

# Reconstructing the Kronos Incident: A Visual and Analytical Approach

Bhavarth Pandya & Qi Pan | CICS, University of Massachusetts Amherst, USA

## The Incident

On the island of Kronos, members of the company GASTech have gone missing during a celebration of the companies successful IPO. Who is responsible? What happened? Can we reconstruct the events given limited data? The problem setup was a part of the 2014 VAST Challenge, we attempted:

- Mini-Challenge 1: Provide an up to date look on everything that has happened regarding the disappearance to the authorities of Kronos
- Mini-Challenge 2: Identify the routines and patterns of GASTech employees to see if they related to the incident at all

## Email Communication Network

### Overview

- Internal emails just prior to disappearances between GASTech employees animated over time (nodes = employees, arrows = emails sent)
- Email arrow colors indicate the sentiment of the subject header classified with a simple Naive Bayes model (green = pos, red = neg)
- Employees move towards the center of the graph as the send emails, and away from the center as they receive emails giving us an intuition of who the "commanders" and "followers" are

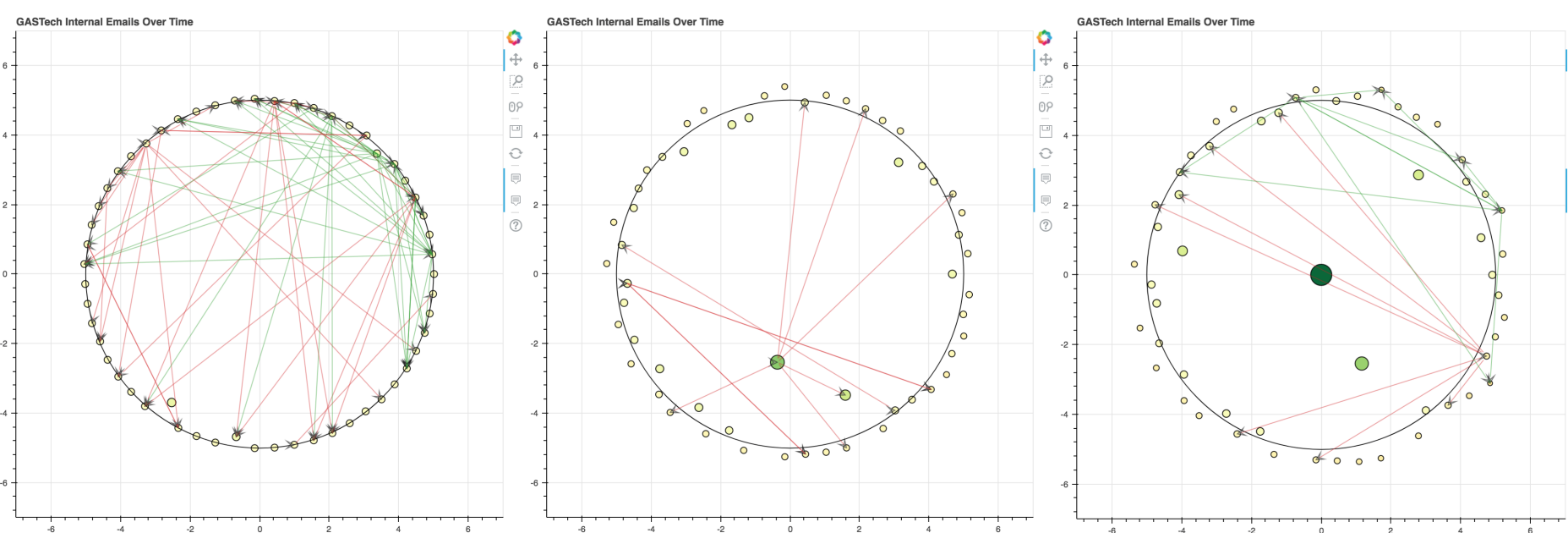


Fig. 1: Email Network at Hour 1, 65, and 129

## Article Timeline

### Overview

- Two timelines for news articles, one for the 20th and 21st January 2014 and another for the previous 10 years
- For each article in the timeline it presents the entities involved in the article as a 'word stack'
- The font size of the entity depicts frequency of occurrence in the article and the color depicts the sentiment
- When combined with the email network, we were able to shortlist GASTech employees who were likely to be connected to the suspected kidnappers and show that they were coordinating prior to the disappearances

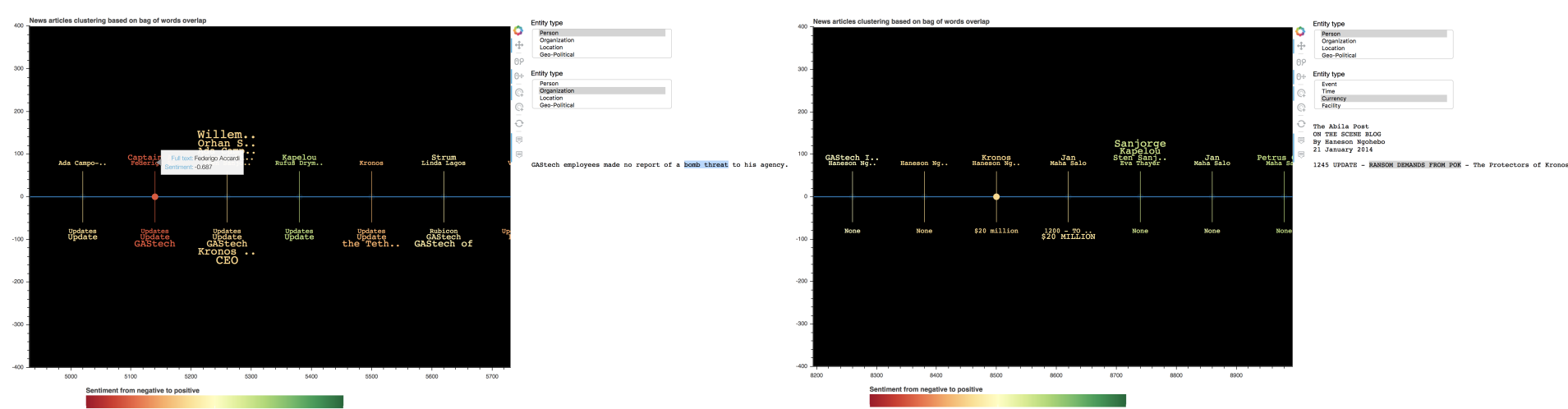


Fig. 2: Timeline visualization showing sentiment analysis and entity recognition

## GASTech Car GPS Trackers

### Overview

- Animated the movements of GASTech vehicles a few weeks prior to the disappearances.
- Helps identify which cars/employees were in close proximity over the time of the data to a user specified point
- Can play, pause, and skip around the time frame, distance calculations are cumulative up to that point

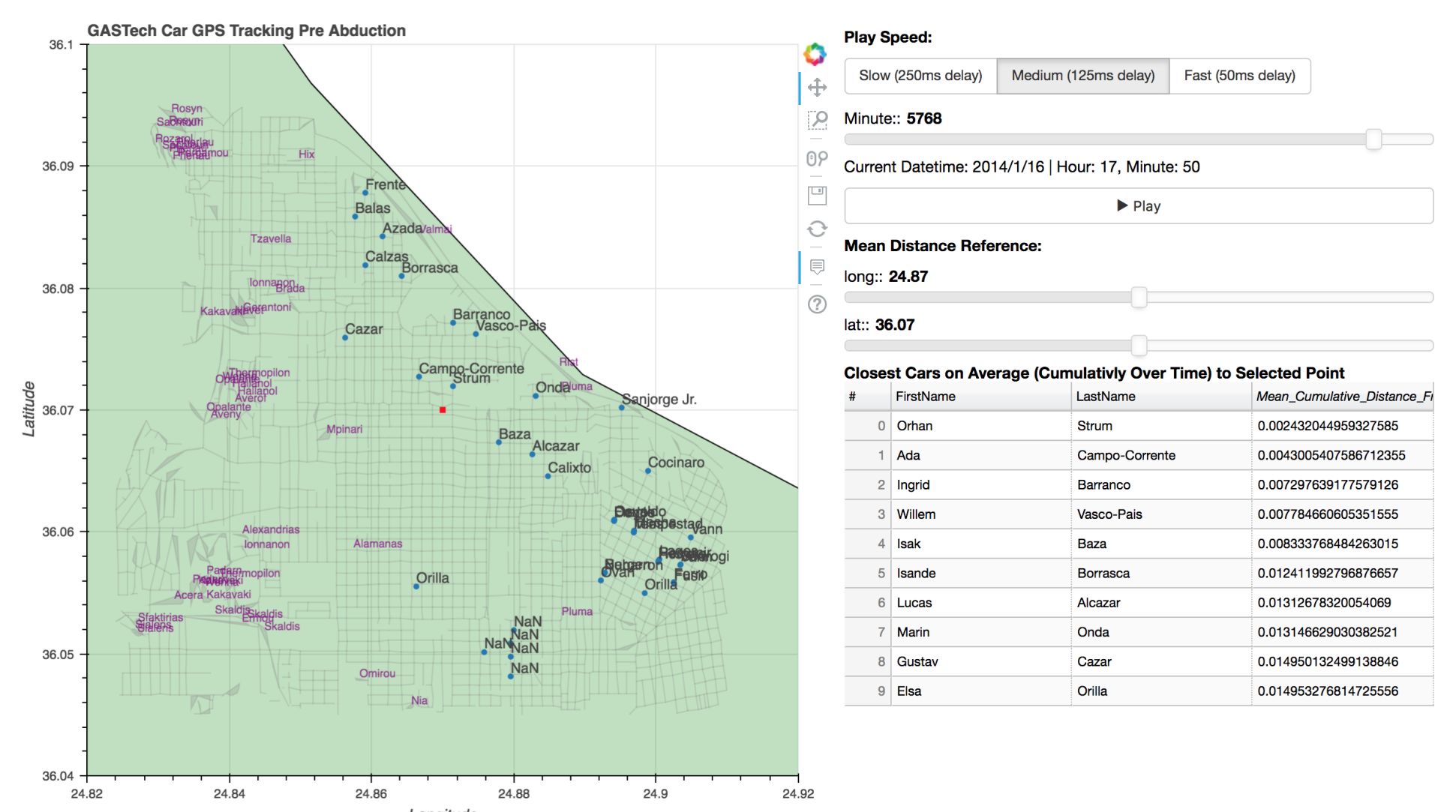


Fig. 3: GASTech Car GPS animation, calculates and sorts the average distance of each car to a user specified point on the map of Abila, Kronos

## Credit Card History

### Overview

- Time vs. date scatter plot for credit card usage for every location showing patterns in card usage as well as detecting anomalies e.g., if someone visits some place at odd hours
- Histograms of people frequenting each location to find out who frequents what places and at what times.
- Heat map of co-location of people giving the information about who is meeting whom and how frequently
- Based on our GPS visualization, we saw that our identified suspects met frequently on the outskirts of Abila; the credit card heatmap supports this by showing many co-occurrences between the suspects

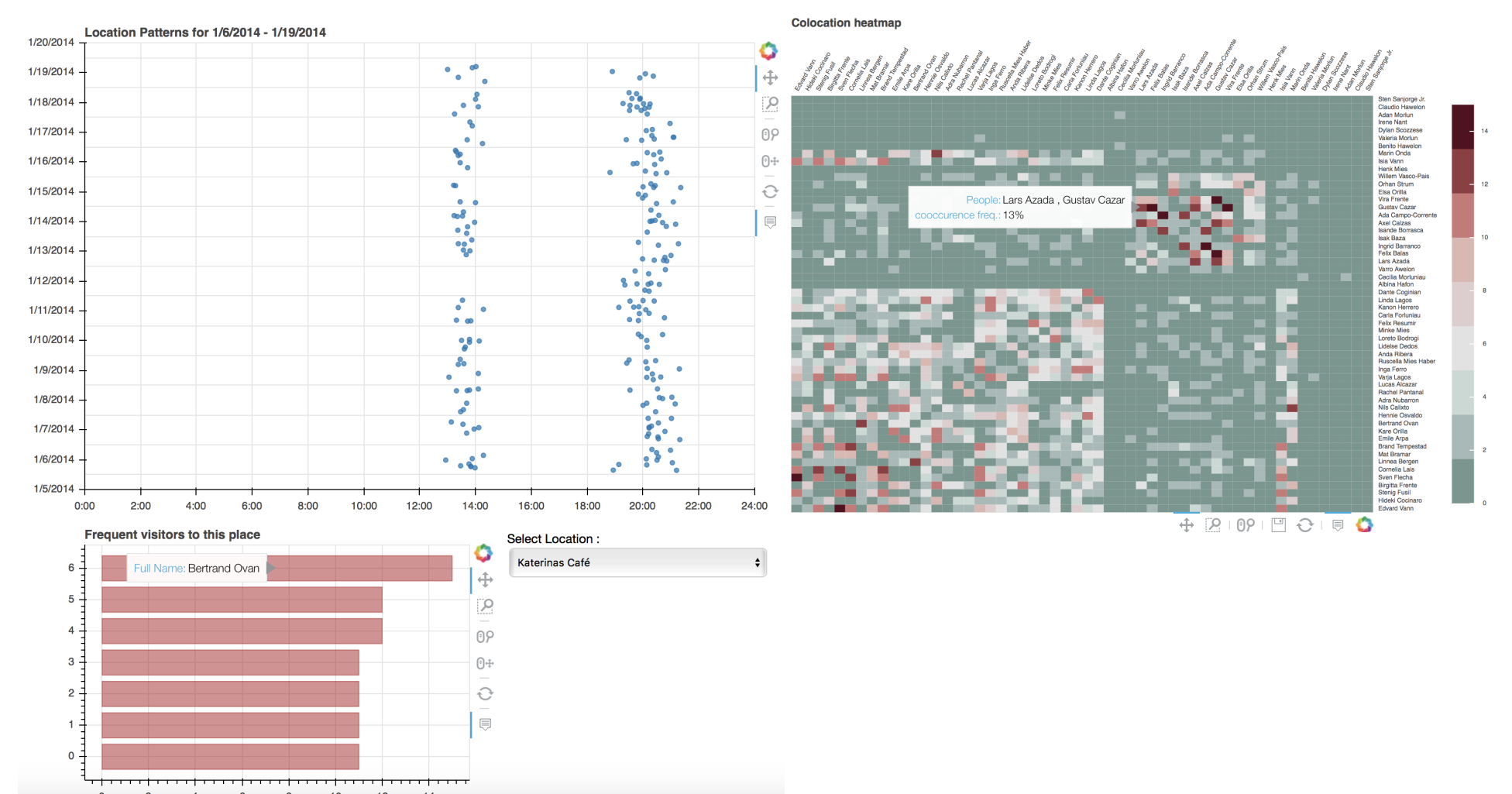


Fig. 4: Scatter plot, histogram and heatmap depicting who frequents which place and meets whom