



## Research Project Highlight

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# Text Analytics on Social Media for Resilience-Enabled Extreme Events Reconnaissance (TAR)

*TSRP Topic – PBE Tools – T1*

### Principal Investigator

Laurent El Ghaoui, Professor of Electrical Engineering and Computer Science, UC Berkeley

### Research Team

- Selim Günay, Project Scientist, UC Berkeley
- Alicia Yi-Ting Tsai, Graduate Student Researcher, UC Berkeley
- Chenglong Li, Graduate Student Researcher, UC Berkeley
- Minjune Hwang, Undergraduate, UC Berkeley

### Start-End Dates:

2/1/2020-1/31/2021

### Abstract

This project aims to apply Natural Language Processing (NLP) techniques to news and social media posts after an extreme event. Natural language processing (NLP) is a subfield of linguistics, computer science, and artificial intelligence concerned with the interactions between computers and human (natural) languages, with the objective of processing and analyzing large amounts of natural language data. In the context of reconnaissance for earthquakes and other natural hazards, it is used here for three purposes: 1) Automated data (news & social media) collection hosted at the Pacific Earthquake Engineering Research (PEER) Center server, 2) Automatic summarization for reconnaissance report generation, and 3) Use of social media to extract information related to earthquake consequences, such as recovery time. The images below illustrate the concept of recovery time, and they show that measuring the intensity of Twitter conversations over time helps develop a sensible recovery measure.

### Deliverables

A PEER report and several conference and journal papers describing the natural language processing techniques used reconnaissance for earthquakes. Software for automated data collection, reconnaissance report generation and reconnaissance analysis.

### Research Impact

The significant worldwide population growth and urbanization of the past century resulted in an era of global development and infrastructure construction on a massive scale, including buildings and other critical infrastructure systems. Recognizing the associated growth, the National Academy of Engineering has identified “restore and improve urban infrastructure” as one of the Engineering Grand Challenges of the 21st century. On a positive note, the major advancements made in sensor and communication



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technologies, artificial intelligence algorithms, and science-based understanding of natural hazards, taken in combination, provide a foundation for developing methods of advanced monitoring, maintenance, and reconnaissance of infrastructure. Moreover, the mass adoption of mobile internet-enabled devices, paired with wide-spread use of social media platforms for communication and coordination, has created new opportunities to better understand human responses to extreme events. These methods have the potential to tackle the above-mentioned grand challenge and achieve resilient communities following natural hazards. Being aware of the existing challenges and opportunities, this project presents the tools and methods aiming to achieve resilient communities through reconnaissance efforts. The project develops methods and software to collect news and social media posts after an extreme event to: a) create automatically generated new summaries for immediate report writing after an event, b) to extract key information, such as the recovery time, the most affected regions and infrastructure, and to relate these to the magnitude of the event, socio-economic consequences facing the community, etc. Application of this tool to several recent earthquakes are demonstrated and potential use of the tool along with extreme event reconnaissance networks can be further established.

### Project Image

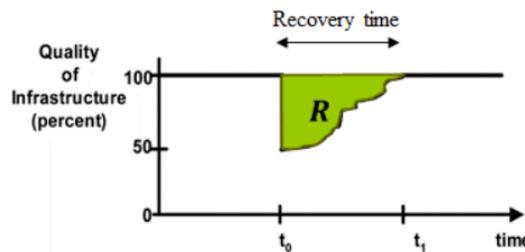
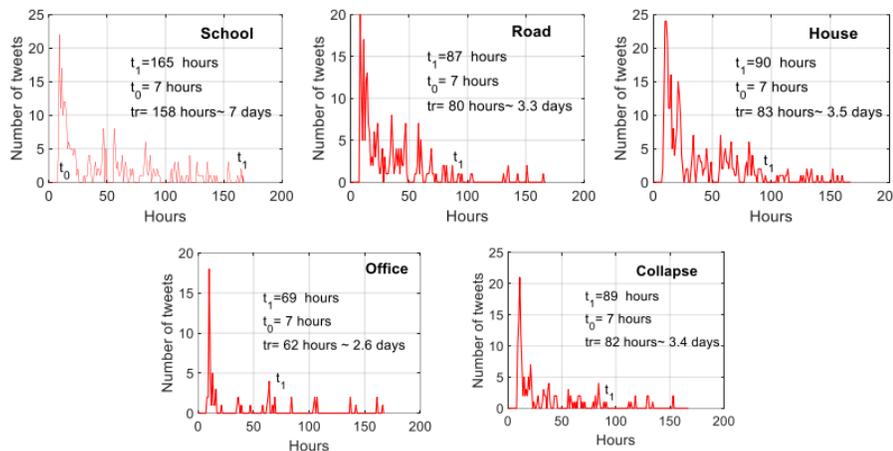


Fig. 7 – Conceptual illustration of recovery time [21].



a) Computational model of recovery time analysis