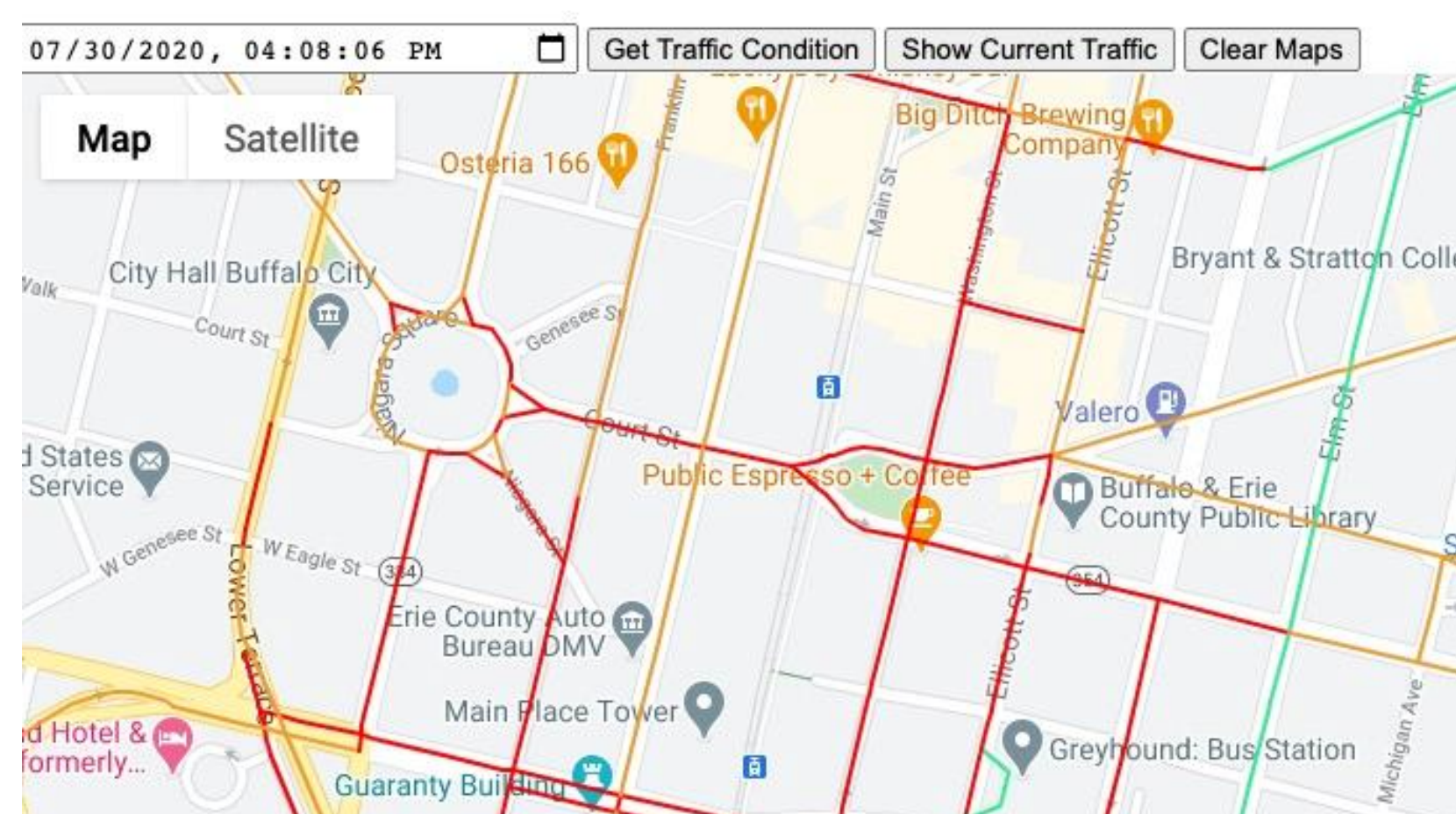# Towards Quality Aware Crowdsourced Road Sensing for Smart Cities

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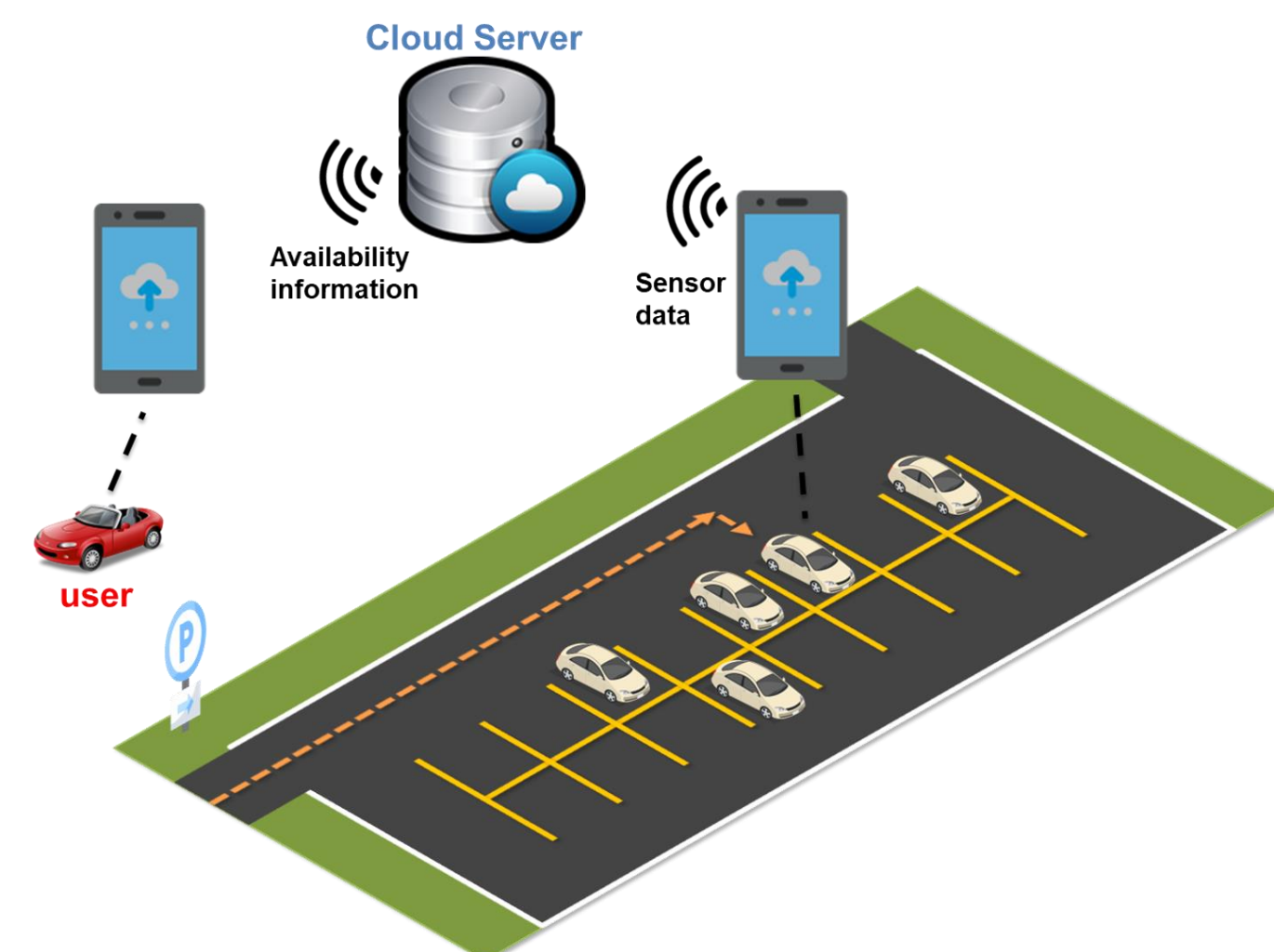**Project Overview:** In this project, we aim to build a reliability-aware crowdsourced road sensing system, called QuicRoad. Quick road gathers information from a variety of sources, including not only vehicle-carried smartphones, but also social media as well as specialized vehicle and authority. By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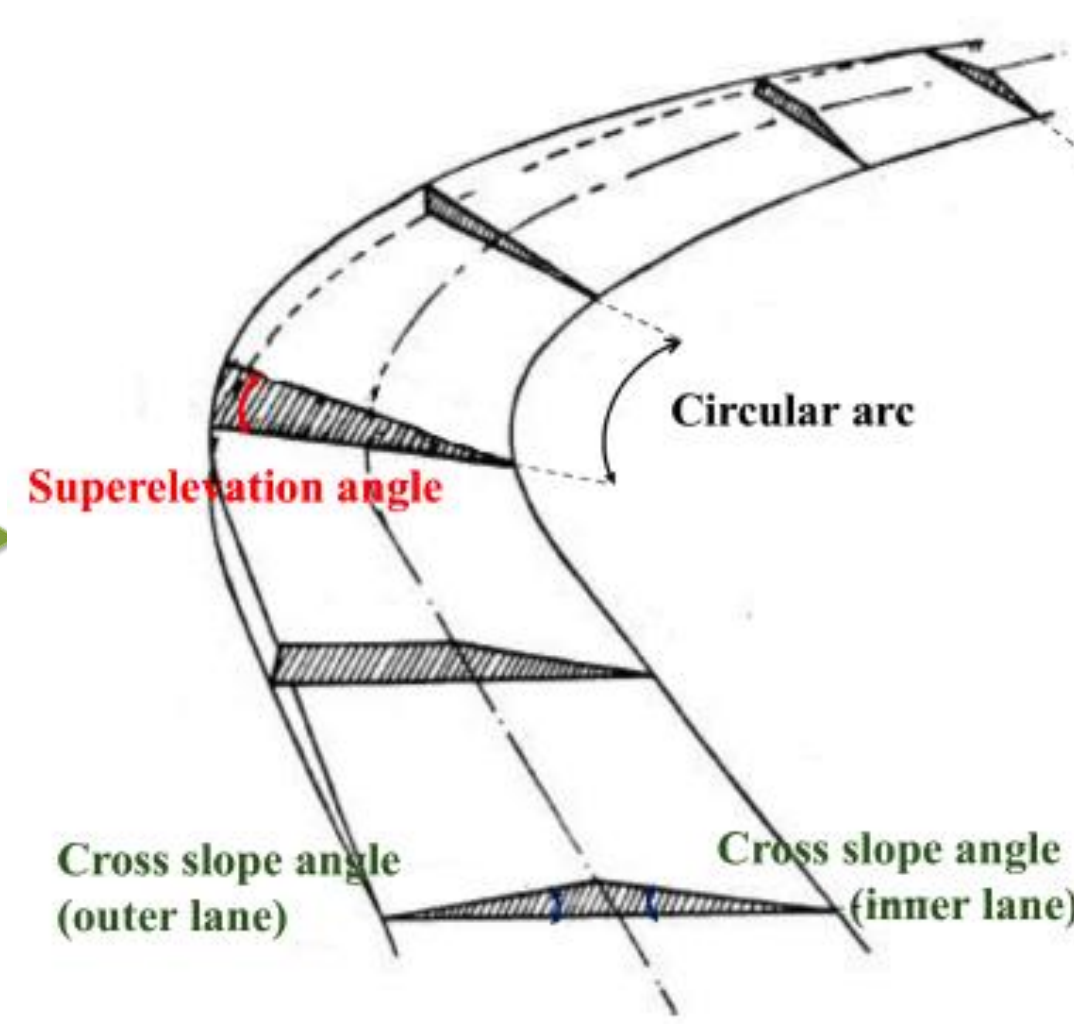
Project Activities:

• 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.

• We propose a crowd sensing system that can provide spot-level availability in a parking lot by analyzing the behavior of the drivers using their smartphone data.

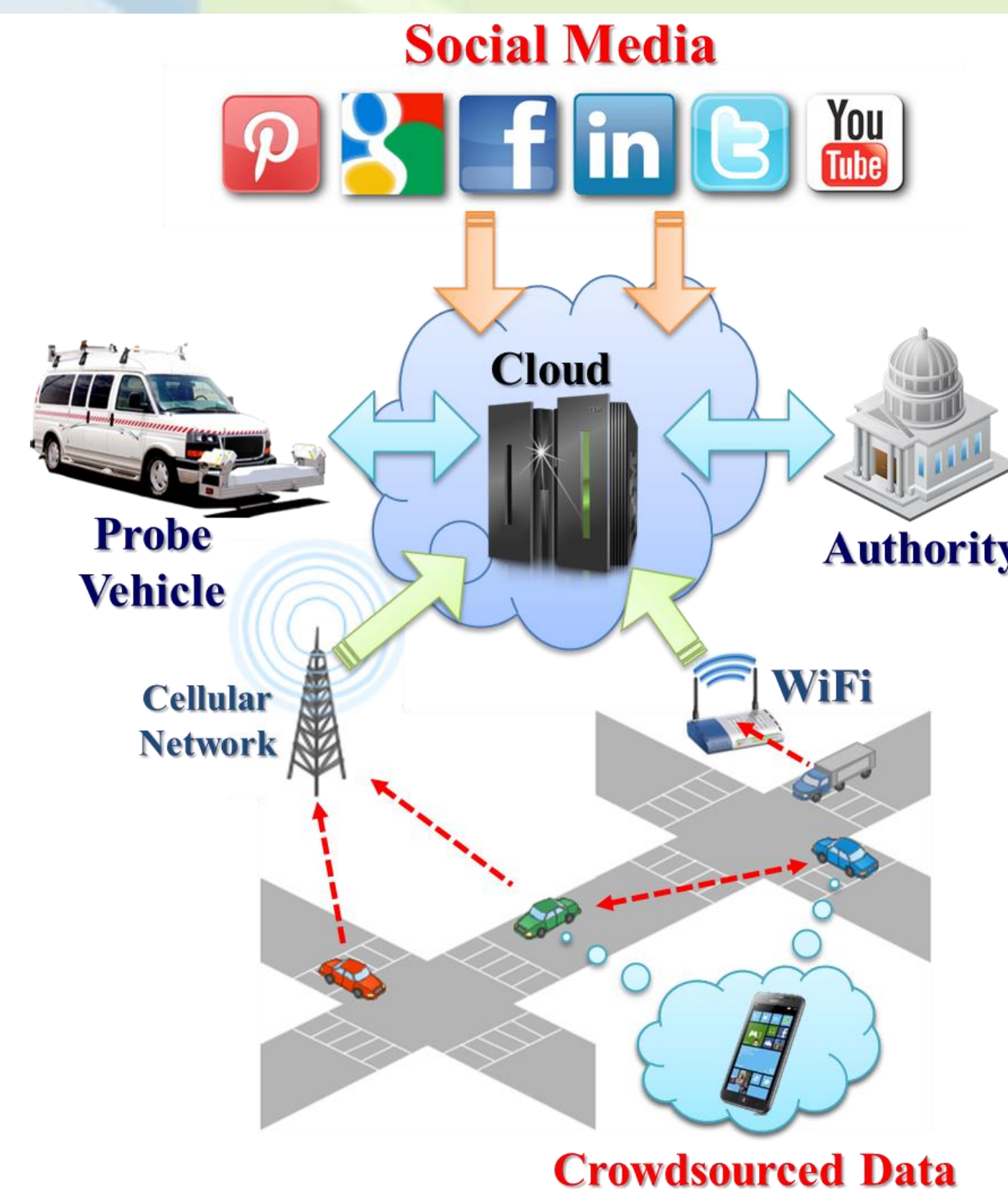• We develop a crowdsourced road geometry estimation system that can leverage vehicle-carried smartphone's sensory data to estimate various road geometric features, such as road grade, cross slope, and super-elevation.

Social Media / Cloud / Probe Vehicle / Authority / Cellular Network / WiFi / Crowdsourced Data

Traffic Condition Estimation   **Parking Lot Availability Detection   Road Geometry Estimation**

Immediate Impact on Society: By seamlessly integrating the technological and social dimensions, the proposed research can not only improve the coverage and quality of assisted driving and road navigation services for travelers, but also support policy-making in traffic planning and operations by transportation authorities.

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 the 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.

Next Steps:

• Make use of video stream from roadside traffic cameras operated by our partners to estimate traffic condition of a broader area.
  − Combine the GPS and video information to achieve more accurate traffic condition estimation and prediction.

• Integrate our crowdsourced road sensing system into the 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.
  − Collect data from users' smartphones.
  − Visualize estimated/predicted traffic/road condition on the NITTEC app.

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.