A PYTHON QGIS PLUGIN
FOR TWITTER ANALYSIS DURING EMERGENCIES

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What problem were we trying to solve?

First, let’s establish some context.
Natural and man-made disasters create emergency response and damage assessment needs.

Remote sensing addresses many of these emergency response and damage assessment needs.
Unfortunately satellites are not always overhead, and planes and helicopters have limited flight times.

This means that a lot of ground truth is missed.
We are exploring augmenting remotely sensed data with Volunteered Geographic Information (VGI).

Georeferenced tweets can provide situational awareness.

Other social media can also be used, such as Instagram, Google Plus, or Facebook.
Safecast is an example of citizens explicitly sharing radiation and pollution observations.

(Image from www.safecast.org)
So how to best use VGI?

Let’s look at what might be a work flow for a typical analyst.
Analyst

Civil Air Patrol

Tweets

Satellite data

Products

Decision Makers
These **products** will typically include **maps**.

Naturally the analyst will use a **Geographic Information System (GIS)** to create these maps, among other products.
Bringing in remotely sensed data into a GIS is easy, but VGI may not be so convenient.

Developed a proof of concept system that would make it more convenient to read tweets.

We chose to use QuantumGIS as our prototype platform.
QuantumGIS is a free, open-source geographic information system.
QuantumGIS (qgis) is:

- Open source, **free**
- Was started in 2002
- Version 1.0 was released in 2007
- Current version (as of 3/25/2015) is 2.8.1
- Runs on **Windows, Macs, *nix, and even Android tablets**

[http://www.qgis.org/en/site/]
qgis also supports python (2.7.4).

It has a built-in python console so that users can interact programmatically with qgis.

However, it supports user-added plugins written in C++ or python.

Most qgis plugins are in python.
On the left you see the list of all plugins available for your QGIS, both installed and available for download. Some plugins come with your QGIS installation while most of them are made available via the plugin repositories.

You can temporarily enable or disable a plugin. To enable or disable a plugin, click its checkbox or double-click its name...

Plugins showing in red are not loaded because there is a problem. They are also listed on the 'Invalid' tab. Click on the plugin name to see more details, or to reinstall or uninstall this plugin.
So let’s talk about the plugin we developed, TweetWrangler.
Tweet Wrangler

Loads georeferenced tweets

Tags: twitter

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Installed version: 0.1 (in /Volumes/Coletti Data/Mark Coletti Home/.qgis2/python/plugins/TweetWrangler)
<table>
<thead>
<tr>
<th>Screen Name</th>
<th>Tweet</th>
<th>Tweeted At</th>
</tr>
</thead>
<tbody>
<tr>
<td>lameyhopf</td>
<td>arts fest preparations @ State College Municipal Building <a href="http://t.co/26HBFfQGeG">http://t.co/26HBFfQGeG</a></td>
<td>2014-07-08 18:48:06</td>
</tr>
<tr>
<td>gpioppi</td>
<td>Currently in charge of 10 14 year olds...... What is my life</td>
<td>2014-07-08 18:45:33</td>
</tr>
<tr>
<td>__shoes</td>
<td>@analisa_seader HAHAHAHAHA</td>
<td>2014-07-08 18:42:37</td>
</tr>
<tr>
<td>Kristinaa_Bee</td>
<td>I'd rather get shot in the leg but thanks coach <a href="http://t.co/AKfZcWi0t0">http://t.co/AKfZcWi0t0</a></td>
<td>2014-07-08 18:40:46</td>
</tr>
<tr>
<td>mackslenoo</td>
<td>@azs5238 <a href="http://t.co/UECOzgU9KI">http://t.co/UECOzgU9KI</a></td>
<td>2014-07-08 18:40:23</td>
</tr>
<tr>
<td>BEChorner</td>
<td>@kaylav</td>
<td>2014-07-08 18:35:34</td>
</tr>
</tbody>
</table>
Let’s dive into some of the details of what makes up a qgis plugin.
Qgis plugins live here:

$HOME/.qgis2/python/plugins/

This directory contains directories for each plugin:

- python code for the **plugin**
- **resource files** for the toolbar icon
- a **Qt** user interface description file
Generally a **plugin** has the following parts:

- **__init__.py**, invoked at qgis start up to initialize plugin
- a **main class** that initializes the dialog, and has a `run()` method to invoke it when the user selects the plugin
- a **dialog class** that inherits from `QtGui.QDialog` and a **Qt class** generated from the UI file
Qt is a C++ cross-platform development toolkit

This is what enables qgis to run on Windows, *nix, and MacOS.

It uses an easy to learn “slot and signal” system to connect UI events to class methods.

Qt provides “QtDesigner” to allow for visual building of GUIs.

http://www.qt.io/developers/
PyQt provides python bindings to Qt.

The python plugins use PyQt to create and interact with their dialogs.

http://www.riverbankcomputing.co.uk/software/pyqt/intro
If this sounds a little complicated, qgis comes with a “meta-plugin,” PluginBuilder.

PluginBuilder creates and populates a directory with all the files necessary to start plugin development.
That covers general plugin development.

Let’s talk about some of the details behind the twitter plugin, as well as a couple other similar plugins.
TweetWrangler is written using twython.

(https://twython.readthedocs.org/en/latest/)

Uses Twitter REST API and Outh 2 authentication.
At qgis startup:

1. `__init__.py` is invoked with connection to internal qgis interface
2. Creates `TweetWrangler` object passing along internal interface
3. `TweetWrangler` establishes connection via Twython to Twitter
4. creates, but does not show, the dialog
5. initializes other internal state
When plugin is invoked from qgis:

1. `TweetWrangler.run()` invoked
2. shows the dialog
3. user enters search criteria into dialog
4. when the dialog is closed, return value is checked to see if user selected “Ok” or “Cancel”
5. if former gets search information from dialog
6. uses twitter connection to get tweets
7. adds points to “tweets” layer corresponding to new tweets
We also developed a qgis plugin that uses the Arizona State University’s TweetTracker.

This uses the Twitter Streaming API.

A user can create a TweetTracker account to begin saving a stream that matches search criteria.

The qgis plugin uses the TweetTracker API to gather these tweets.

http://tweettracker.fulton.asu.edu/
Safecast also provides an API, and we similarly developed a plugin that will read those observations.

https://api.safecast.org/
We feel that our plugins show that the proof of concept has merit:

Developing plugins is a viable approach for getting certain types of VGI to to analysts.
First stop for qgis plugin development:

https://plugins.qgis.org/

The qgis plugin developer’s cookbook:

http://docs.qgis.org/testing/en/docs/pyqgis_developer_cookbook/
The funding for this research was kindly provided by the Office of Naval Research.

Grants N0014-13-1-0784 and N0014-14-1-0208

• Guido Cervone, Penn State, P.I.
• Rebecca Goolsby, ONR, P.M.