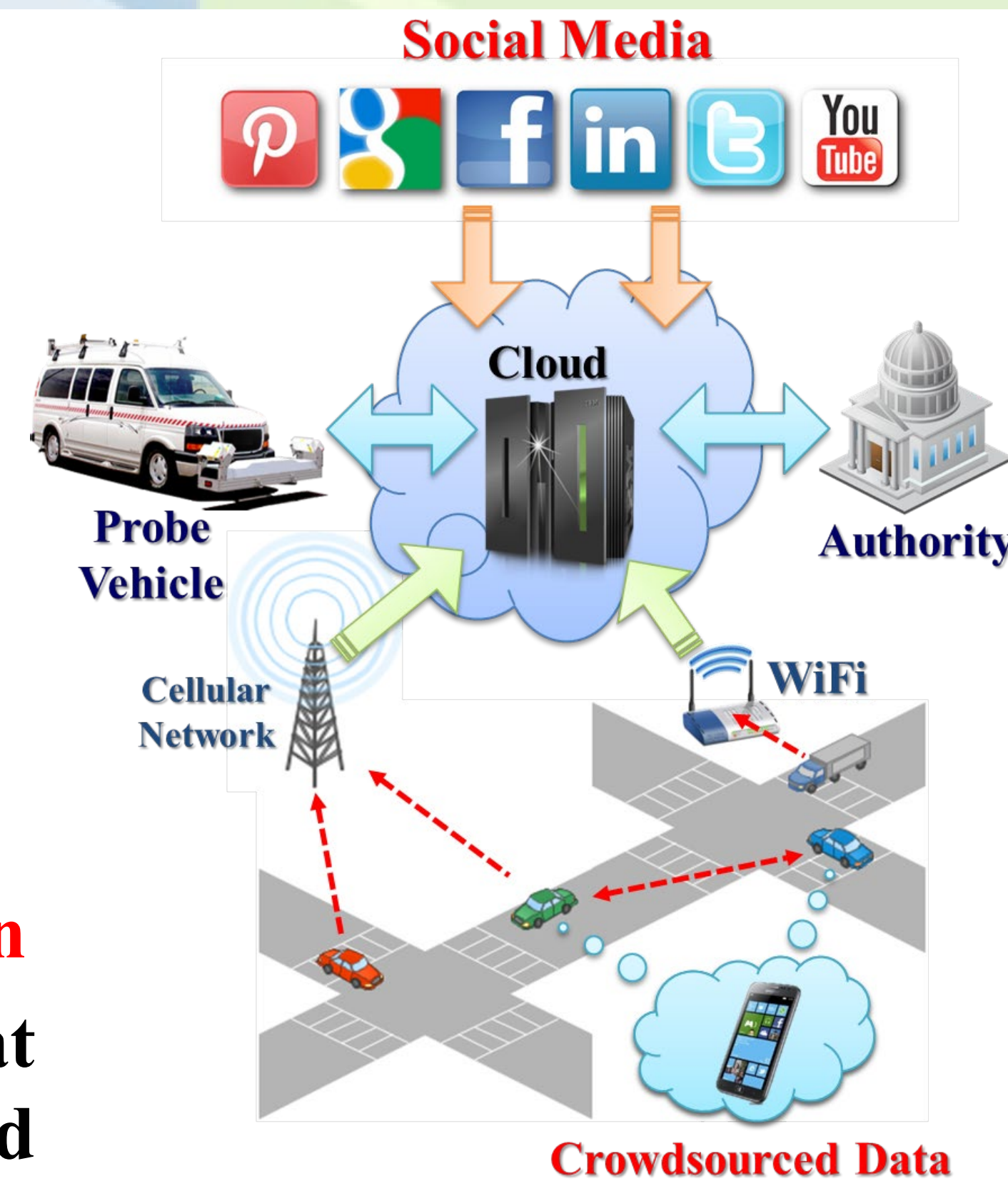# Towards Quality Aware Crowdsourced Road Sensing for Smart Cities

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Project Overview: In this project, we aim to build a reliability-aware crowdsourced road sensing system, called QuicRoad. Quick road gathers information from a variety of sources, including not only vehicle-carried smartphones, but also social media as well as specialized vehicle and authority. By integrating information from these sources, we can make the acquisition and dissemination of road and traffic condition information more accurate, efficient, and timely.

Project Activity 1: Traffic Condition Prediction

We develop a deep learning framework that can predict traffic conditions with limited road sensing data that are temporally sparse and unevenly distributed across regions.

- Collect GPS data from 150+ NFTA buses and use them to estimate and predict traffic condition in Buffalo.
- Visualize estimated/predicted traffic/road condition on our partner's NITTEC app (https://www.nittec.org/travel_resources/nittec_mobile_app/), which provides users with customized real-time traveler information in the Buffalo-Niagara region.

Traffic Condition Prediction
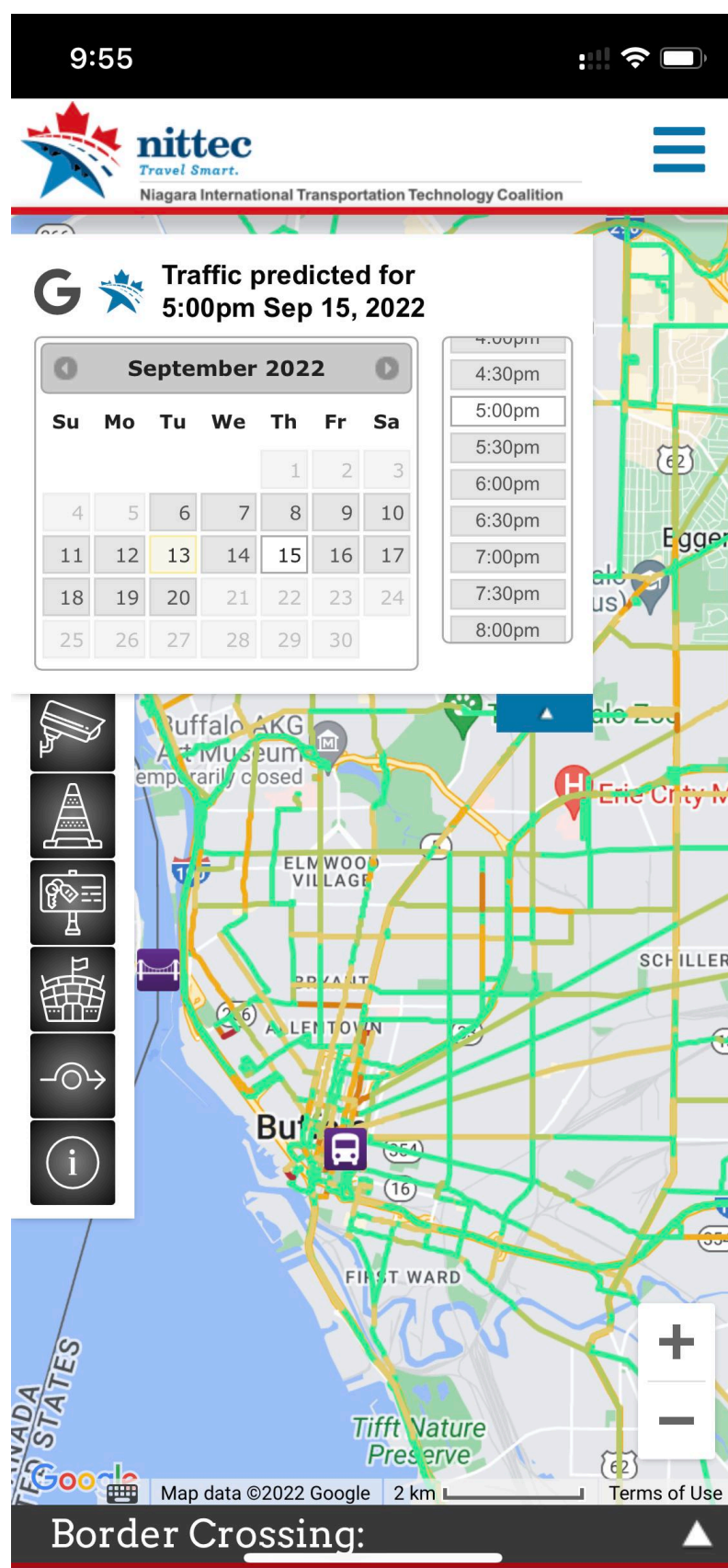
Crowdsourced Data

Road Geometry Estimation

Project Activity 2: Road Geometry Estimation

We develop a crowdsourced road geometry estimation system that can leverage vehicle-carried smartphone's sensory data to estimate various road geometric features, such as road grade, cross slope, and super-elevation.

- We build a map-based web-application to display the estimated road geometry features.
- We have filed a new technology disclosure through UB's Technology Transfer Office, and been working with them on filing a patent for our proposed work.

Intellectual Merit: This project integrates (i) technological research: a novel Quality of Information (QoI) aware information integration framework that can jointly optimize the estimation of the QoI of various sources and their information-integration, as well as decision-making process; and (ii). social research: it answers fundamental questions such as whether and to what degree the road/traffic condition information provided by the proposed QuicRoad system would change the social behavior of the travelers.

Immediate Impact on Society: To study the feasibility and usability of our crowdsourced road geometry estimation system, we have conducted 150+ interviews with

- Mapping companies such as Google, Lyft, HERE, TomTom, Uber, DoorDash, Mapbox, and Spin
- Autonomous vehicles companies such as Waymo, Cruise
- Trucking software companies such as KeepTruckin, RoadAware
- Transportation agencies such as NCDOT, NYSDOT, NREL, etc.

Next Steps:

- Continue to work with local communities to improve the developed crowdsourced road sensing system.
- Continue to work with industry and government partners to explore larger-scale deployment and commercialization opportunities.
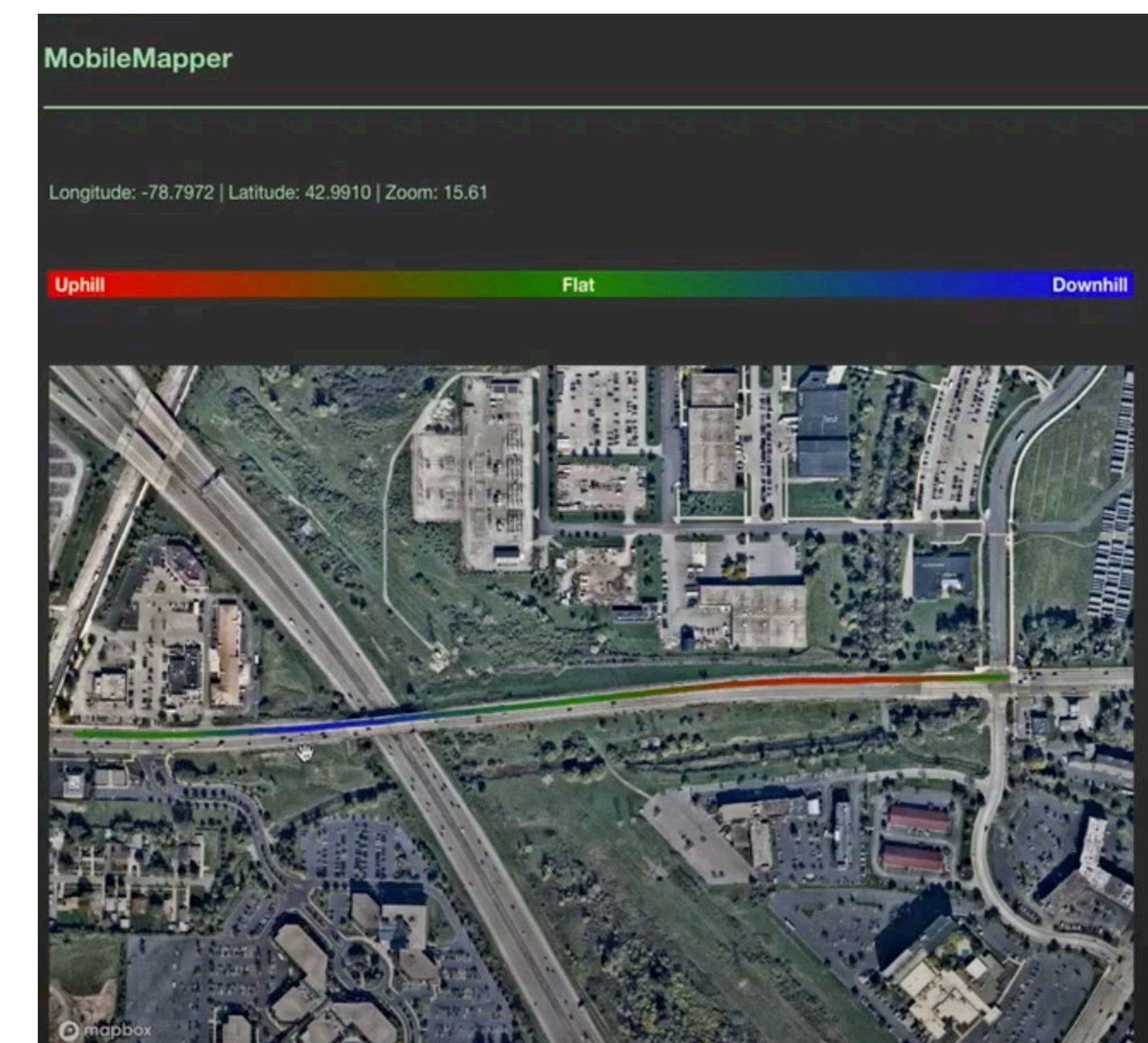
Lasting Impact and Sustainability:

The research will potentially benefit a wide spectrum of real-world road sensing applications aimed at improving road safety, mitigating traffic congestions, and reducing fuel consumption and emissions, and eventually contribute to building a sustainable society.