VAST Challenge 2019
Grand Challenge Guide for Reviewers

This document provides information to support peer review of submissions to VAST Challenge 2019, Grand Challenge. It covers background about the submission structure, the challenge problem, tasks and questions presented to participants, potential answers, and evidence found in the Challenge data supporting these answers. For a full description of the challenge problems and to access the data provided to the participants, please visit https://vast-challenge.github.io/2019/GC.html.

Submissions

Participants are required to submit their entries on a standard answer form, along with a video explaining how visual analytics were used to help solve the challenges. Please consider both parts of the submission in your review. If you have difficulty reading the answer form or playing the video, please contact us at vast-challenge@ieeevis.org for assistance.

Scenario

The VAST Challenge 2019 presents three mini-challenges and a grand challenge for participants to apply visual analytics research and technologies to help a city grapple with the aftermath of an earthquake that damages their nuclear power plant.

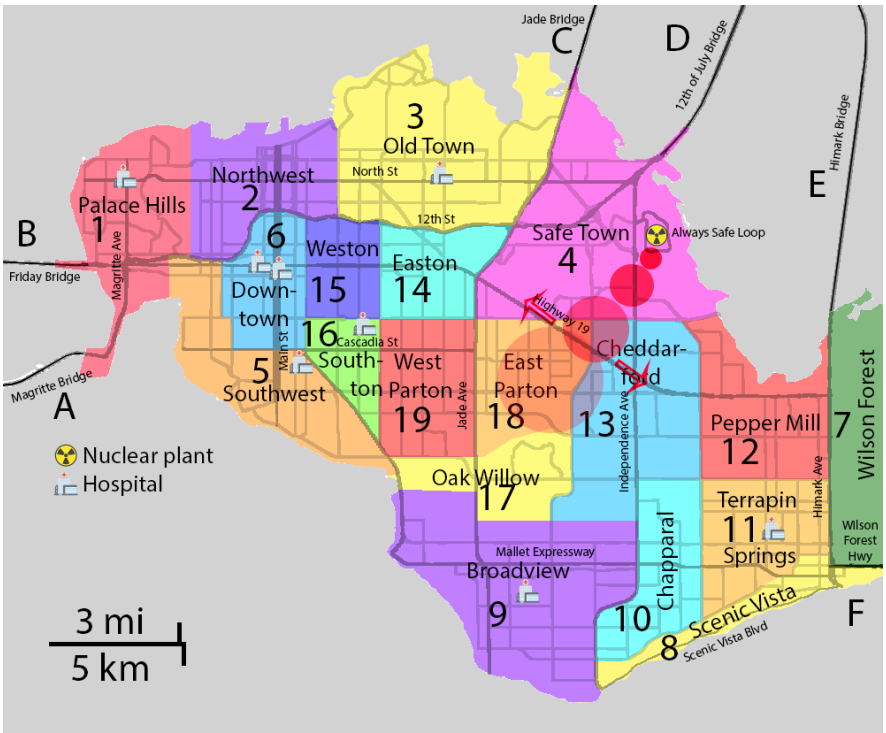


Figure 1. Map of St. Himark, with neighborhood names and numbers.

Overview

St. Himark is a vibrant community located in the Oceanus Sea. Home to the world-renowned St. Himark Museum, beautiful beaches, and the Wilson Forest Nature Preserve, St. Himark is one of the region's best cities for raising a family and provides employment across a number of industries including the Always Safe Nuclear Power Plant. Well, all that was true before the disastrous earthquake that hits the area during the course of this year's challenge. Mayor Jordan, city officials, and emergency services are overwhelmed and are desperate for assistance in understanding the true situation on the ground and how best to deploy the limited resources available to this relatively small community.

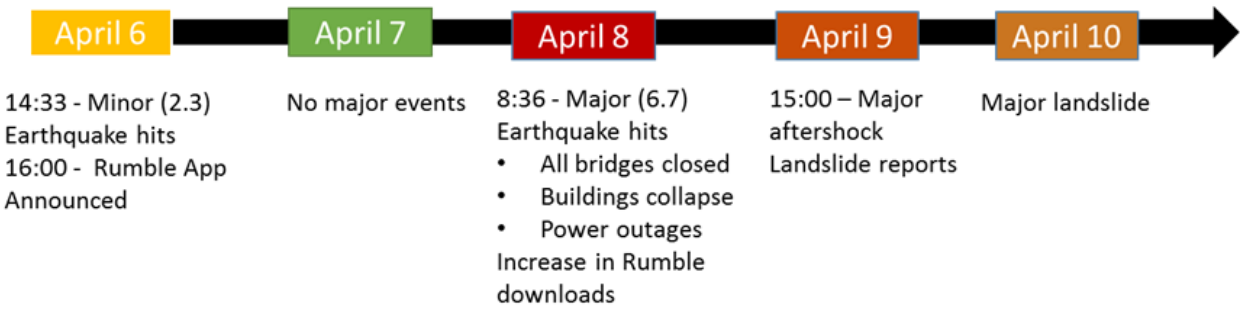
Grand Challenge: Putting it All Together

No additional data is provided for this grand challenge. Contestants are expected to utilize the three mini-challenge datasets to tackle this problem. Data available from these mini-challenges are:

- Mini-Challenge 1
  - Shake maps showing the earthquake
  - Rumble App data – categorical data where citizens can report when they feel shaking and indicate the conditions in their area
- Mini-Challenge 2
  - Data from mobile sensors taking radiation count readings
- Mini-Challenge 3
  - Social media data related to the earthquakes

Timeline of Events

The most significant events in the scenario span the mini-challenges and are included in the timeline below:



April 6

The scenario starts off on an ominous note when a small rumble shakes the city. In a lucky coincidence, the city also announces the new Rumble mobile application which allows citizens to report when they

feel earthquakes and what the conditions are in their neighborhood. The small tremor provides incentive for people to download the application and try it out.

April 7

Life returns to normal as citizens go about their normal routine. The Himark Science Society discusses a meeting and mobile sensors are shown meeting up.

April 8

Disaster! A major earthquake hits St. Himark at the beginning of the work day. Buildings are destroyed, bridges are damaged, power is lost, and traffic grinds to a halt.

Social media topics suddenly shift from mundane topics to panic and concern.
Mobile sensors stop moving as traffic is halted. Power outages sporadically cause gaps in Rumble reports.

April 9

The day after sees the city in recovery mode. As power is restored, Rumple app reports start coming back in. However, in the midst of recovery a major aftershock hits renewing the fear and concern of the citizens. Worse still, the aftershocks cause liquefaction where buildings sink into the ground and landslides cause additional damage

April 10

Let it pour! Aftershocks have become a minor affair but now the rainclouds move in. While trying to recover and assess the situation, a huge downpour adds to residents' misery. Landslides hit previously unaffected sections of the city (Scenic Vista).

General Trends

Certain trends and characteristics of the datasets should quickly become apparent to the contestants. Social media data responds the quickest to events but also has the most noise and uncertainty. People talk about numerous topics and even relevant conversations could be difficult to extract meaning from. Rumble App theoretically contains only relevant data since it is a specific purpose tool. However, people do not instantly fill out a survey as soon as an event happens so events here are typically delayed. Further, people in different neighborhoods may interpret damage differently and cause confusion. The sensor data from MC2 is very timely but without must be taken in context to line it up with the other datasets.

Further uncertainty can be introduced due to damage in the city which makes it impossible for mobile sensors to reach an area, power outages making people unable to send Rumple reports or the server unable to process them.

Contestants must navigate these difficulties and show how their tool helps makes sense of data in context and explain how they can resolve uncertainty.

Questions for Participants

The following are the questions participants were asked to respond to. As you review the submissions, keep in mind that we are looking for submissions that go above and beyond rudimentary visualization techniques and shallow analyses. We are looking for visual analytics approaches that provide context for the data, support interactive exploration to identify and understand patterns. We encourage creativity. We are also particularly interested in representations of uncertainty in the visualization. Analyses should provide both answers and evidence or rationales, and should demonstrate critical thinking about the data. It is even better if assumptions, multiple competing hypotheses are documented as well.

As you develop your review of the submission, please also consider the following questions.

- Did the team use all of the mini-challenge data to synthesize a solution? Did it provide a comprehensive overview of the situation in the city?
- Were the findings reasonable and logically derived from the data? Did they highlight uncertainty in the results?
- Did the submission provide information emergency responders and city planners could use to allocate resources?
- Did the team develop an innovative visual analytic tool? Alternatively, did they use an existing tool in an innovative way?
- Did visualizations enable the analysis process? Or did they merely illustrate conclusions? Did the submission rely more heavily on non-visual analytic approaches?
- Did their tool allow useful interactions?
- Did they use all the available data? Was the submission clear?

The following are the questions for participants:

1. **Generate a master timeline of events and trends during the emergency response. Indicate where it is uncertain and which data underlies that uncertainty.**

   The timeline of events is presented above.

2. **Identify and explain cases where data from multiple mini-challenges help to resolve uncertainty, and identify cases where data from multiple mini-challenges introduces more uncertainty. Present up to 10 examples. If you find more examples, prioritize those examples that you deem most relevant to emergency response.**

   Participants may identify multiple examples. Generally, participants should be using data across multiple mini-challenges to confirm or disconfirm their hypotheses. For example, the Mini-Challenge 3 social media data can be used to explain patterns in the Mini-Challenge 1 data.

3. **Are there instances where a pattern emerges in dataset before it presents itself in another? Could one data stream be used to predict events in the others? Provide examples you identify.**

   The answers may vary. Generally, neighborhood damage is reflected immediately by sensors in the neighborhood. Social media reports will next report the issue, and then, finally, the Rumble app will report.

4. **The data for the individual mini-challenges can be analyzed either as a static collection or as a dynamic stream of data, as it would occur in a real emergency. Were you able to bring analysis on multiple data streams together for the grand challenge using the same analytic environment? Describe how having the data together in one environment, or not, affected your analysis of the grand challenge.**

   Responses may vary. We are looking for thoughtful answers regarding how the form of the data may affect their insights.