

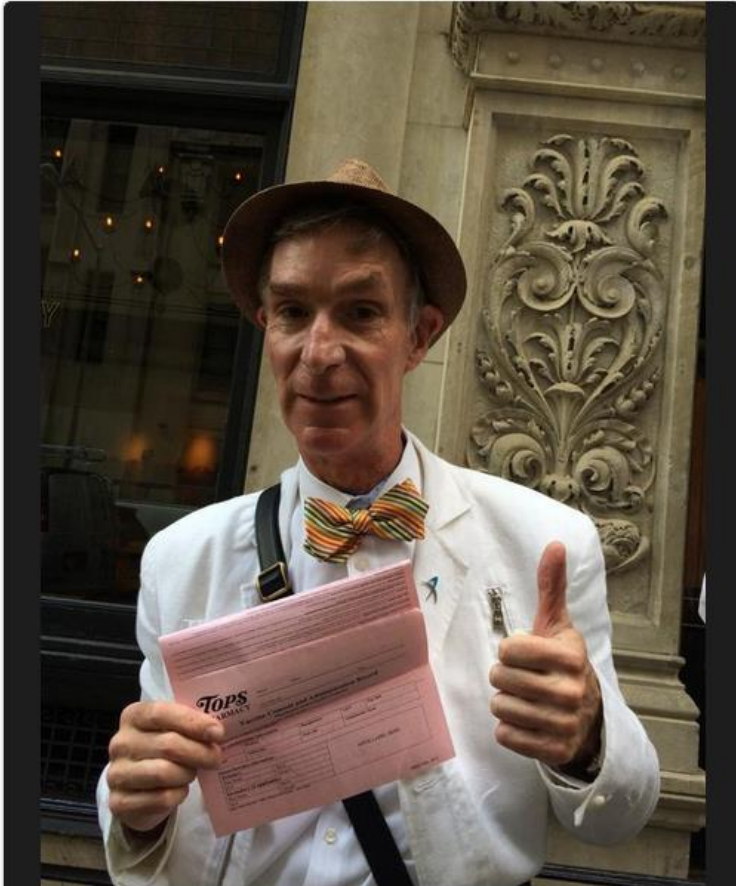


SMART Dashboard and Social Media Analytics for disease outbreaks, disaster responses, and major events

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PostDoc., HDMA, SDSU

2014.09.18

1



Bill Nye ✓

@TheScienceGuy

Follow

Got my flu shot; you should too-- for all of our sakes. It's evolution!

12:26 PM - 26 Aug 2014

1,465 RETWEETS 2,762 FAVORITES



7



CDC Flu ✓

@CDCFlu

Follow

Don't let the #flu catch you by surprise this season. Get prepared with these tips: 1.usa.gov/1cGv6jr #NatlPrep

6:08 AM - 16 Sep 2014

101 RETWEETS 31 FAVORITES



88

5



moomoo ✓

@CHRIS_andtell

Follow

but DC kids bump club music, like the ravens, try do the avenue & got the bird flu 🤮 yall love Baltimore! →→→

8:40 AM - 10 Sep 2014

90 RETWEETS 20 FAVORITES



89

6



Shane Murphy

@Shanehasabeard

Follow

Got my flu shot at the Target pharmacy today. Next week I'm having surgery at Costco.

2:20 PM - 27 Oct 2013

238 RETWEETS 364 FAVORITES



88

8



Lana ✓

@LanasTwittah

Follow

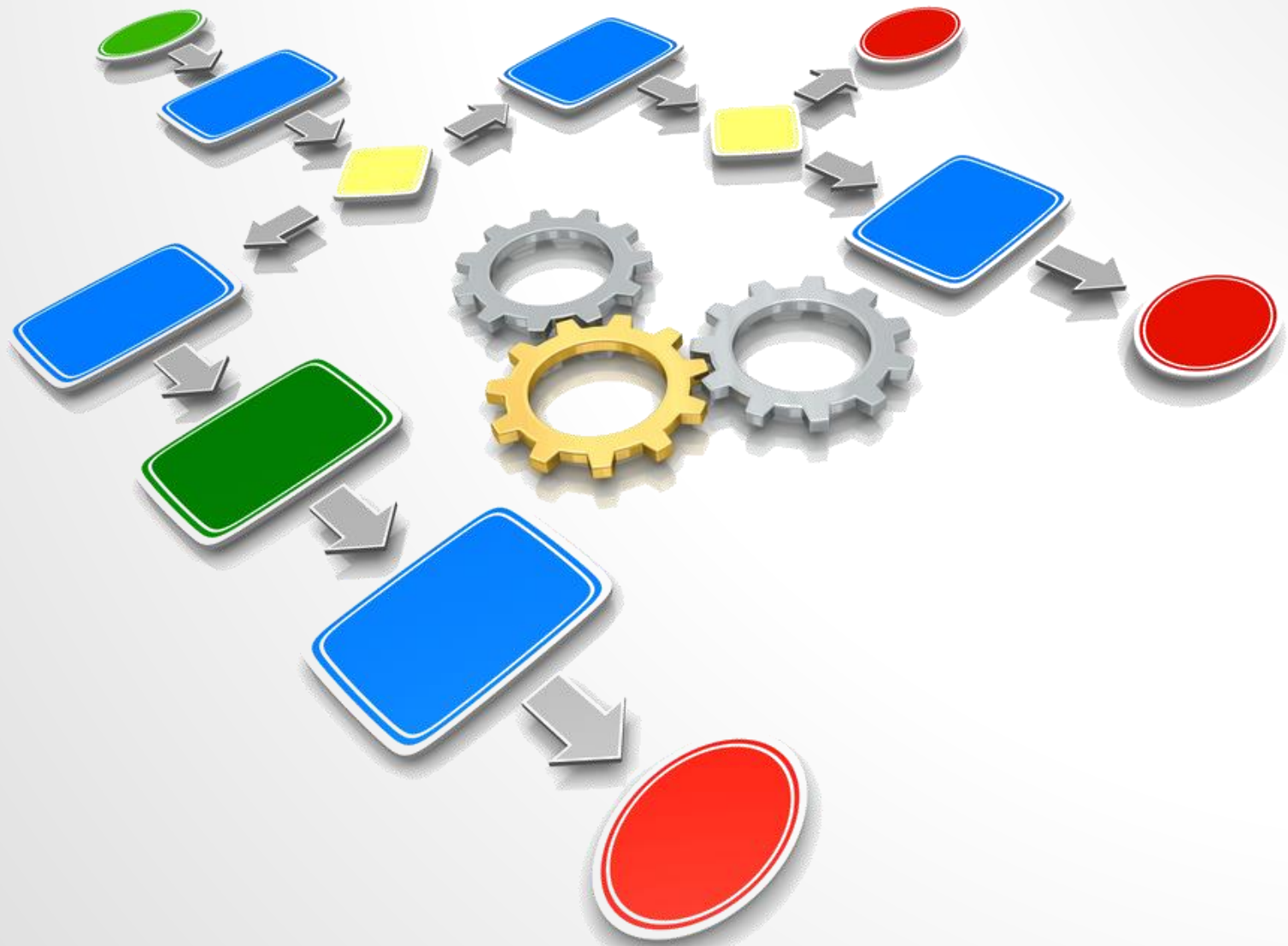
Remember that stomach flu everyone had in January? Another extremely similar one is going around. Take care of yourselves! It's horrible :(

11:31 AM - 15 Sep 2014

82 RETWEETS 394 FAVORITES



79



SMART Social Media and Analytic Research Testbed

<http://vision.sdsu.edu/hdma/smart/>

The screenshot displays the SMART Social Media and Analytic Research Testbed interface. The main dashboard is titled 'flu' and shows data for 'Human Dynamics in the Mobile Age'. The dashboard includes a 'Select a Target City' dropdown menu set to 'Top 30 US Cities', a 'Trend' graph showing 'Tweets from Top 30 US Cities on 2014-09-16' with a 'Filtered' legend, and a 'Top URL' section listing the most referred web pages. A central modal window is open, titled 'About Human Dynamics Center, San Diego State University'. The modal contains a description of Human Dynamics as a transdisciplinary research field, the mission of the Center for Human Dynamics in the Mobile Age (HDMA), and a selection of topics: Flu, Whooping Cough, Wildfire, Drugs, and Aztecs. The background interface shows a 'Tweets from Top 30 US Cities' graph with a value of 1396, a 'Top URL' section with a value of 42441, and a 'Top URL' section with a value of 42441. The dashboard also includes a 'Keywords' section and a 'Top URL' section with a value of 42441. The interface is dark-themed with blue and green accents.

About Human Dynamics Center, San Diego State University

Human Dynamics is a transdisciplinary research field focusing on the understanding of dynamic patterns, relationships, narratives, changes, and transitions of human activities, behaviors, and communications.

The Center for Human Dynamics in the Mobile Age (HDMA) is a new research institute at SDSU to focus on research questions and analytical software development for human dynamics problems, such as disaster responses and disease outbreaks, urban problems, by monitoring information from mobile technologies and mobile devices (such as GIS, social media and GPS datasets).

Please select a topic

- Flu
- Whooping Cough
- Wildfire
- Drugs
- Aztecs

SMART

http://vision.sdsu.edu/hdma/sr



The screenshot shows a Twitter dashboard for the keyword 'flu'. At the top, there are four summary cards: '1396 Tweets from Top 30 US Cities on 2014-09-16', '7424 Tweets from Top 30 US Cities in past 7 days (2014-09-10 - 2014-09-16)', '23321 Tweets from Top 30 US Cities in past 30 days (2014-08-18 - 2014-09-16)', and '42441 Tweets from Top 30 US Cities since 2014-07-12'. Below these is a 'Trend' graph showing filtered tweets over time, and a 'Top Media' section with image thumbnails. A workflow diagram is overlaid on the dashboard:

- A large green box labeled **Geo-Targeting Search** is positioned over the trend graph, with a yellow arrow pointing down to the next step.
- A horizontal sequence of four green boxes: **Filter**, **Machine Learning**, **Statistics**, and **Spatial Analysis**, connected by yellow arrows pointing right.

SMART Social Media and Analytic Research Testbed

<http://vision.sdsu.edu/hdma/smart/>

flu
Log in

Human Dynamics in the Mobile Age

Select a Target City

Top 30 US Cities

Dashboard

- Index
- Word Cloud
- Trend
- Top URL
- Top Hashtags
- Top Mentions
- Top Retweet
- Top Media
- Top Cities

Keywords 2

1396

Tweets from Top 30 US Cities on 2014-09-16

7424

Tweets from Top 30 US Cities in past 7 days (2014-09-10 - 2014-09-16)

23321

Tweets from Top 30 US Cities in past 30 days (2014-08-18 - 2014-09-16)

42441

Tweets from Top 30 US Cities since 2014-07-12

Trend

Filtered

Daily Weekly Monthly

Top Media

All Past 30 Days Past 7 Days Yesterday

Top URL (The Most Referred Web Pages)

All Past 30 Days Past 7 Days Yesterday

#	Content	Count
1	<p>CDC Says "Take 3" Actions To Fight The Flu Seasonal Influenza (Flu) CDC CDC Says Take 3 Actions To Fight The Flu</p>	90
2	<p>Flu Season is Around the Corner Features CDC Everyone 6 months and older should get an annual flu vaccine. It takes about two weeks after vaccination for your body to develop an immune response. Get vaccinated now so you will be protected all season long!</p>	33
3	<p>http://funnient.com/site/post/1388</p>	26

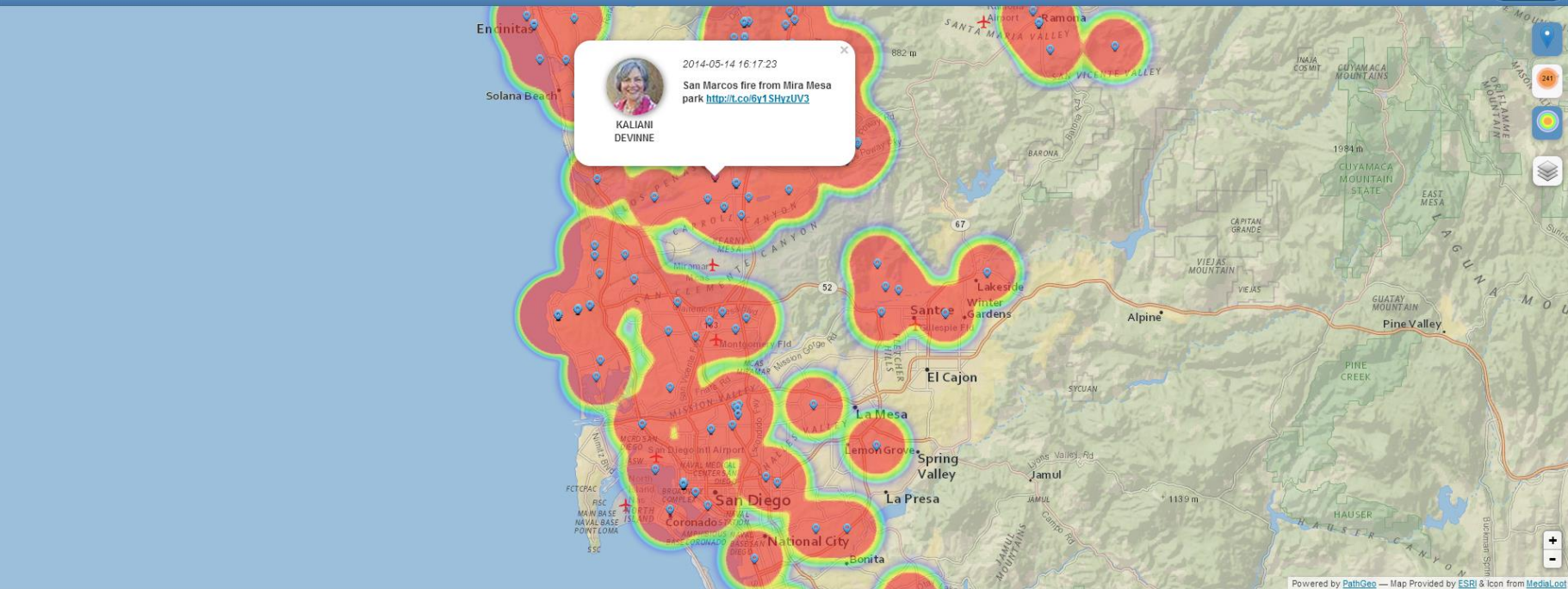
Word Cloud

All Past 30 Days Past 7 Days Yesterday

GEO-Viewer <http://vision.sdsu.edu/hama/wildfire/>

SAN DIEGO STATE UNIVERSITY cocos tweets about San Diego wildfires

Timeline



Showing 17 to 22 of 150 entries

ID	text	userName	dateTime	radius	Coordinates
17	San Marcos fire from Mira Mesa park http://t.co/By1SHyzUV3	KALIANI DEVINNE	2014-05-14T16:17:23.000Z	40 miles	-117.140, 32.930
18	View from @ifersix and @ifergan66 backyard in North San Marcos. #SanMarcosFire http://t.co/HLleeCeoCZ	righthandrule	2014-05-14T16:17:41.000Z	40 miles	-117.090, 33.003
19	San Diego fire rages on. #SanMarcosFire http://t.co/mwD6RoQORr	righthandrule	2014-05-14T16:18:31.000Z	40 miles	-117.090, 33.003
20	San Marcos, scripps, poway, lake side, fall took, Carlsbad are all on fire. WHY. Arson. Why. Why.	Brian Guendling	2014-05-14T16:30:43.000Z	40 miles	-117.031, 33.014
21	@slaterradio San Marcos fire from Alva Rd Rancho Bernardo. Be safe San Diego! http://t.co/hBucp3nvi	Sumi Perkovich	2014-05-14T16:37:21.000Z	40 miles	-117.112, 33.039
22	#sanmarcosfire from Rancho Bernardo near Westwood club. Lake hodge in foreground http://t.co/8QoHOeyFIR	Craig Hall	2014-05-14T17:19:33.000Z	40 miles	-117.080, 33.037



Human Dynamics in the Mobile Age

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BACKUP SLIDES



Search (REST) API
Streaming API

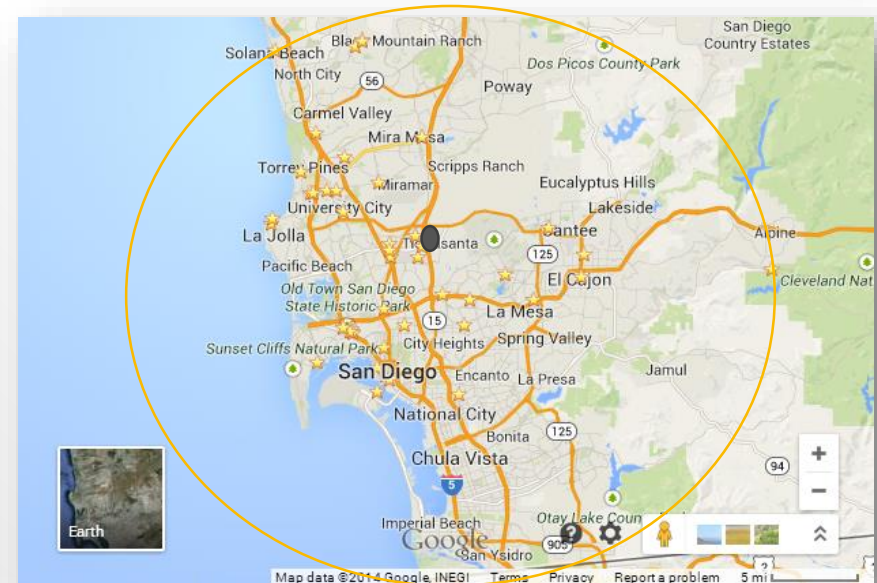
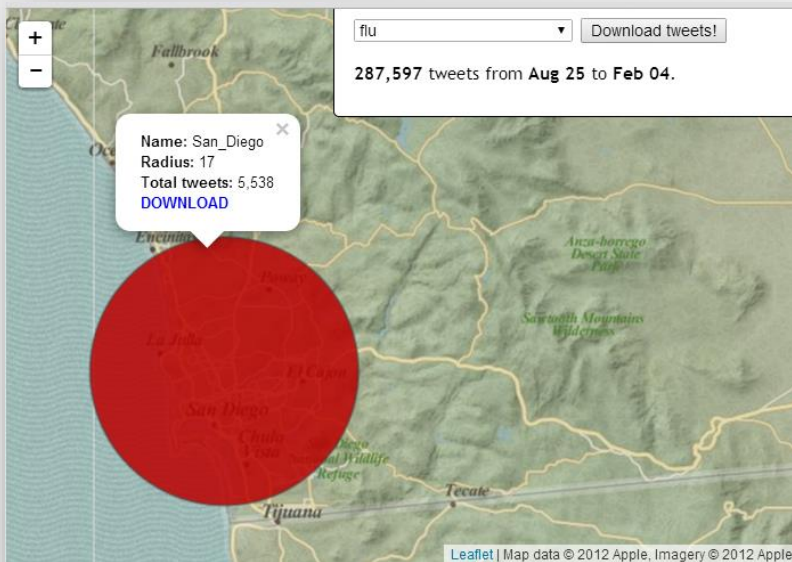


Source: **Twitter APIs** to collect public tweets

Keywords: **“fire”, “wildfire”, and “evacuation”**

Region: **40 miles** radius from the center of San Diego City.

Time: Daily update at 2AM.



Twitter Search API: based on the user profile (locations) and **gazetteers** (San Diego: include La Jolla, La Mesa, Chula Vista) (FREE for Search APIs)

- Over **84,000** tweets collected in 10 Days (6 different keywords) within San Diego (40 miles radius).

Keyword / Topic	Total Tweets	Tweets with GPS
Fire (many unrelated tweets)	51,495	4 % with GPS coordinates
wildfire	2,885	3 % with GPS
evacuation	6,477	3 % with GPS
san marcos	11,781	1 % with GPS
bernardo	2,871	4 % with GPS
carlsbad	10,513	2 % with GPS

(Search APIs can search historical tweets back up to 7 Days)

Filter

- Remove RT
- Remove tweets only containing URL addresses
- Remove users that have the keyword in their username

Machine Learning

- Collect a training sample
- Identify relevant keywords
- Machine learning

Statistics

- Top retweet
- Top URL
- Top hashtag
- Top mention

Spatial Analysis

- Hot spot analysis (Kernel Density)
- Overlay with layers (e.g., landuse, census data)

REST API - GetTweet

Geo-Targeting
Collection

Analysis

Visualization

http://vision.sdsu.edu/hdma/smart/getTweet/{topic}?
keywords={keywords}&
cities={locations}&
texts={texts}&
startDate={startDate}&
endDate={endDate}&
removeRT={true / false}&
format={json or geojson}

```
[
- {
  lang: "en",
- search_info: {
  - keywords: [
    "wildfire"
  ],
  - topics: [
    "wildfire"
  ],
  - search_areas: [
    - {
      radius: 40,
      name: "San_Diego_40_mi",
      - coordinates: [
        -117.137001,
        32.814998
      ]
    }
  ]
},
  source: "<a href='http://twitter.com/download/iphone' rel='nofollow'>Twitter for iPhone</a>",
  text: "RT @619ladycasper: 8 Firefighters Burned Battling California Wildfire http://t.co/eUEyPrBLd7 via @HuffPostGreen",
  created_at: "2014-08-12T04:55:46.000Z",
  created_at_local: "2014-08-11T20:55:46.000Z",
- entities: {
  - user_mentions: [
    "619ladycasper",
    "HuffPostGreen"
  ],
  - urls: [
    "http://www.huffingtonpost.com/2014/08/10/firefighters-burned-\_n\_5665908.html"
  ]
},
- user: {
```

REST API - GetReport

Geo-Targeting
Collection

Analysis

Visualization

`http://vision.sdsu.edu/hdma/smart/getReport/{topic}?
keywords={keywords}&
cities={locations}&
texts={texts}&
startDate={startDate}&
endDate={endDate}&
removeRT={true / false}&
format={json or geojson}`

```
{
  name: "wildfire",
  startDate: "2014-07-22T16:53:21.030Z",
  endDate: null,
  updateTime: "2014-08-12T07:52:50.179Z",
  - keywords: [
    "wildfire",
    "#4SFire",
    "#SanDiegoFire"
  ],
  - index: {
    newTweets: 7,
    totalTweets: 50
  },
  - applications: [
    - {
      url: "http://vision.sdsu.edu/hdma/wildfire/",
      name: "Wildfire GEO-Viewer"
    }
  ],
  - searchAreas: {
    - counts: [
      - {
        - geo: {
          type: "Point",
          - coordinates: [
            -118.412002,
            34.112098
          ]
        },
        utc_offset: -8,
        radius: 40,
        name: "Los_Angeles_40_mi",
        - groups: [
          "social"
        ]
      }
    ]
  },
}
```