SAFE-NET: A Computing Platform for Public Safety Applications

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1. Introduction

There are increasing calls for developing descriptive, predictive, and prescriptive analytical tools using big data to enable informed and optimal decision making for public safety applications.

These tools provide necessary intelligence and decision support capabilities including:

- Estimation of missing information
- Incident state prediction
- Evaluation of response scheme alternatives to determine the optimal strategies

2. Objectives

This research aims at accelerating public safety innovation through the development of SAFE-NET.

SAFE-NET is a novel computational platform to support efficient and safe dynamic mobilization of resources and personnel for emergency response.

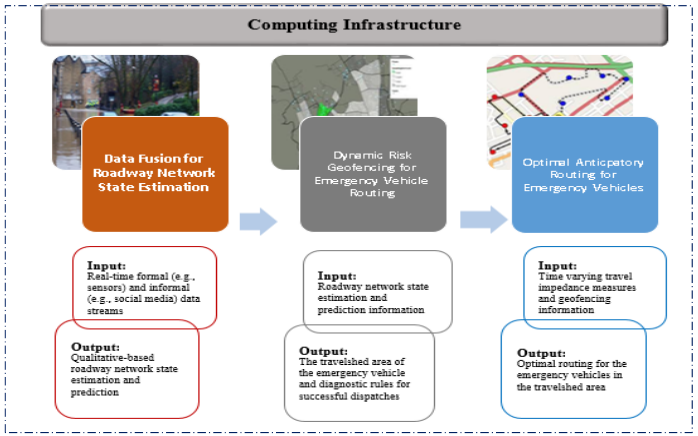
3. Research Questions

Q1: What data sources can be fused, and how can this fusion process be efficiently performed to provide accurate estimation of the time-varying roadway network conditions?

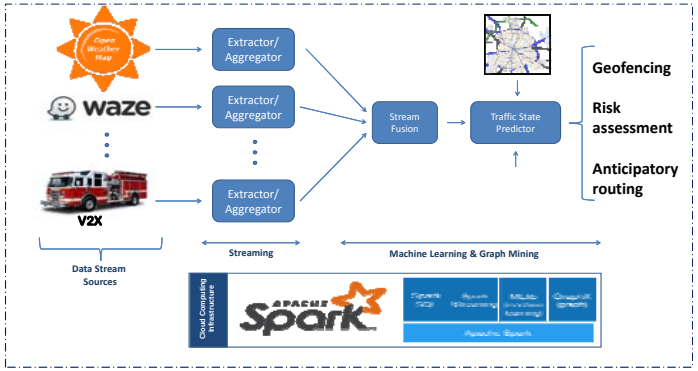
Q2: What is the travelshed area (geofencing) for emergency vehicle routing, and how can the temp-spatial risk in this travelshed area be quantified?

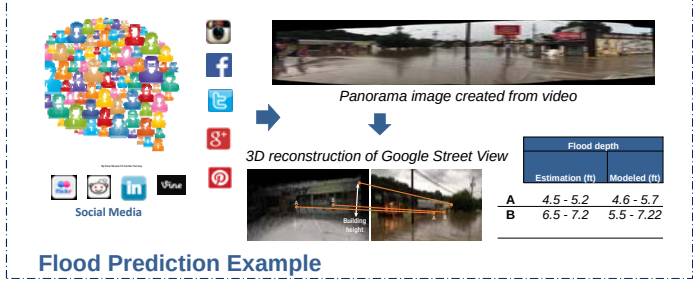
Q3: What is the most optimal route for an emergency vehicle taking into consideration the tradeoff between speed and safety requirements of the emergency vehicle dispatching process?

4. Overall Framework



5. Multi-Source Data Fusion

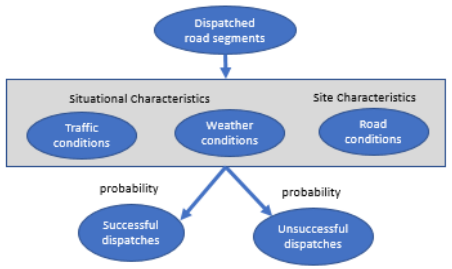




Flood Prediction Example

6. Dynamic Geofencing & Risk Assessment

Dynamically fence out high-risk street segments from dispatch routing at a given time.



Conceptual framework for applying data mining (e.g. classification and regression techniques - CART) to elicit rules of site and situational characteristics for successful and unsuccessful dispatches on road segments.

7. Distributed Routing Algorithm

- We present a novel algorithm which integrates the network decomposition and link augmentation techniques.
- The algorithm uses parallelization techniques to expedite the computational time.