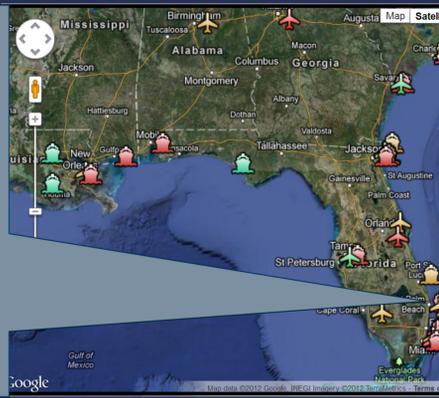


```

Port
Port code
Airport
Commodities:
10 commodity A
5 commodity B
3 commodity C

42.37% relative to all ports

Top 10 commodities:
10 commodity D
5 commodity E
3 commodity F
2 commodity G
2 commodity H
    
```



# Technical Reachback

SUMMER 2015

## Interns

- Noah Bergman**, University of Southern California 2018, Computer Science
- Jordan Fisher**, Rensselaer Polytechnic Institute 2015, Aerospace Engineering
- Steven Rivera-James**, University of California, Berkeley 2013, Media Studies
- Hannah Robinson**, University of California, Davis 2019, Materials Engineering
- Kevin Ross**, Biola University 2017, Aerospace Engineering
- Samuel Wagner**, University of California, Davis 2017, Electrical Engineering
- Nathan Wang**, University of California, Irvine 2018, Computer Science
- Sally Zhao**, Carnegie Mellon University 2018, Chemical Engineering

## Mentors

- Ken Black**, Org 8137 Exploratory Sys Technologies
- Ethan Chan**, Org 8954 Quantitative Modeling & Analysis
- Craig Hokanson**, Org 8944 CA App Development & Tech Library
- William Johnson**, Org 8131 Rad/Nuc Detection Materials & Analysis
- Edward Walsh**, Org 8954 Quantitative Modeling & Analysis
- Matthew Wong**, Org 8954 Quantitative Modeling & Analysis

Sandia National Laboratories, CA  
U.S. Department of Energy

**Abstract:** Technical Reachback is a Department of Homeland Security program that assists federal, state, tribal, and local law enforcement in assessing radiological threats reported within the United States and at its border by providing situational awareness. U.S. ports of entry have radiation portal monitors and handheld gamma detectors that detect radiation emissions from vehicles entering the country. Sandia produces software that is used to analyze data from radiation monitors in order to distinguish between types of radioactive cargo and help officials determine whether a vehicle with an anomalous radiation profile is in fact a threat.

**Quality Control:** A major challenge of Secondary Reachback is verifying the accuracy and usability of software applications. As the Quality Control Team, we help to meet this challenge through rigorous examination of each application's individual functions and overall functionality. This includes comprehensive manual field comparisons, automated test scripts, and extensive scrutiny of graphical user interfaces. Errors, findings, and general comments are submitted to a bug-tracking system for the developers to examine. Our work helps to ensure software products are always in a stable, working condition. Besides quality control, time is also devoted to improving, extending, and developing software applications.

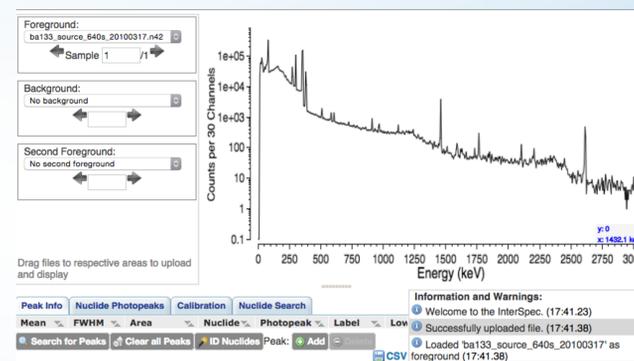
**Quix:** Quix is a multiuser, web-based file manager. It allows its users to manage and/or share files over the internet or an intranet. Users can utilize Quix to exchange and manage mission critical files for their respective projects. Current features being implemented include a password strength meter, mouse listener for timeout refresh, downloadable directories (current feature only allows for individual files), drag and drop upload of files, and rename functionality.

**LSS Calls Log App:** This mobile application for iPhones and iPads displays data Services) regarding radiological events at the on phone calls made to Laboratory and Scientific (LSS) U.S. border. The app displays all ports of entries as pins on a map; additional information is displayed in a table. Eventually, users will be able to filter call data by date range, isotope, and location.

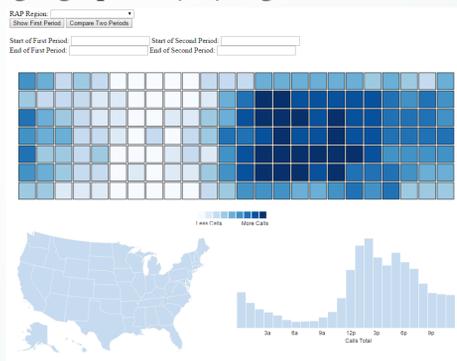
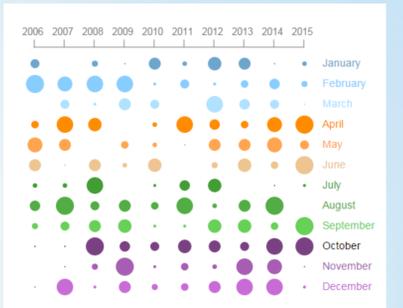


**TRB Machine Learning:** The main focus of machine learning is to use classification algorithms to predict and verify our data's attributes. However, we also aim to explore the possibilities of more diverse classes of algorithms. We search for unconsidered trends in the data through clustering and association rule learning. Finally, our team aims to automate classification algorithms on new incoming data in order to verify the integrity of the data.

**LSS Top 10 Categories Visualization:** This visualization consists of two interactive pie charts. One shows the 10 most common radioactive commodities, such as kitty litter, that cross into the United States. Selecting a commodity displays additional information on a second pie chart. The pie charts provide an easy-to-use visualization of the commodities that raise radiological alarms at our borders.



**LSS Calls Comparison Visualization:** This interactive visualization compares the number of phone calls in a given month to the same month in previous years. The size of a circle represents the number of calls. This visualization will eventually allow the user to filter the data geographically by region and state.



**LSS Heatmap:** This app renders the LSS phone-call database as a temporal heatmap. As an analyst hovers over a grid, a bar graph of the days' calls is displayed. Users can filter the calls geographically by selecting a state on the map, or an RAP region from the dropdown menu. The application can compare two time periods, allowing analysts to more easily identify anomalous activity.