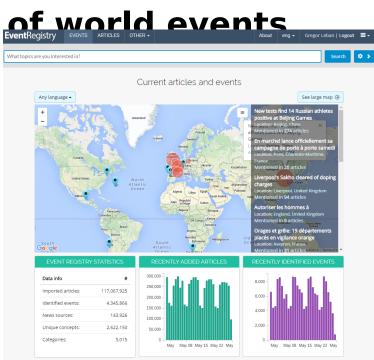
Event Registry

Gregor Leban

Jozef Stefan Institute

Event registry

- http://eventregistry.org/
- Event registry is a system for
 - collecting news content published globally
 - automatic identification of world events from news articles
 - Extraction of core event information
- Extensive search options
- Rich visualization options



What is an event?

- Event = any significant happening in the world
- Assumption: If something is significant eported by various news publishers
- Event is identified through a collection of news articles that report about the same



Flydubai plane crashes in Russia; 62 dead

9 609

WHEN: Sat, March 19, 2016 WHERE: Rostov-on-Don, Russia

 $CATEGORIES: Society \rightarrow Issues \rightarrow Transportation\ ,\ Science \rightarrow Technology \rightarrow Aerospace\ ,\ Business \rightarrow Transportation\ and\ Logistics \rightarrow Aviation\ .$

ENTITIES: Rostov-on-Don, Russia Dubai, United Arab Emirates Russia Boeing Flydubai

KEYWORDS: Airport Boeing 737 Fixed-wing aircraft Airline Runway

ARTICLES: 815 (362 English, 92 German, 106 Spanish, 21 Portugese, 28 Italian, 87 French, 5 Russian, 32 Turkish, 66 Chinese, 16 Croatian)

A CCTV camera captured the moment the aircraft exploded on the runway A FlyDubai Boeing 737-800 has crashed in a fireball while it attempted to land at a Russian airport. The passenger jet was believed to be making its second attempt to land at Rostov-on-Don airport in poor visibility. A video published on Youtube appears to show a fireball as the aircraft crashes into the ground. This is believed to be the moment the crashed on landing at Rostov-on-Don airport in Russia The aircraft...

Event registry pipeline

Data collectio n Article-level processing

Event construction

Event storage & maintenanc

Semantic annotation

Extraction of date references

Detection of article location

Crosslingual article matching

Detection of article duplicates

Article clustering

Crosslingual cluster matching

Event formation

Event info. extraction

Filling event template

Identifying related events Manual event administration



Fronten d interfac

API access

Main strea m news



Event registry pipeline







Event construction



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Fronten d interfac

API access

Main strea m news



Input data

- We use a data collection service News Feed
- http://newsfeed.ijs.si/
- Monitoring ~100k mainstream news RSS feeds
- Data volume: ~300k articles per day
- 15 languages used in Event Registry:
 - eng, ger, spa, chi, slo, cat, por, ita, fra, rus, ara, tur, cro, ser

Event registry pipeline







Event construction



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API access

Main strea m news



Article semantic annotation

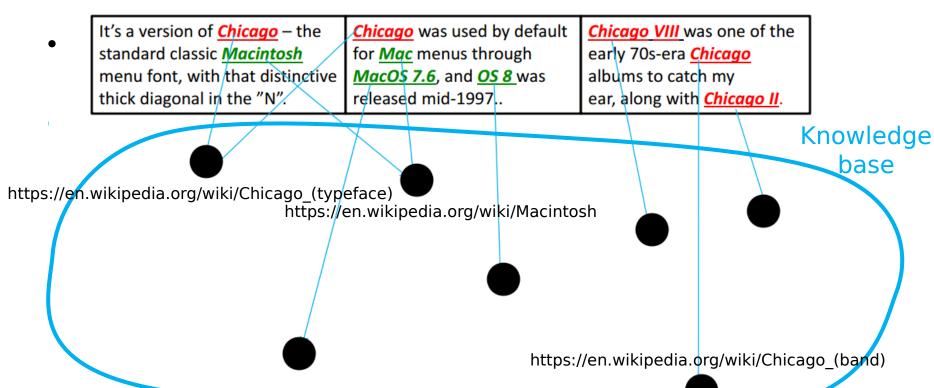
 We want to capture the meaning of the words mentioned in the text

It's a version of <u>Chicago</u> – the standard classic Macintosh menu font, with that distinctive thick diagonal in the "N".

<u>Chicago</u> was used by default for Mac menus through MacOS 7.6, and OS 8 was released mid-1997.. <u>Chicago VIII</u> was one of the early 70s-era <u>Chicago</u> albums to catch my ear, along with <u>Chicago II</u>.

Article semantic annotation (2)

- Ambiguity same word, different meaning (e.g. Chicago)
- Variability different words, same meaning (Mac,



Wikifier demo (http://wikifier.org/)

Wikifier results Language autodetected as "en" (0). Text **Annotations** Support Link Targets Syria conflict: Government offers prisoner exchange Syria's foreign In the Wikipedia, where do links with a particular anchor PR P(I|p) Index Phrase Annotation Annotation minister has said <u>Damascus</u> is ready to offer a prisoner exchange with text point to? Select an annotation to rebels. Speaking in Moscow. Walid Muallem also said he had presented a 0.0116 Syria W D show which phrases in >> Anchor text: syria ceasefire plan for the second city Aleppo to his Russian counterpart, the text support it. >> P(link | phrase) = 0.4532Sergey Lavroy. The moves came as the opposition Syrian National Coalition prepares to meet in Istanbul to decide whether to go to next Aleppo PR (lin.) Score Cosine Target week's peace conference. The coalition is under Western pressure to 1.0000 0.0116 0.4036 Syria participate in the Geneva II talks. However, many of its members have already pulled out. Some are reluctant to go unless President Bashar al-0.0043 0.9816 0.4884 Syrian Civil War National Assad is excluded from any transitional government, but Damascus says Coalition for 0.1992 Seleucid Empire 0.0029 0.9589 there should be no pre-conditions for the talks. The three-year conflict has 0.2894 French Mandate for 0.0026 0.9423 claimed more than 100,000 lives. An estimated two million people have Revolutionary Syria and the fled the country and some 6.5 million have been internally displaced. Lebanon Aleppo 'example' Mr Muallem said he was ready to exchange lists of Opposition 0.0023 0.9248 0.2191 Ottoman Syria prisoners. "I informed Lavrov of our principled position in favour of an Forces W D 0.0021 0.9091 0.2431 Greater Syria agreement to exchange those held in Syrian prisons for those taken by the other side," he said. "We are ready to exchange lists and develop the 0.0019 0.8881 0.2148 Roman Syria Assad w D necessary mechanism for accomplishing these goals." The Syrian foreign 0.0018 0.8741 0.2709 Syria (region) 0.0060 Saudi Arabia Saudi Arabia minister added that he had given Russia a ceasefire plan for Aleppo, which 0.0017 0.8689 0.2778 Arab Kingdom of he said he wanted to "serve as an example to other towns". But correspondents say it remains far from clear that even a partial ceasefire 0.0058 Lebanon W D 0.0017 0.8645 0.2058 Bilad al-Sham could be achieved. On Thursday, the two foreign ministers held talks with >> 0.0017 0.8636 0.2309 Muslim conquest of Iranian officials. Mr Lavrov said there was "no hidden agenda" to their Istanbul >> the Levant meeting. "This does not mean that we have some tri-party (peace) draft." 0.0054 Syrian people Syrian people >> he told reporters. Mr Lavrov is keen for Iran to be part of the peace talks, 0.0015 0.8453 0.4289 History of Syria but US Secretary of State John Kerry has said that Tehran must first agree 0.0013 0.8147 0.0605 Syria national 0.0052 Geneva w Geneva to the Geneva I communique which calls for a political transition in Syria. football team >> Huge doubts The Syrian National Coalition is deeply divided, with its key 0.0012 0.7902 0.3597 Syrian Republic bloc - the Syrian National Council - threatening to boycott the talks. Of the Lavrov (1930-58)120 members of the coalition, 44 have already pulled out of the meeting 0.0051 Tehran w p >> 0.0012 0.7788 0.2919 Flag of Syria in Switzerland. But all of them - and their regional backers such as Qatar >> 0.0011 0.7771 0.2406 Syria-Lebanon and Saudi Arabia - are under huge pressure from the Americans and 0.0049 United States United States >> Campaign others to take up the opportunity to achieve the goals of the Syrian Secretary of revolution, the BBC's Jim Muir in Lebanon reports. However, our 0.0007 0.6748 0.3001 State of Syria (1924correspondent says that the coalition - if it goes to the talks - will be really 0.0049 Syrian Syrian weak, with huge doubts about how representative it is, as virtually none of

0.0007 0.6652

0.1570 Syrian Arab

Computing similarity between articles in different languages

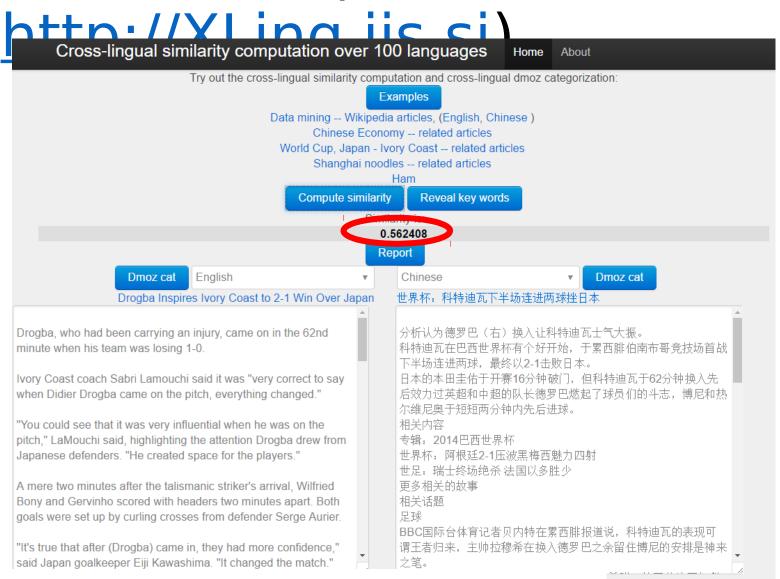
- Question: how similar is this Spanish article to this English article?
- Translation tool slow/expensive
- Alternative: Canonical correlation analysis
- Map each article into a common semantic space
- Use dot product to compute similarity between documents

data, mining, knowledge, artificial, machine, discovery, buzzword, term, ..., oping using an alighed corpus (for semantic space

datos, minería, modelos, utilizando, procesamiento inteligencia, ...,

Documents as vectors
500 dimensions

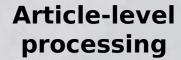
CCA demo (



upnik, et.al - http://www.jair.org/papers/paper4780.html

Event registry pipeline







Event construction



Semantic annotation

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Fronten d interfac

API access

Main strea m news





Article clustering

- For each language we try to identify groups of articles that describe a single event
- Online clustering algorithm
- Cluster based on
 - article title
 - article content
 - detected named entities

NEW STRAITS TIMES

Comedian Joan Rivers dead at 81 | New Straits

Joan Rivers, the raucous, acidtongued comedian who crashed the male-dominated realm of late-night talk shows and turned Hollywood red carpets into danger zones for Thursday. She was 81. Rivers died at Mount Sinai Hospital in New York, surrounded by family and close ...

WWW.TIMEOUTPOLK.COM

Legendary Comedian Joan Rivers Dies in at

Joan Rivers, the raucous, acidtongued comedian who crashed the male-dominated realm of late-night talk shows and turned Hollywood red carpets into danger zones for Thursday. She was 81. Rivers died at Mount Sinai Hospital in New York, surrounded by family and close ..

WVVA TV 6

Comedy

pioneer dead at

surrounded by family and close

Rivers died at Mount Sinai

friends, daughter Melissa

hospitalized Aug. 28 after

going into cardiac arrest in a

doctor's office following a

routine procedure. The New

York state health department is

Hospital in New York,

Rivers said. She was

investigating the ..

Comedian Joan Rivers dead at

Joan Rivers, the raucous, acidtongued comedian who crashed the male-dominated realm of late-night talk shows and turned Holl

WASHINGTON POST

Comedian Joan Rivers dead at

Joan Rivers, the raucous, acidtongued comedian who crashed the male-dominated realm of late-night talk shows Hollywood red

SUNNYVALE SUN Comedy legend Joan

Rivers dies at 81

Joan Rivers remains hospitalized; daughter asks for prayers Joan Rivers, the raucous, acid-tongued median who crashed the le-dominated realm of lateht talk shows and turned Hollywood red carpets into danger zones for badly Thursday. She was 81. Rivers

WWW.WTOP.COM

Comedian Joan Rivers dead at 81 - WTOP.com

Joan Rivers, the raucous, acidtongued comedian who crashed the male-dominated realm of late-night talk shows and turned Hollywood red carpets into danger zones for badly dressed celebrities, died Thursday. She was 81. Rivers died at Mount Sinai Hospital in New York, surrounded by family and close ..

WEST SIDE JOURNAL

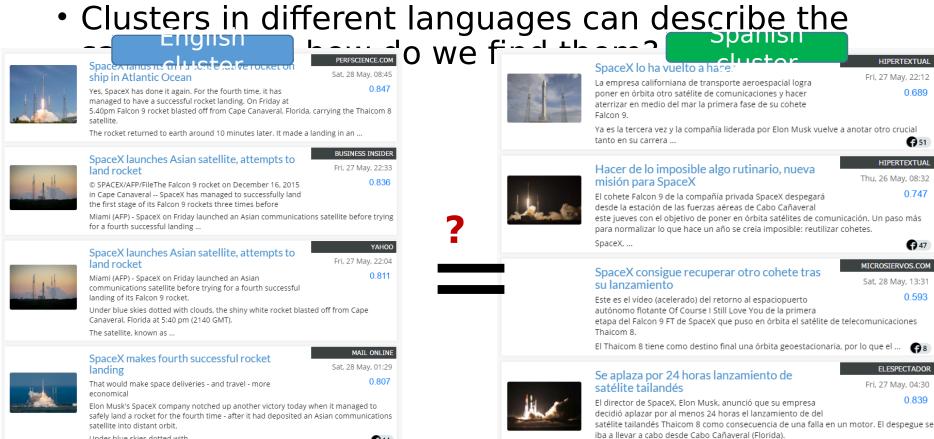
Witty, brash comedian Joan Rivers dies, age

Joan Rivers, the raucous, acidtongued comedian who crashed the male-dominated realm of late-night talk shows and turned Hollywood red carpets into danger zones for Thursday. She was 81. Rivers died at Mount Sinai Hospital in New York, surrounded by family and close.

Cross-lingual cluster linking

Under blue skies dotted with ...

· Each cluster only contains articles in the same language



"Se trata de una pequeña anomalía ...

(1) 4

Cross-lingual cluster linking (2)

- Use machine learning
- Extract a set of features for evaluated pair of clusters
 - Similarity of relevant concepts (semantic annotations) in each cluster
 - Time difference between articles in each cluster
 - Similarity of article categories
 - Agreement in story location
 - CCA similarity between articles in both clusters
 - ...
- Classify using SVM model trained on >1.000 examples
- 90% accuracy

Event formation

- Using one or more linked clusters we form an event
- Each event is assigned a unique id

tp://eventregistry.org/event/4284299



EgyptAir plane from Paris to Cairo goes missing

3,072

WHEN: Thu, May 19, 2016

WHERE: Cairo, Egypt

CATEGORIES: Society \rightarrow Issues \rightarrow Warfare and Conflict , Society \rightarrow Issues \rightarrow Terrorism , Science \rightarrow Technology \rightarrow Aerospace

ENTITIES: EgyptAir Egypt Cairo, Egypt Paris, France France

KEYWORDS: Fixed-wing aircraft Mediterranean Sea Airbus A320 family Radar Airline

ARTICLES: 6702 (3054 English, 754 German, 747 Spanish, 22 Catalan, 321 Portugese, 144 Italian, 786 French, 836 Russian, 29 Slovene, 9 Serbian)

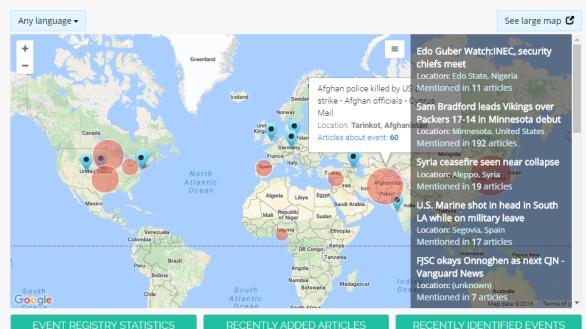
Story highlights69 people were on board -- 59 passengers, 10 crewWeather conditions were calm when the plane crossed the Mediterranean (CNN)EgyptAir Flight 804 heading from Paris to Cairo disappeared from radar with 69 people on board, the airline said. The plane was flying at 37,000 feet when it disappeared shortly after entering Egyptian airspace, the airline tweeted. It said the Airbus A320 had 59 passengers and 10 crew members. Conditions were clear and calm when the plane crossed over the...

Extracting event information

- Use articles assigned to the event to extract event information
- Information to extract:
 - Location
 - Event date
 - Main event entities and keywords
 - Event categories
 - Event title and snippet

DEMO (http://eventreaistrv.ora/)

Current articles and events



EVENT	REGIST	TRY	STAT	ISTI	CS

Data info	#	
Imported articles:	141,227,827	
Identified events:	5,007,526	
News sources:	154,160	
Unique concepts:	2,692,089	
Categories:	5,015	



4.000 2,000 Aug 21 Aug 28 Sep 04 Sep 11 Sep 18

API access

- Content in Event Registry can be accessed using the API
- To simplify access, a Python library is available at:

https://github.com/gregorleban/EventRegistry gregorleban / event-registry-python Unwatch
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 ✓ Obtain data from Event Registry using Python — Edit 16 commits 1 branch 0 releases # 1 contributor P branch: master ▼ event-registry-python / + = - added small example gregorleban authored on Jan 8 latest commit 7a4aa8ac38 gitignore ... 5 months ago EventRegistry.py - bug fix: RequestEventArticles had a typo when specifying parameters Examples.py - added small example a month ago LICENSE 5 months ago README.md - beauty changes 5 months ago ■ README.md **Accessing Event Registry data through Python** This library contains classes that allow one to easily access the event and article information from Event Registry (http://eventregistry.org). To use the library one needs to import it:

from EventRegistry import *

API access example (1)

```
>>> from EventRegistry import *
>>> er = EventRegistry()
>>> q = QueryEvents()
# get events related to Barack Obama
>>> q.addConcept(er.getConceptUri("Obama"))
# and are related to issues in society
>>> q.addCategory(er.getCategoryUri("society issues"))
# and have been reported by the BBC
>>> q.addNewsSource(er.getNewsSourceUri("bbc"))
# return event details for first 30 events
>>> q.addRequestedResult(RequestEventsInfo(page = 0, count = 30))
# execute query and obtain results
>>> res = er.execQuery(q)
```

API access example (2)

```
'events': { 'resultCount': 122,
  'results': [
      {'articleCounts': {'eng': 54.0, 'total':
54.0},
      'categories': [{...}],
      'concepts': [{...}, ...],
       'eventDate': '2014-08-29',
       'eventDateEnd': '',
       'multiLingInfo': { 'eng': {
          'title': ..., 'summary': ...}},
   'uri': '1211229', 'wgt': 9.0}
       }, ...
```

API access example (3)

```
# get information about event with ID 123
>>> q = QueryEvent("123");
# return concept labels in 3 languages
>>> q.addRequestedResult(RequestEventInfo(["eng", "spa", "slv"]))
# get 10 most central articles
>>> q.addRequestedResult(RequestEventArticles(0, 10))
# get information how articles about the event were trending
>>> q.addRequestedResult(RequestEventArticleTrend())
# get top keywords
>>> q.addRequestedResult (RequestEventKeywordAggr())
>>> eventRes = er.execQuery(q);
```

API access example (4)

```
>>> q = QueryArticles();
# articles should be from a particular time period
>>> q.setDateLimit(datetime.date(2014, 4, 16),
datetime.date(2014, 4, 28))
# they should mention apple
>>> q.addKeyword("apple")
# they should also mention iphone
>>> q.addKeyword("iphone")
# get top 30 articles that match criteria
>>> q.addRequestedResult(RequestArticlesInfo(page=0, count
= 30));
>>> res = er.execQuery(q)
```

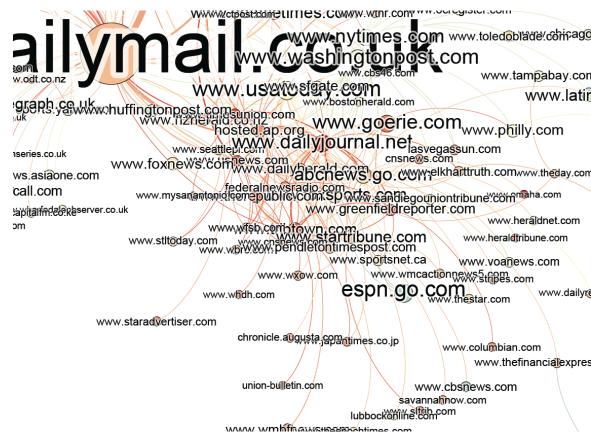
Future / Ongoing work

Detection of news bias

- Various ways in which news publishers can be "biased"
- Examples:
 - Gender bias
 - News source citations
 - Topic bias
 - Geographical bias
 - Vocabulary bias

Information diffusion/propagation

 Analysis of how information propagates from one publisher to the next



Infobox extraction / slot filling

- Events are of different types (e.g. earthquakes, mergers and acquisitions, product releases,
- For each event type we can de a specific set of properties (slots) that should be extracted

	Date	11 March 2011		
		(3 years, 5 months and 2 weeks)		
	Origin time	14:46:24 JST (UTC+09:00)		
(Duration	6 minutes ^[1]		
	Magnitude	9.0 $(M_w)^{[2][3]}$		
	Depth	30 km (19 mi)		
2	Epicenter	38.322°N 142.369°E		
_	Туре	Megathrust earthquake		
	Areas	Japan (primary)		
,	affected	Pacific Rim (tsunami, secondary)		
(Total	Tsunami wave, flooding,		
	damage	landslides, fires, building and		
		infrastructure damage, nuclear		
		incidents including radiation releases		
	Mari			
	Max.	IX - Violent		
	intensity			
	Peak	2.99 g		
	acceleration			
	Tsunami	Up to 40.5 m (133 ft)		
		in Miyako, Iwate, Tōhoku		

Landslides None

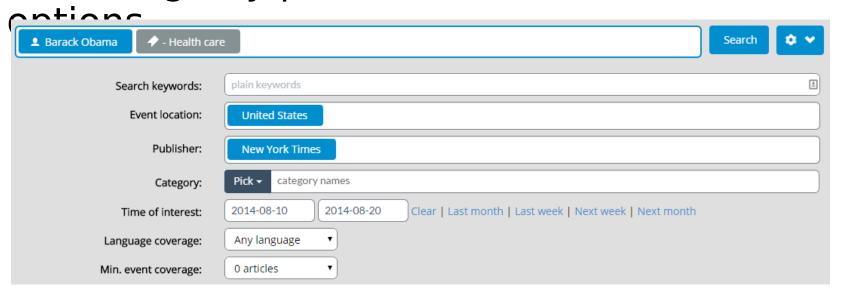
Foreshocks 7

Causality

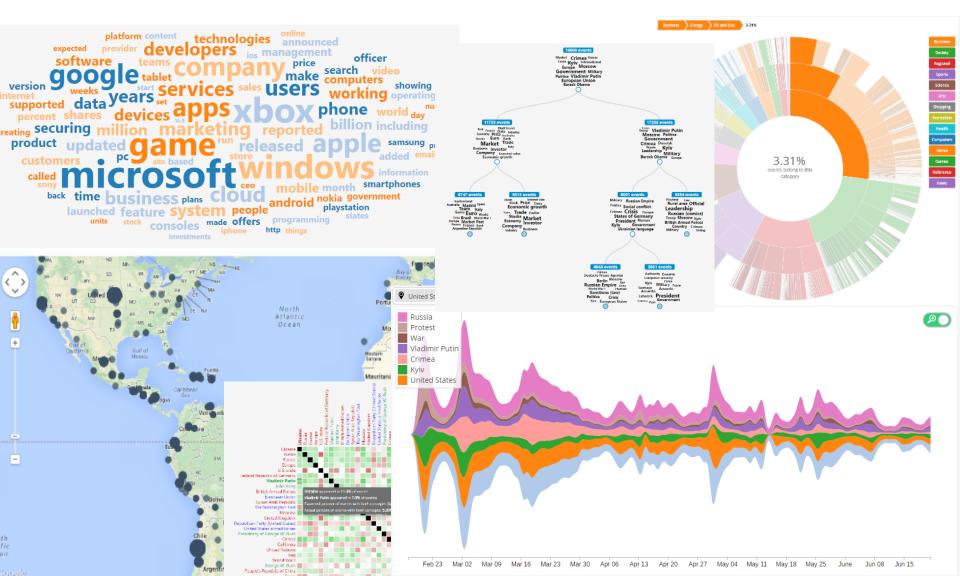
- Goal: Finding causal templates in event sequences
- Example 1: campaign events @ election day @ inauguration
- Example 2: flood © outbreak of a disease
- How to do it:
 - For each event we can identify related events
 - Generalize events to find common patterns

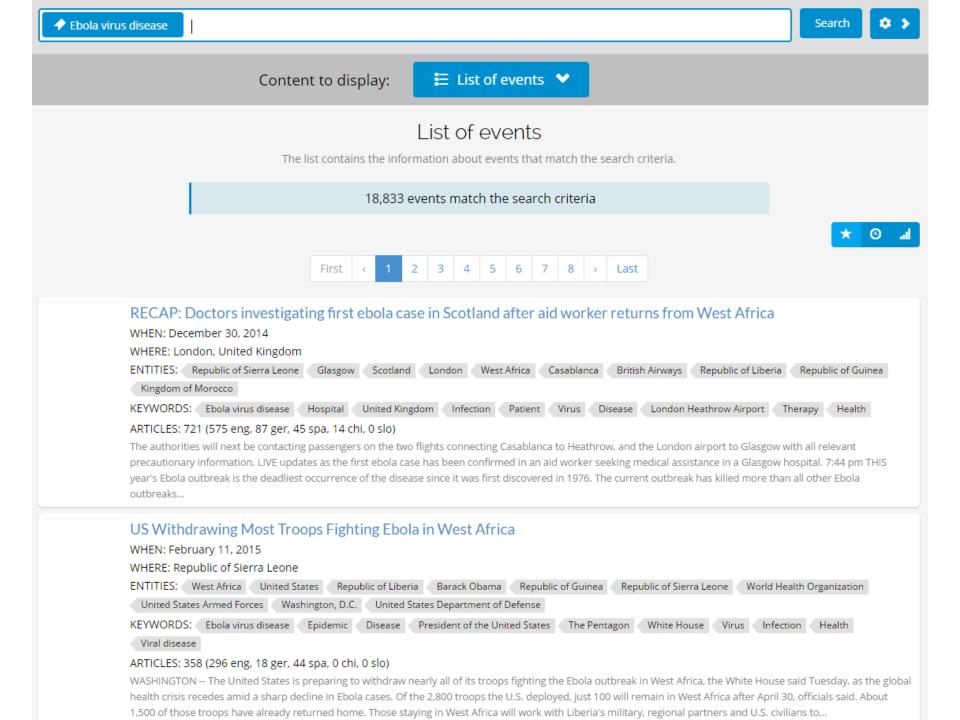
Event registry

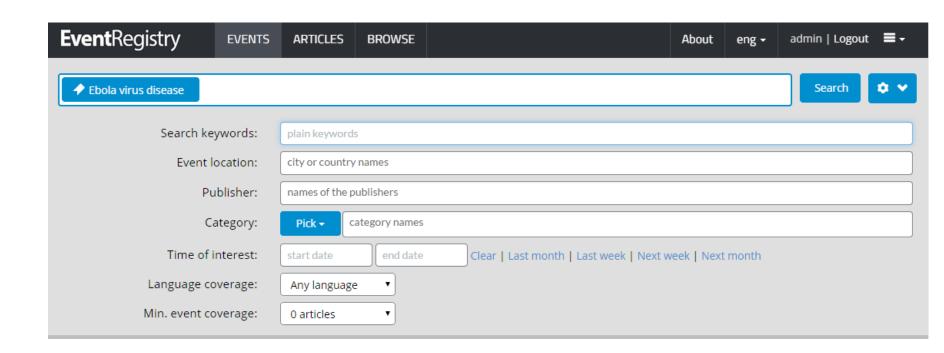
Event registry provides extensive search



Event registry (2)

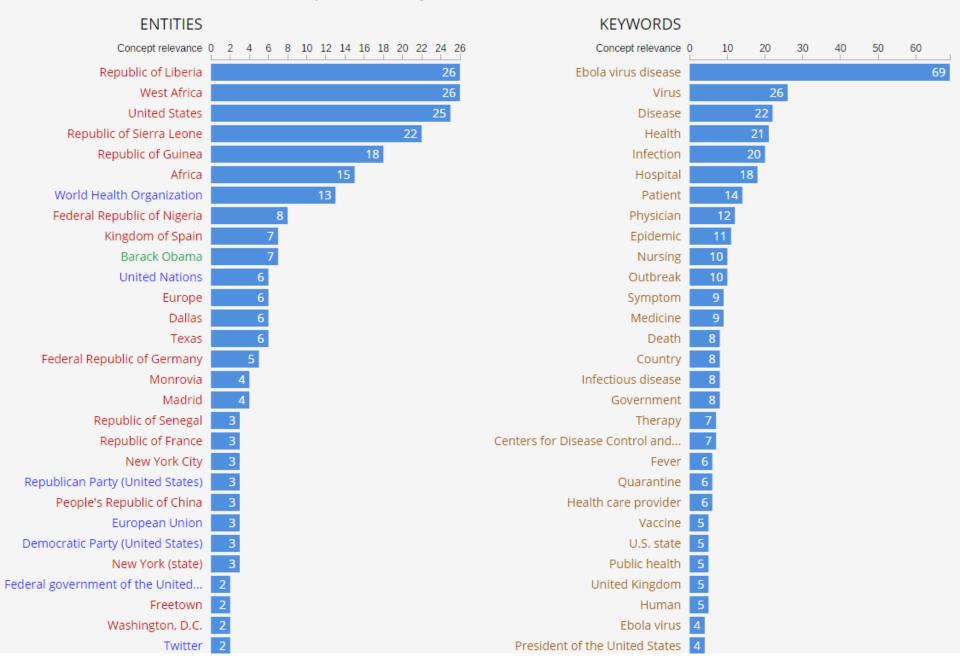






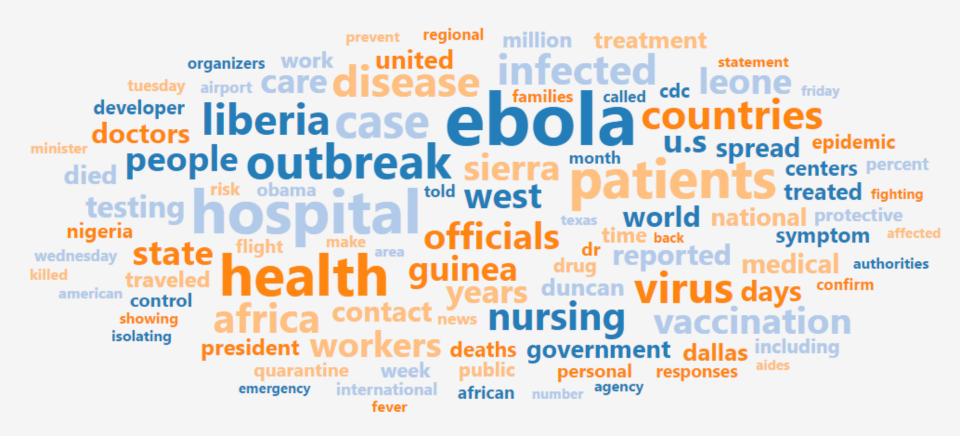
Top concepts in events

List of concepts (entities and keywords) that best describe what the events are about



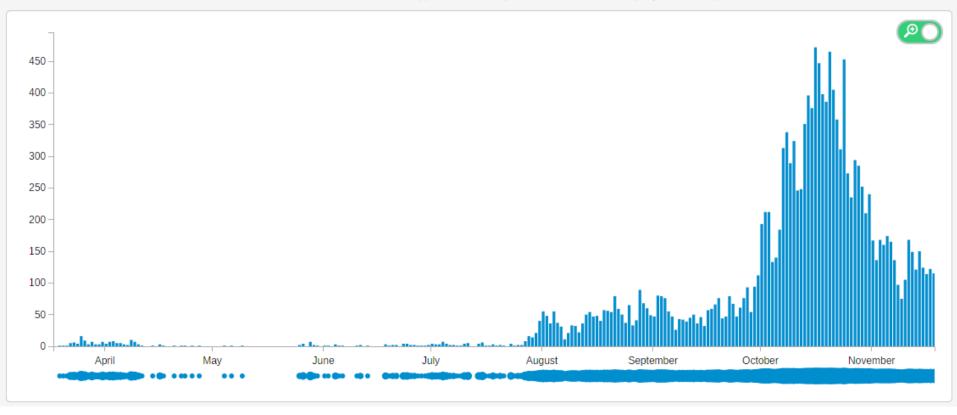
Tag cloud

Tag cloud displays top keywords extracted from the events



Timeline of events

See when the events that match the search criteria happened. Click a particular column to display a list of top events for that date.



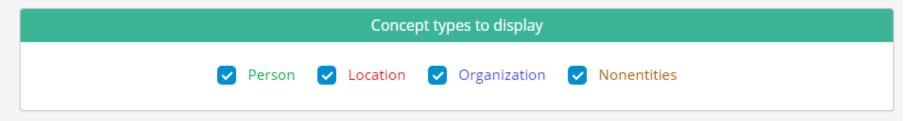
Top publishers

The information displays who are the publishers that report the most about the resulting events. The numerical values represents the percent of the resulting events that are covered by a particular publisher. The geographical map shows the locations of the publishers and the circle sizes correspond to percentages.



Top entities and relations

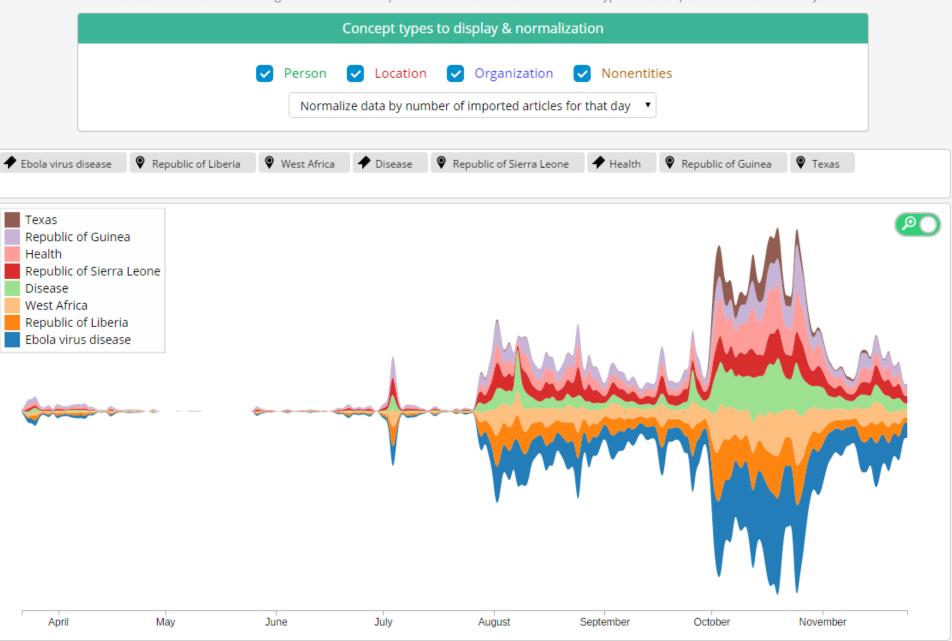
The nodes in the graph are the most relevant concepts in the events. The edges are displayed between the concepts that frequently co-occur in the same events.

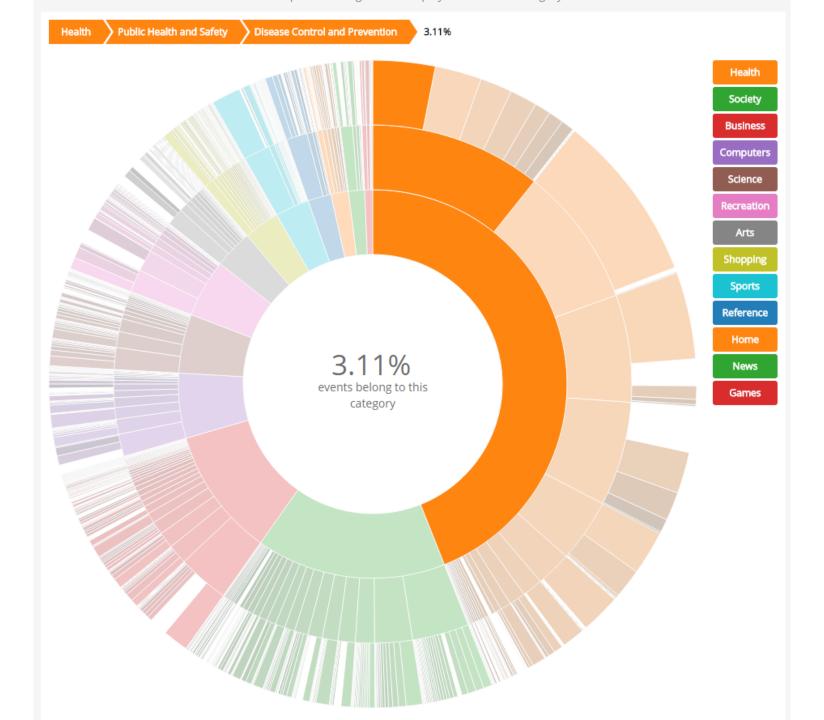




Trending of concepts in search results

The visualization shows the trending of individual concepts in the events. You can choose the types of concepts to visualize or enter your own.





Malaysian plane shot down over Ukraine



17 Jul 2014

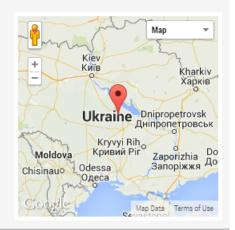
Ukraine

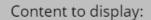
Society→Issues→Warfare and Conflict , Society→Issues→Transportation

KIEV, Ukraine (AP) -- A Ukrainian official said a passenger plane carrying 295 people was shot down Thursday over a town in the east of the country, and Malaysia Airlines tweeted that it lost contact with one of its flights over Ukrainian airspace.

Anton Gerashenko, an adviser to Ukraine's interior minister, said on his Facebook page the plane was flying at an altitude of 10,000 meters (33,000 feet). He also said it was hit by a missile fired from a Buk launcher, which can fire missiles up to an altitude of 22,000 meters (72,000 feet).

The fate of the passengers wasn't immediately...







Articles

Below is a list of articles describing the event.



Official: Malaysian plane shot down over Ukraine

KIEV, Ukraine (AP) -- A Ukrainian official said a passenger plane carrying 295 people was shot down Thursday over a town in the east of the country, and Malaysian Airlines tweeted that it lost contact with one of its flights over Ukrainian airspace.

Anton Gerashenko, an adviser to Ukraine's ...

GREENWICH TIME

17 Jul, 16:22

0.9952

Official: Malaysian plane shot down over Ukraine - WTOP.com

KIEV, Ukraine (AP) -- A Ukrainian official said a passenger plane carrying 295 people was shot down Thursday over a town in the east of the country, and Malaysian Airlines tweeted that it lost contact with one of its flights over Ukrainian airspace.

Anton Gerashenko, an adviser to Ukraine's ...

WWW.WTOP.COM

17 Jul, 17:04

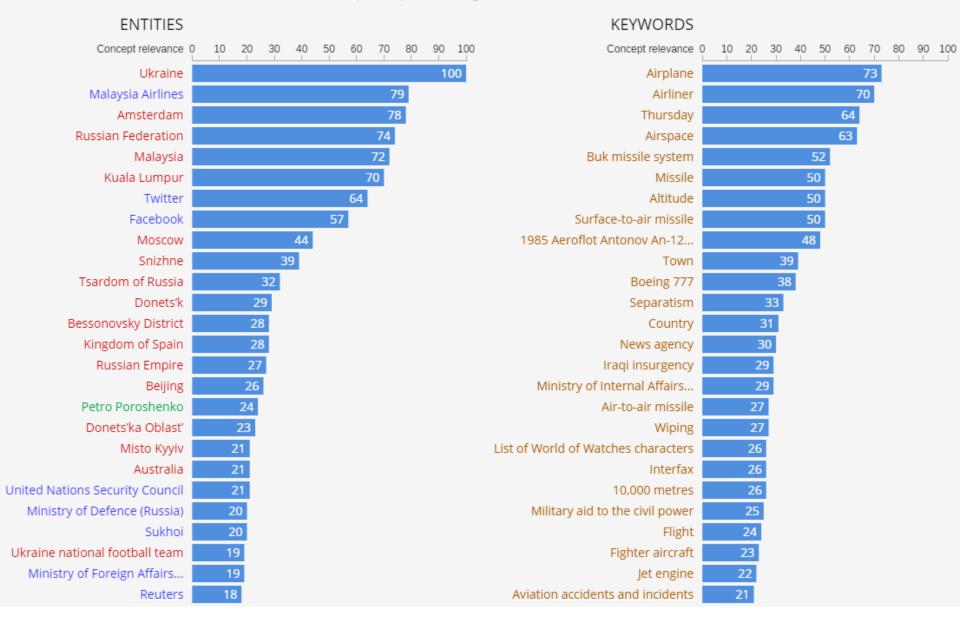
0.9932

Malaysian Airlines plane shot down over Ukraine; 295 feared dead

NORTHWEST FLORIDA

Event concepts

Top concepts describing what the event is about.



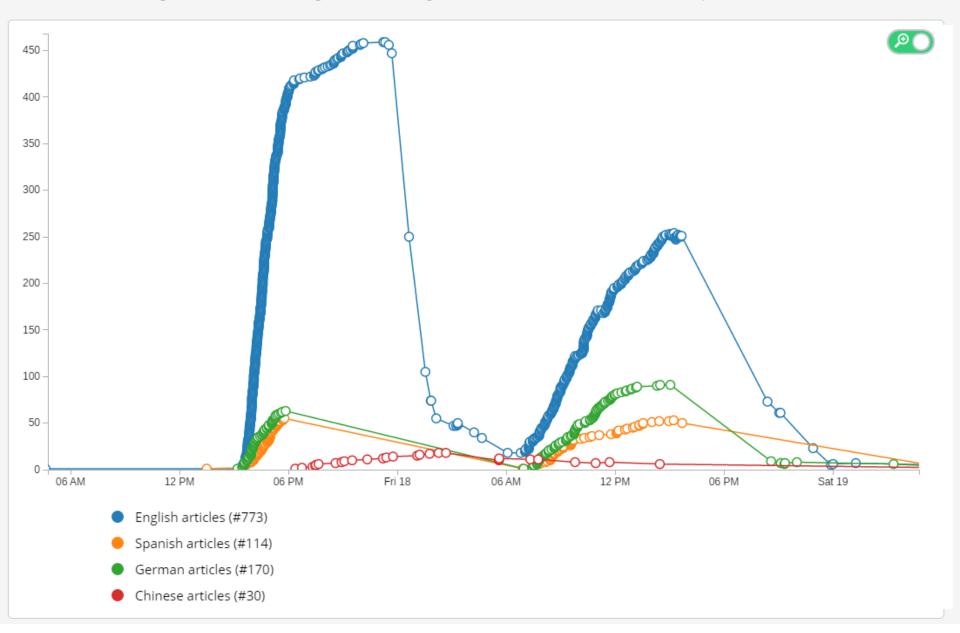
Tag cloud

Tag cloud displays top keywords from the articles



Timeline of articles

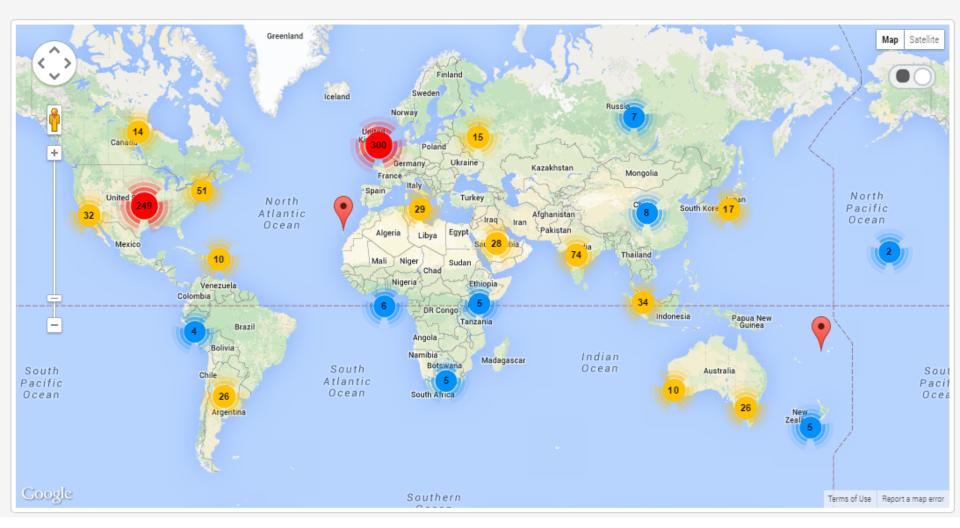
Publishing times of articles describing the event. The height of the curve indicates the number of articles published in last 8 hours.

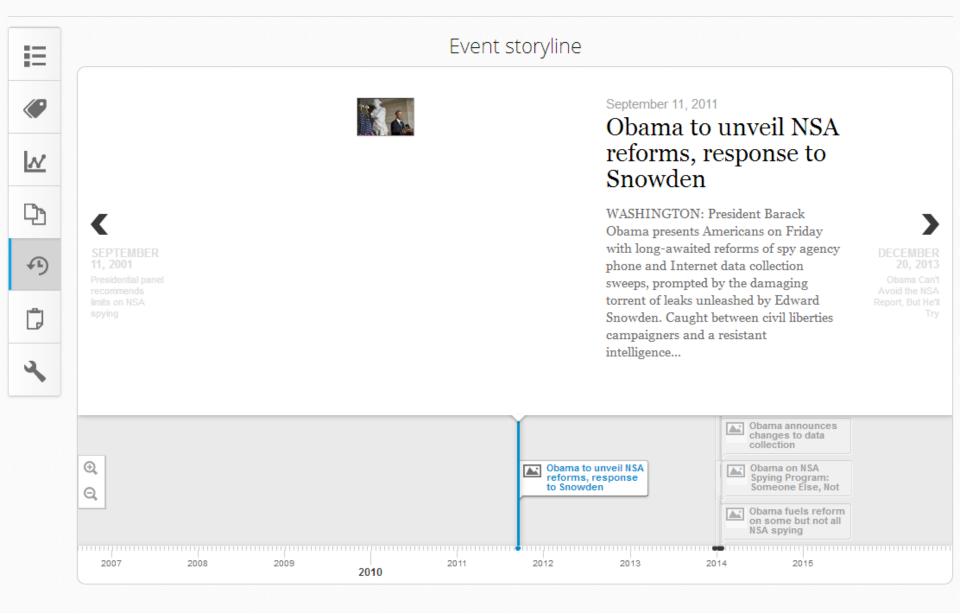


Sources of the news articles

Map shows the geographic locations of the news sources that published articles about the current event.

Below the map is the time distribution of articles. Click and drag to select a specific time period and highlight only the corresponding subset of sources on the map.





Location 201#-##-##

