AN INTELLIGENT SPATIAL DECISION SUPPORT SYSTEM BASED ON CITIZEN SCIENCE FOR DRIVING RESILIENCE IN COASTAL COMMUNITIES

[innovationX]

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Introduction of Our Team:

We formed a multidisciplinary team that consists of people from GIScience, environmental science, management information science, electrical and computer engineering, and computer science and engineering.

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Research Objectives

1) Identifying spatial hotspots of socially vulnerable locations.
2) Evaluating transportation accessibility for socially vulnerable communities.
3) Mapping house damages at a spatiotemporal scale using citizen science.
4) Analyzing disaster risk perceptions using social sensing and surveys.

Community Outreach and Survey

Our team developed a risk perception survey for safety-net organizations to help them improve services during disaster preparedness and recovery. The survey includes the topics such as:

1) Previous health and safety training experience
2) Evacuation and emergency planning
3) Service delivery plan
4) Socially vulnerable community engagement plan

Research Methods

1) Social Media Data Mining

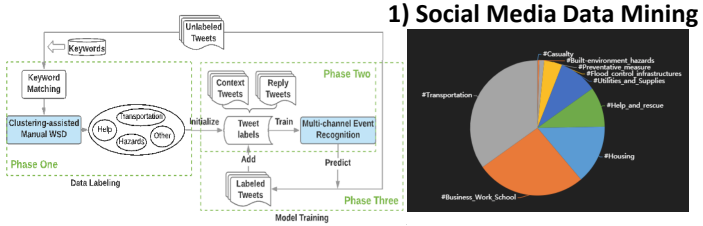

Figure 1. Identify emergent events from social media using a weakly-supervised learning system [1]. The results are illustrated in Figure 2 as a pie chart.

2) Data Fusion and Web Mapping: Integrate geospatial big data and visualization tools into an intelligent decision support system (DSS) for **disaster resilience planning**.

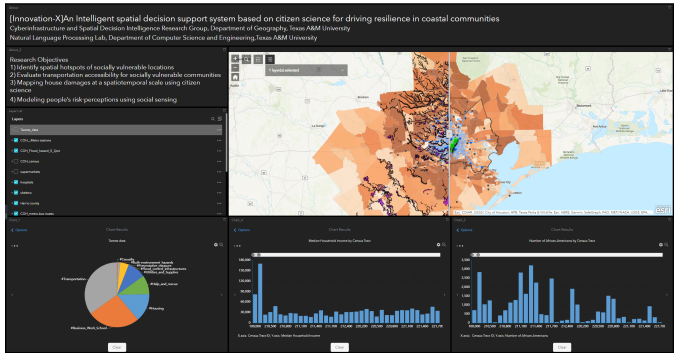

Figure 2. Visualizing social vulnerability, social sensing-based risk perceptions, and transportation accessibility in Harris County. Data layers: census data (e.g., income, age, and race), critical facilities (e.g., hospitals, metro stations, and supermarkets), flooding maps, metro-bus routes, and social media data. Bar Chart (left): Median household income by census tract. Bar Chart (right): number of African-Americans by Census tract. Map: population density of Harris county.

3) An Interactive Citizen Science-driven Mapping Tool:

This web-based mapping tool is designed to enable collaborative decision making in assessing disaster damages during **disaster recovery.** People can report damages and share their house repairing practices in real-time.

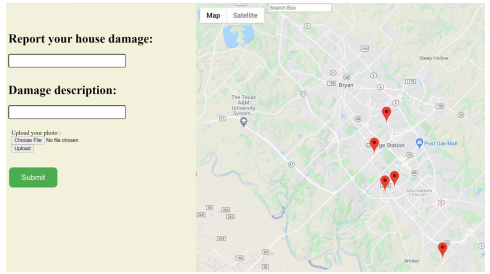

Figure 3. A web-based mapping tool for reporting house damages.

Conclusion and Discussion

The existing disaster information systems remain temporally imprecise, spatially vague, and do not consider social vulnerability and decision-making capabilities. In this project, we designed an interactive and collaborative spatial decision support system based on advanced cyberinfrastructure, WebGIS, and citizen science to improve situational awareness in disaster management. Our platform considers spatial and social vulnerability priorities to enhance knowledge elicitation and sharing among disaster responders and communities.

Reference

[1] Yao, W., Zhang, C., Saravanan, S., Huang, R., & Mostafavi, A.(2020, April). Weakly-supervised fine-grained event recognition on social media texts for disaster management. In Proceedings of the AAAI Conference on Artificial Intelligence (Vol. 34, No. 01, pp. 532-539).

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