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Crisis, Tragedy, and Recovery Network Digital Library (CTRnet) + Web Archiving in Qatar and VT

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Workshop at WADL'13, July 25-26, 2013

Outline

- Introduction
  - Project goal
  - Members & collaborators
- Main Archiving Tasks
- Sub-Projects
- Dissemination Efforts
- IDEAL Project
- Qatar
- VT
- Acknowledgments
- Collaboration

CTRnet Project Goal

- Developing integrative approaches:
  - Collect, analyze, and visualize disaster information with a DL

	Collect	Analyze	Visualize
Content	Web sites, images	Image similarity	Organize images by similarity
	Tweets	Content, user profiles	Patterns, frequencies
	Facebook content	Usage of social media (SM)	SM use
	Focus group interviews/surveys	Usage of SM	SM use/needs
Technology	Crawler	CBIR algorithm	CBIR visualization interface
	Online tools, scripts, APIs	NLP toolkit, SQL	Graphics
	Facebook app	Spreadsheets	
	Brainstorming tool	Brainstorming tool	

Members & Collaborators

- Project members from multi-disciplinary areas
  - Computer Science (HCI, Information Retrieval)
  - Accounting and Information Systems
  - Sociology

- Collaboration with the Internet Archive (IA)

  - Developed web archives
    - Heritrix crawler
    - Crawled data hosted by Wayback Machine in IA
    - Raw data downloaded and locally analyzed
  - Attended Archive-It Partners Meeting
    - Introduced the CTRnet team's crawling approach using tweets

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- Main Archiving Tasks
  - Disaster webpage archives
  - Disaster tweet archives
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Disaster Webpage Archives

- Webpages, PDFs, and multimedia content crawled from the Web
  - 45 archives and growing (8.8 TB+)
  - Active archives:

Boston marathon blast 2013	Global Emergency Overview 2013
Boko Haram Attack 2013	Hurricane Sandy 2012
Center for Research on the Epidemiology of Disasters (CRED) 2012	Japan Earthquake 2011
CTRnet: Emergency Preparedness Information 2011	Texas fertilizer plant explosion 2013

Disaster Tweet Archives

- More than 120 tweet archives and growing
  - Use Twitter Streaming API
  - Hashtags and keyword-based archiving

Natural	floods, earthquakes, wildfires, tsunami, hurricanes
Man-made	shooting, transportation accidents, plane crash
Political	Middle East protests, Iran elections
Health	diabetes, obesity, cancer, mental illness

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- Main Archiving Tasks
- Sub-Projects
  - Social media use during political crisis
  - Topic tagging of webpages
  - Visualizing emergency phases in tweets
  - Water main break visualization
  - Focused crawling
  - LucidWorks tool for big data processing
- Dissemination Efforts
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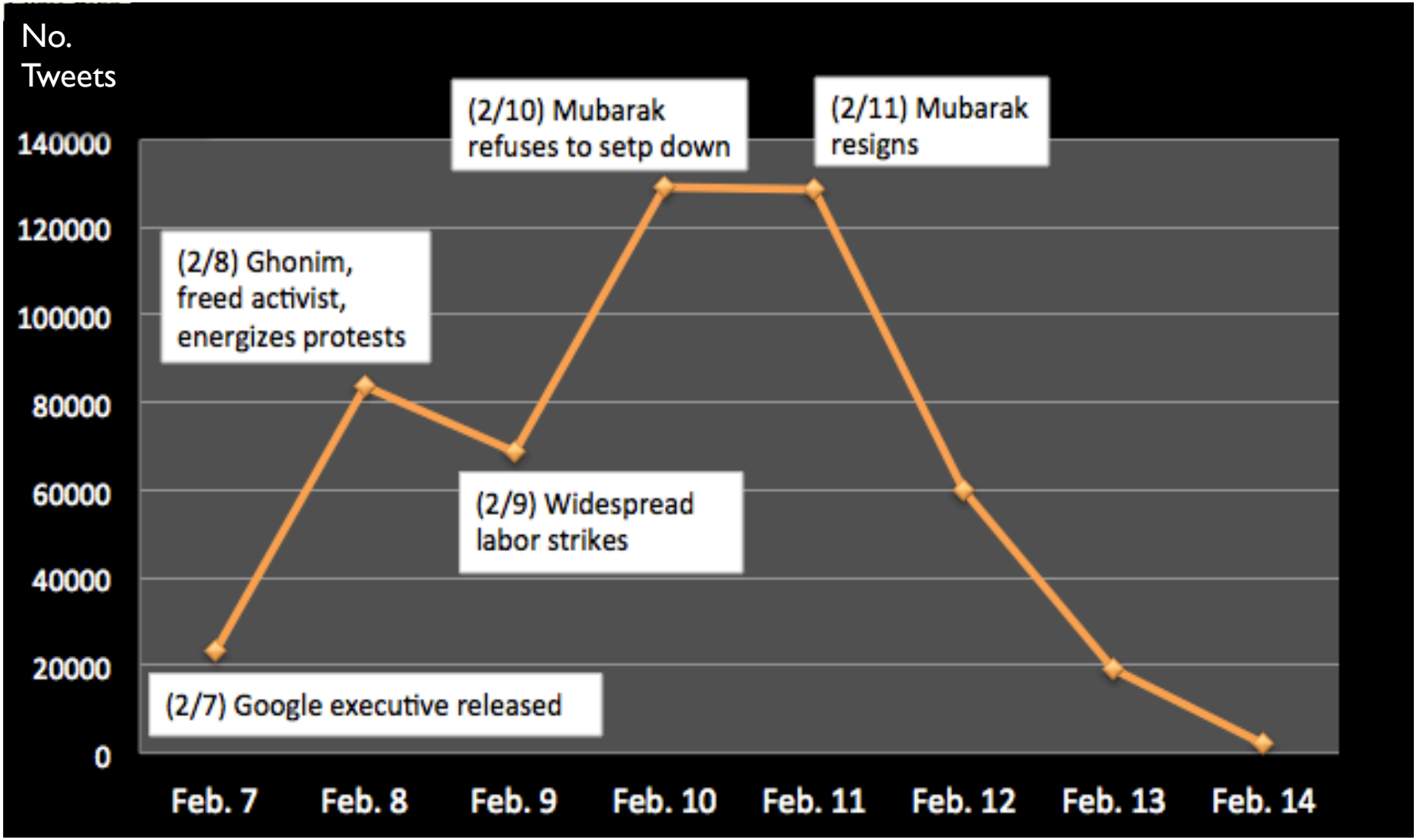
Social Media Use in Political Crisis (1/2) (2/7 - 2/14, 2011)

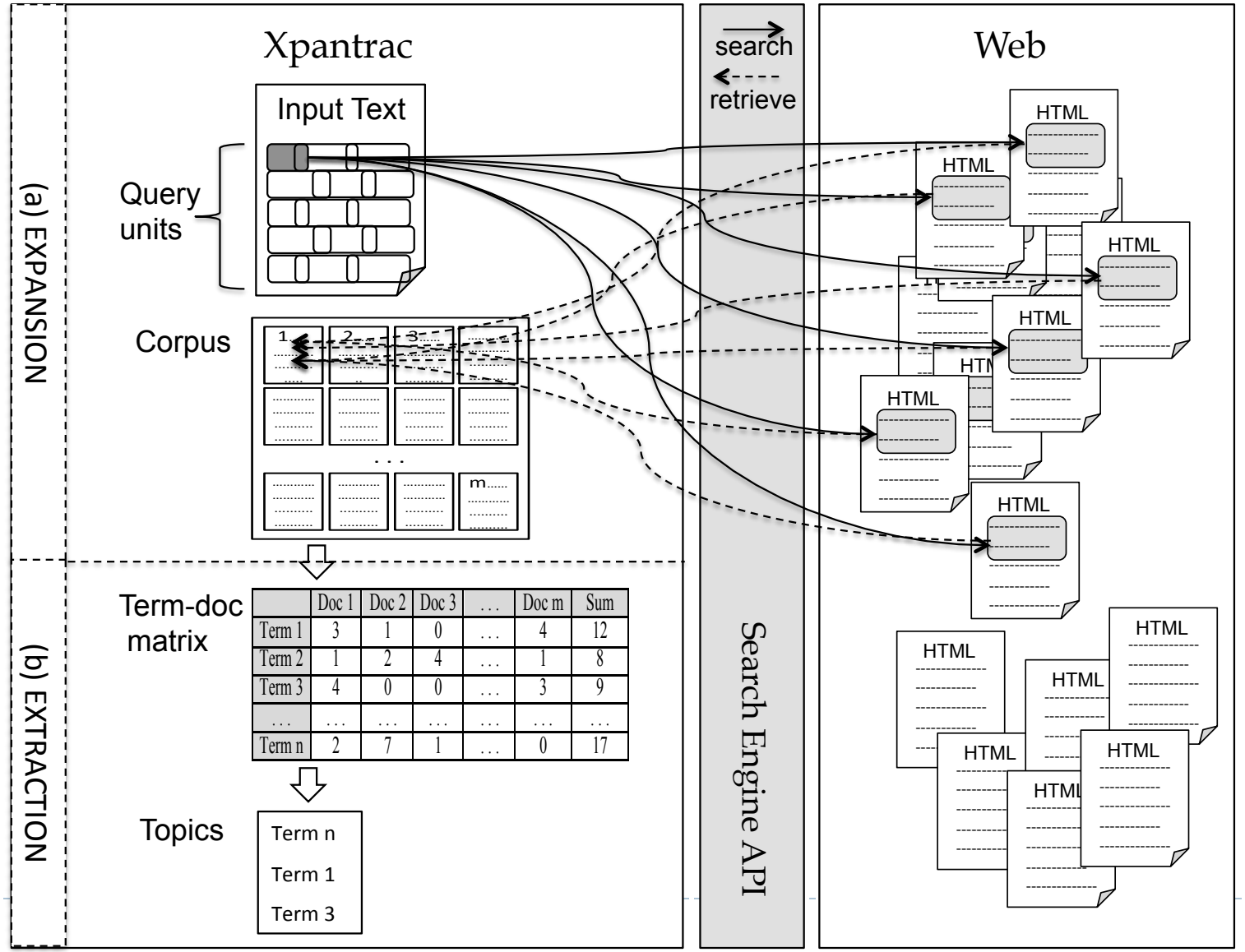


- Total 514,782 tweets

Social Media Use in Political Crisis (2/2)

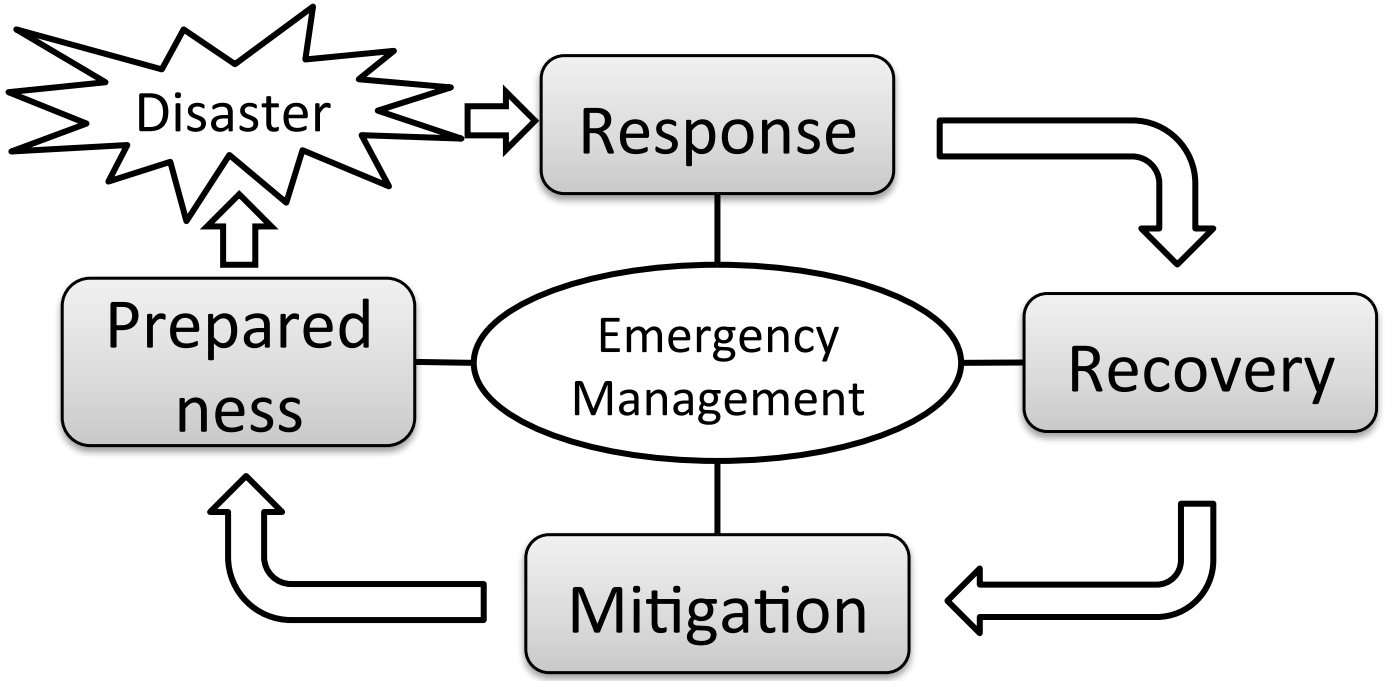
- Opinion Leadership in Egypt Uprising 2011
  - 514,782 tweets (one week around Mubarak's resignation)
  - Total 79,000 unique users
    - Presumably posting from Egypt → 4,710
    - Individuals excluding organizations → 3,675
  - Opinion leaders
    - 500-27,000 followers in top 10% (365) individuals
    - Bios: blogger/activist, writer/reporter, lawyer/executive director, social media consultant,… → 'elite' type actors

Topic Tagging of Webpages: Xpantrac



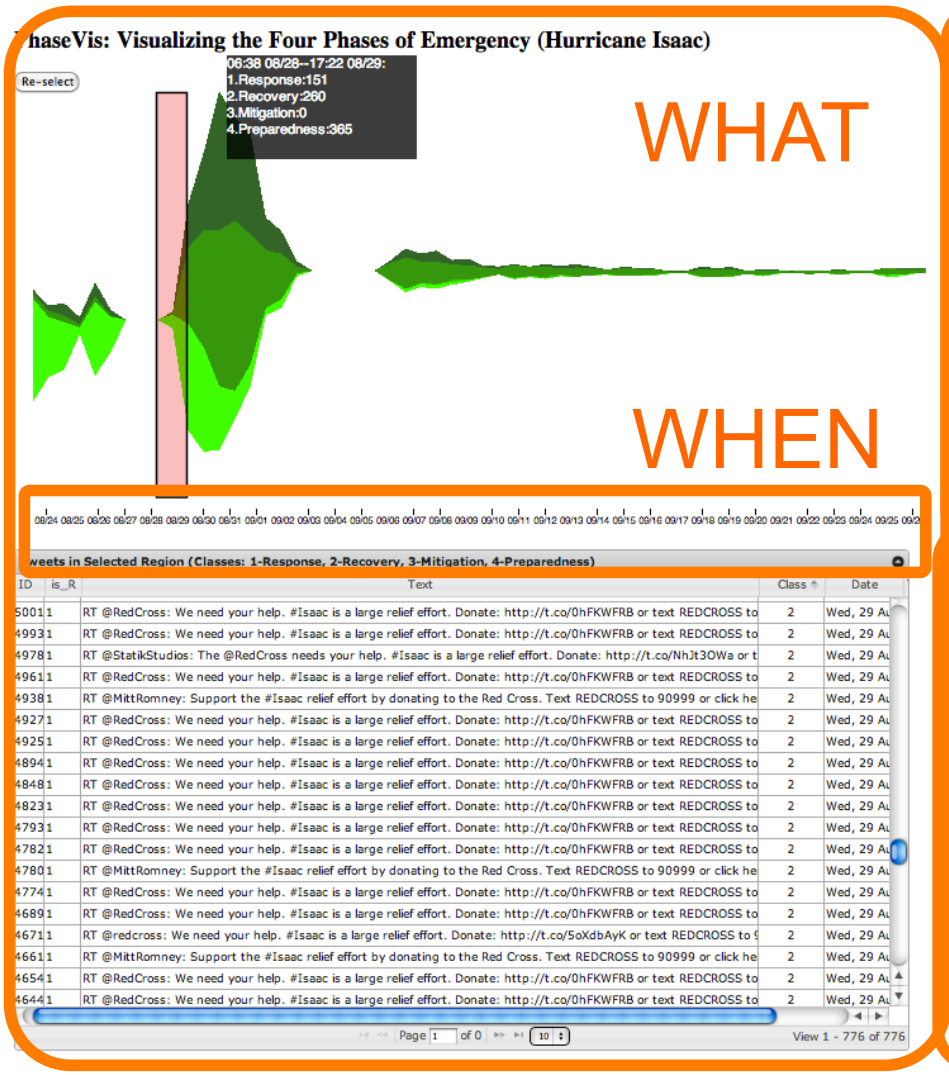
	Doc 1	Doc 2	Doc 3	…	Doc m	Sum
Term 1	3	1	0	…	4	12
Term 2	1	2	4	…	1	8
Term 3	4	0	0	…	3	9
…	…	…	…	…	…	…
Term n	2	7	1	…	0	17

Visualizing Emergency Phases in Tweets (ISCRAM 2013) (1/2)



Four phases of emergency management model

Visualizing Emergency Phases in Tweets (2/2)



http://spare05.dlib.vt.edu/~ctrvis/phasevis/index_may.html

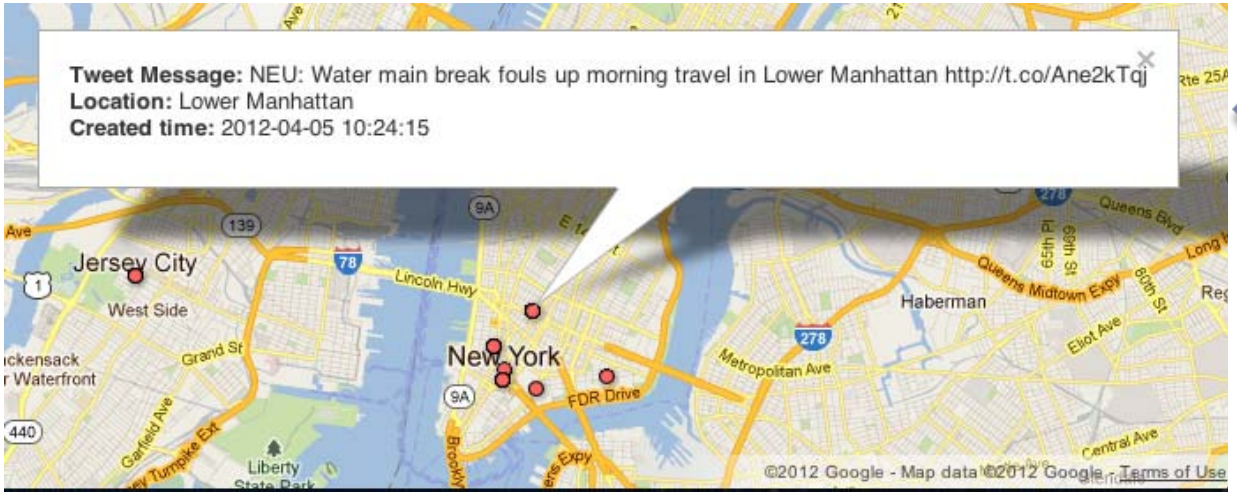
Water Main Break Visualization

Dataset Keyword	Total tweets	# of tweets which have GPS information (percentage)
water main break	13,382	156 (1.17 %)
water pipe leak	967	1 (0.10 %)

Tweets collected with keywords

Location information type	# of tweets
GPS data (longitude, latitude)	36 (1.08 %)
Location information extracted from text	1,473 (44.19 %)

Selected tweets with location information (lat/long, geonames)



Event locations displayed with details

Focused Crawling

- IA collections
  - Identify a CTR event, list keywords
  - Query online news sources, identify URLs in tweets
  - Use URLs as initial seeds for crawling; IA provides access
- Modified version of the LibSVM classifier
  - Reduced noise
  - 3000 documents about school shootings
- Next-generation focused crawler
  - Combines evidence signals for relevance estimation (using Bayesian networks)
  - Solves Tunneling problem using AI approaches (Reinforcement Learning)

LucidWorks Big Data Tool

- Powerful tool with components:
  - Hadoop – for distributed computing
  - Lucene & Solr – for indexing, searching
  - Hbase – distributed database for Hadoop
  - Mahout – distributed machine learning
  - Oozie – workflow
  - Kafka: high throughput distributed messaging
  - Zookeeper: maintaining distributed coordination
  - Pig: high-level platform for creating MapReduce programs
- Packaged as a virtual appliance in Ubuntu for easy installation
- Processing of WARC files downloaded from IA

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- Sub-Projects
- Dissemination Efforts
  - Conferences
  - Journal papers
  - Meetings attended
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Dissemination Efforts

- Conferences, Workshops
  - JCDL, ISCRAM, Digital Government, CHI, WADL
- Meetings Attended
  - NSF workshop: Crisis Informatics 2012, 2011
  - Archive-It Partners Meeting
    - 2012 (Annapolis, MD), 2011 (Lexington, KY)
- Publications
  - Please see http://www.ctrnet.net/publications

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  - Extension of CTRnet
  - Scope broadened beyond crisis events (e.g., community)
  - NSF funding pending
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Integrated Digital Event Archive and Library (IDEAL) Project http://www.eventsarchive.org/

- Extension of CTRnet with broadened scope:
  - Event detection
  - Event data archiving & processing
    - Multimedia (images, videos) shared in social media
- Digital government research
  - Community issue detection
  - Public opinion mining, mood perception, information flow
- Technologies:
  - Focused crawling, analysis/visualization services, integration of archive and DL capabilities

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Qatar Project NPRP 4-029-1-007

Project Objectives/Aims

A. Research and prototype digital library systems and infrastructure for Qatar, focusing initially on Qatari information related to government and scholarly activities.

   Leverage the crawling engine from Penn State's SeerSuite software infrastructure, and extend it beyond its current focus on English to support Arabic-English collections, and to cover a broad range of scholarly disciplines, and all types of government information.

… (with collaboration of National Library)

Project Objectives/Aims (cont'd)

B. Research and build the digital library community in Qatar, supporting digital library use, services, collection development, tailored systems, and advancing toward a Knowledge Society.

Study scholarly activities, and engage in community building in Qatar, so DLs can be tailored to specific domains and to the unique needs of Qatar. Through workshops, a consulting center at the proposed Institute, and collaborative efforts with libraries and museums in Qatar, we will identify particular needs and uses, and tailor collections, systems, and services, to lead toward the Qatari Knowledge Society.

VT

- Half of campus web servers use the central CMS
- Many other web servers cover varied content
- Coverage by Internet Archive is OK, but for parts of the overall campus Web, crawling is infrequent

- Discussions with IT, Library, University Relations, about
  - Heretrix
  - Memento support
  - SiteStory

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Acknowledgment

- NSF for funding:
  - Grant: CTRnet IIS-0916733
  - Proposal: IDEAL IIS-1319578, Integrated Digital Event Archive and Library
- The Internet Archive:
  - Heritrix crawler
  - hosting the crawls and resulting archives

Collaboration

- We invite anyone to collaborate with us!

- Contact:
  - Edward A. Fox <fox@vt.edu>

Thank you!

Questions/Comments?