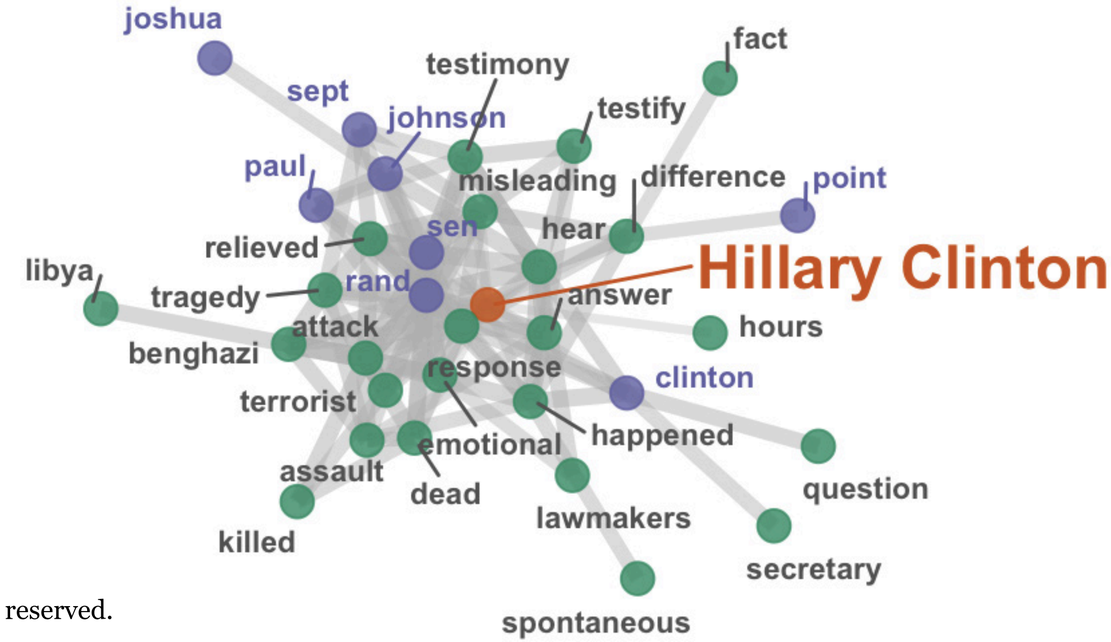
Mike Safar
KMS Product Strategies
August 1, 2018

Improved Insights and Visualizations for Unstructured Data Mining

Creative Data Mining of Hillary Clinton's State Department Emails



Sophisticated data analytics and visualization are key features of mainstream applications

AI and unsupervised machine-learning are being democratized

However…

The reality for many is ***usability and insight*** *aren't fully delivering on the potential*

Low user traction…

50% *of users indicate they are using analytics technologies less than a of couple of times per year*

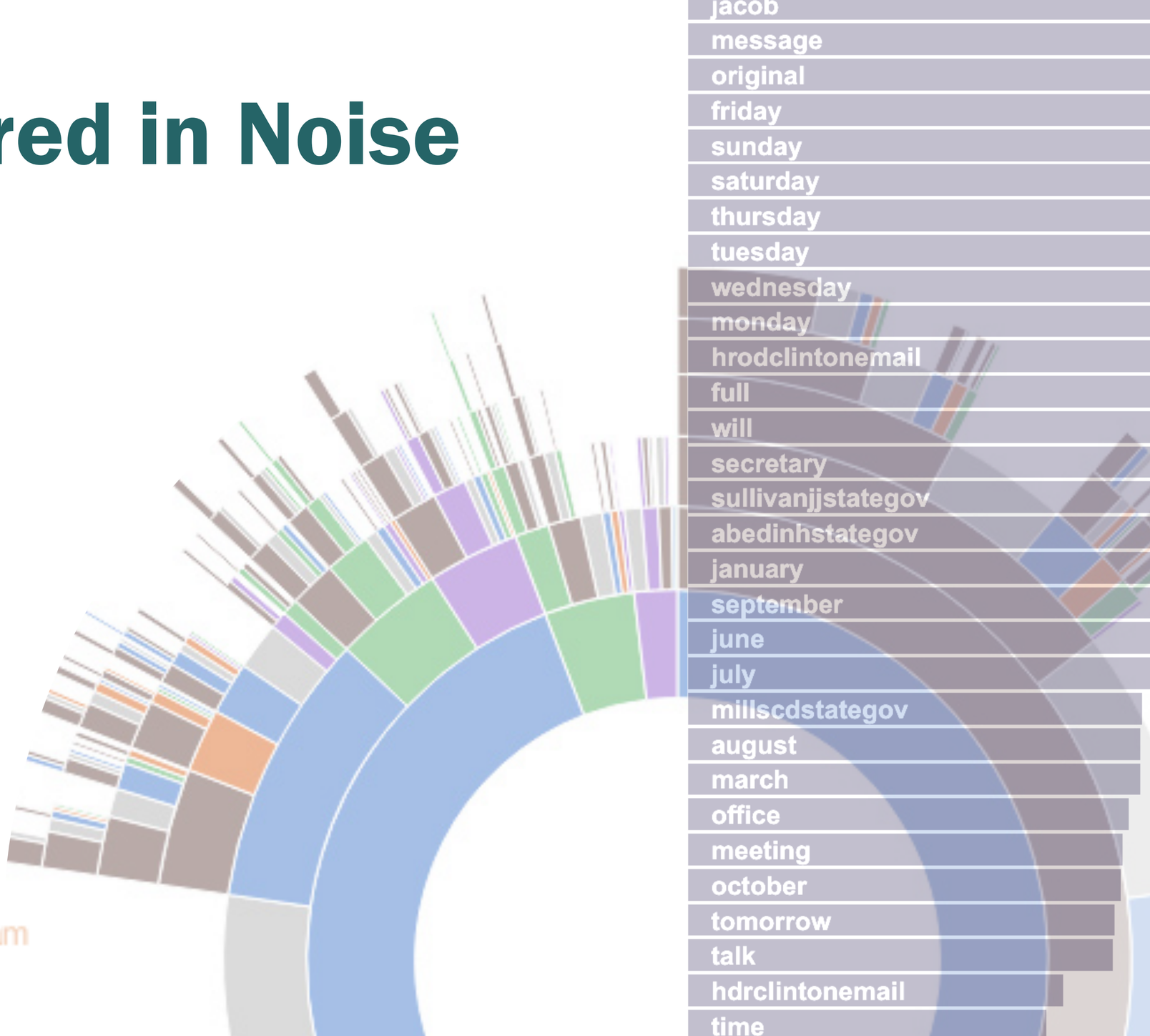
10% *are using social media analytics*

EMC Research as reported in Legaltech News, July 17, 2018

Why?

Insights Obscured in Noise

- *Low-value data*
- *Low-dimensionality*
- *Lack of context*



The Challenge

- Improve usability of standard text-mining visualizations
- Derive summary-level insights quickly
- Useful even on demanding datasets
- Repeatable methodology

Subject:
Hillary Clinton's
State Department Email Release

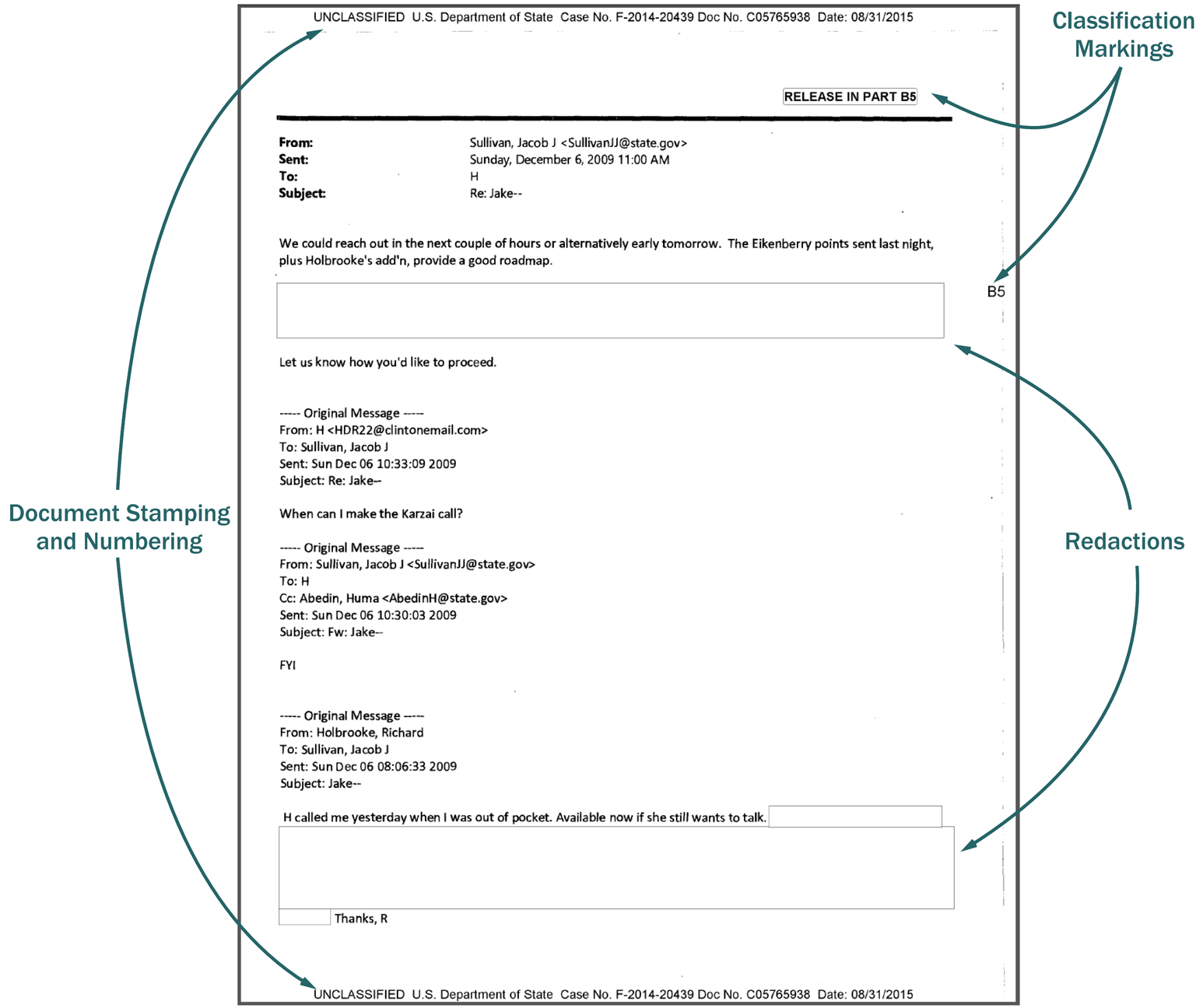
To: H <hrod17@clintonemail.com>

The Dataset

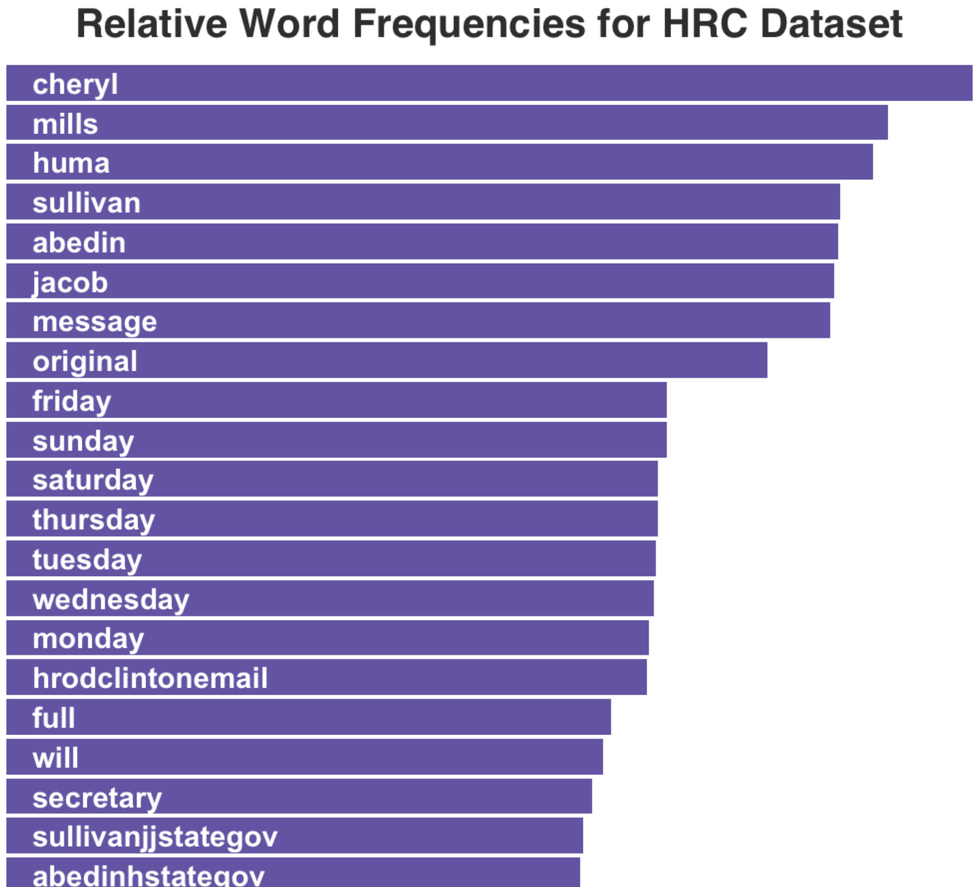
- Sec. Hillary Clinton's private email server (@clintonemail.com)
- 27,159 emails & docs
- 2009-2012
- No metadata
- Redacted and marked

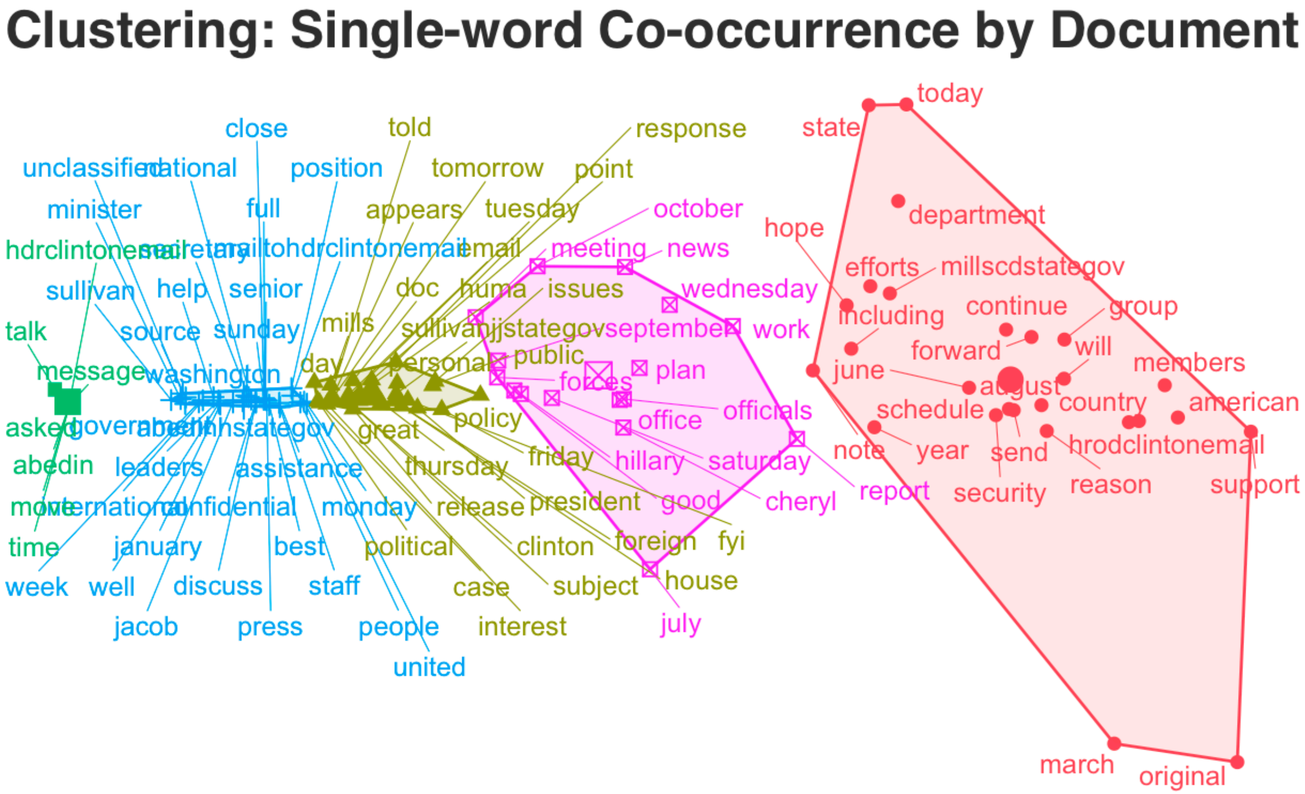
Typical Image

Unlike original email, these images come with no metadata, or even machine-readable text; OCR is required

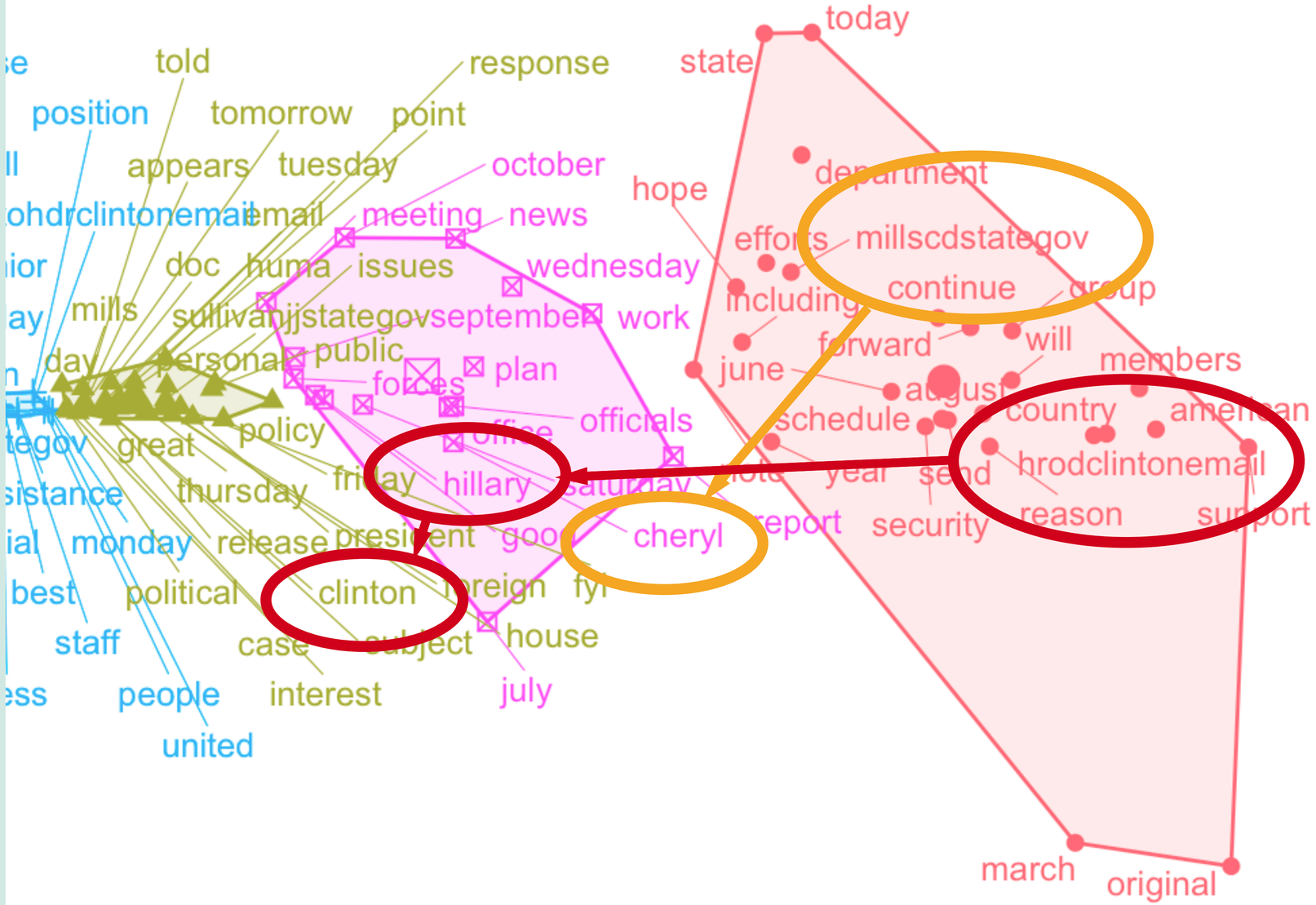


The data is searchable, but as far as visual analytics go, it's a bust...



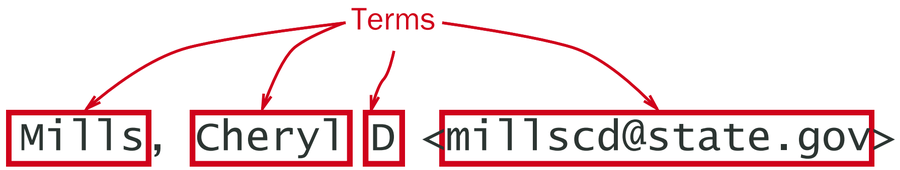


K-means clustering and related graph are saturated and confusing



Specific Challenges with Clinton Dataset

- Unfielded email addressing is split into multiple terms



- OCR errors in the data mask email addresses

hrod17©clintonemail.com

- Document stamping and marking skews the data

- Redaction removes some identifying info

Email as a source poses additional challenges:

- Emoticons, abbreviations, spelling errors
- Repeated content in reply chains
- Boilerplates and signatures skew data
- Shifting topics and language over time

Summarization and visualization are hampered under these conditions!

Enhanced Data Prep

- **Scrub**
- Normalize
- Extract
- Type

Tune Cleaning Regimen to Corpus

1. Remove common OCR errors in the data:

hrod17©clintonemail.comi

hrod17@clintonemail.com

2. Remove unnecessary doc-stamping and markings.

3. Discard irrelevant, but non-typical stop words

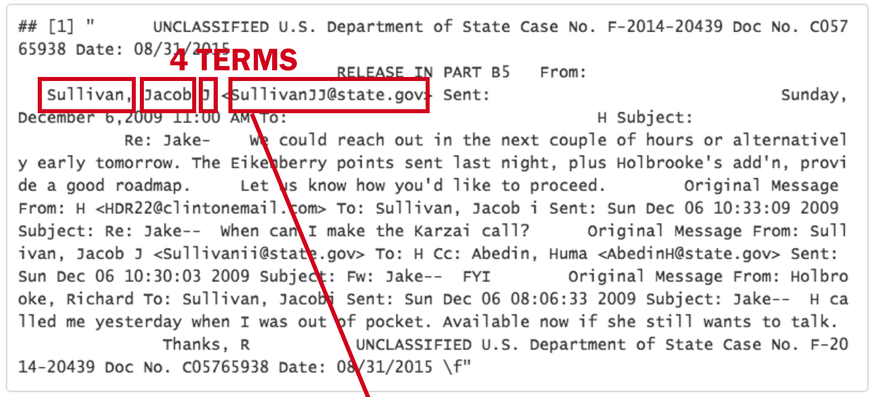
```
##   [1] afternoon    am          anytime     apr          arrive
##   [6] asap         attached    aug         availability bcc
##  [11] btw          calls       cc          check        checking
##  [16] confirmed    connect     copies      copy         copying
##  [21] cscc         day         dec         depart       departing
##  [26] departs      drive       email       emailed      fax
##  [31] feb          finish      flight      forward      fri
##  [36] full         fw          fyi         going        good
##  [41] jan          jul         jun         list         mailto
##  [46] mar          meet        meeting     meetings     messages
##  [51] minutes      mon         month       morning      mtg
```

Enhanced Data Prep

- Scrub
- **Normalize**
- Extract
- Type

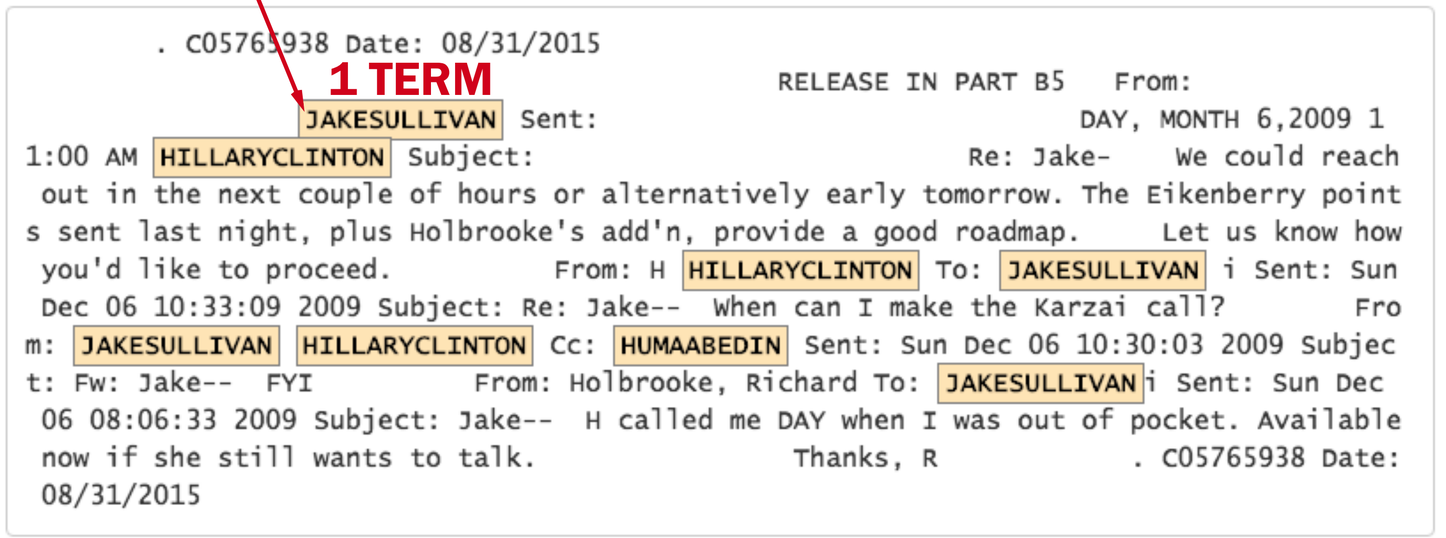
Normalize Around Known Entities

Collapse critical term sequences into unique identifiers:



Matched with Directory or other ID database

Moniker	First	Last	Email1
CHERYLMILLS	Cheryl	Mills	millscd@state.gov
HILLARYCLINTON	Hillary	Clinton	hrod17@clintonemail.com
JAKESULLIVAN	Jacob	Sullivan	sullivanjj@state.gov
HUMAABEDIN	Huma	Abedin	abedinh@state.gov
LAURENJILOTY	Lauren	Jiloty	JilotyLC@state.gov
LONAVALMORO	Lona	Valmoro	ValmoroLJ@state.gov
MONICAHANLEY	Monica	Hanley	HanleyMR@state.gov



Enhanced Data Prep

- Scrub
- Normalize
- **Extract**
- Type

Extract Actionable Metadata

Identify metadata and extract…

```
## [1] "      UNCLASSIFIED U.S. Department of State Case No. F-2014-20439 Doc No. C057
65938 Date: 08/31/2015
                                    RELEASE IN PART B5   From:
   Sullivan, Jacob J <SullivanJJ@state.gov> Sent:                                Sunday,
December 6,2009 11:00 AM To:                                H Subject:
           Re: Jake-    We could reach out in the next couple of hours or alternativel
y early tomorrow. The Eikenberry points sent last night, plus Holbrooke's add'n, provi
de a good roadmap.     Let us know how you'd like to proceed.        Original Message
From: H <HDR22@clintonemail.com> To: Sullivan, Jacob i Sent: Sun Dec 06 10:33:09 2009
Subject: Re: Jake--  When can I make the Karzai call?      Original Message From: Sull
ivan, Jacob J <Sullivanii@state.gov> To: H Cc: Abedin, Huma <AbedinH@state.gov> Sent:
Sun Dec 06 10:30:03 2009 Subject: Fw: Jake--  FYI        Original Message From: Holbro
oke, Richard To: Sullivan, Jacobi Sent: Sun Dec 06 08:06:33 2009 Subject: Jake--  H ca
lled me yesterday when I was out of pocket. Available now if she still wants to talk.
              Thanks, R           UNCLASSIFIED U.S. Department of State Case No. F-20
14-20439 Doc No. C05765938 Date: 08/31/2015 \f"
```

Sometimes, metadata such as sent date can be effectively extracted

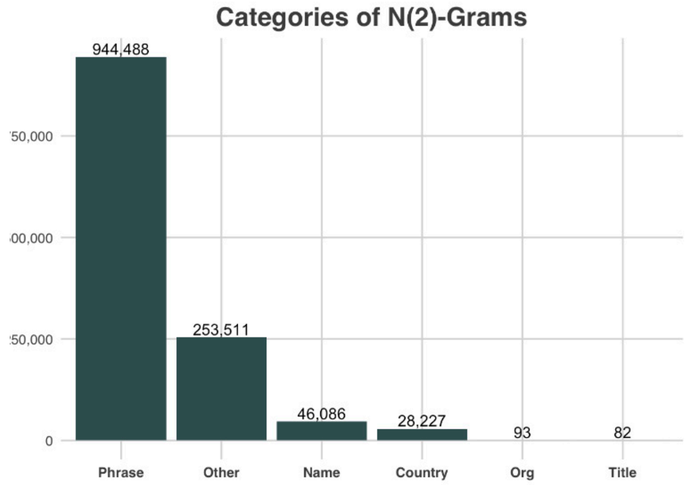
Enhanced Data Prep

- Scrub
- Normalize
- Extract
- **Type**

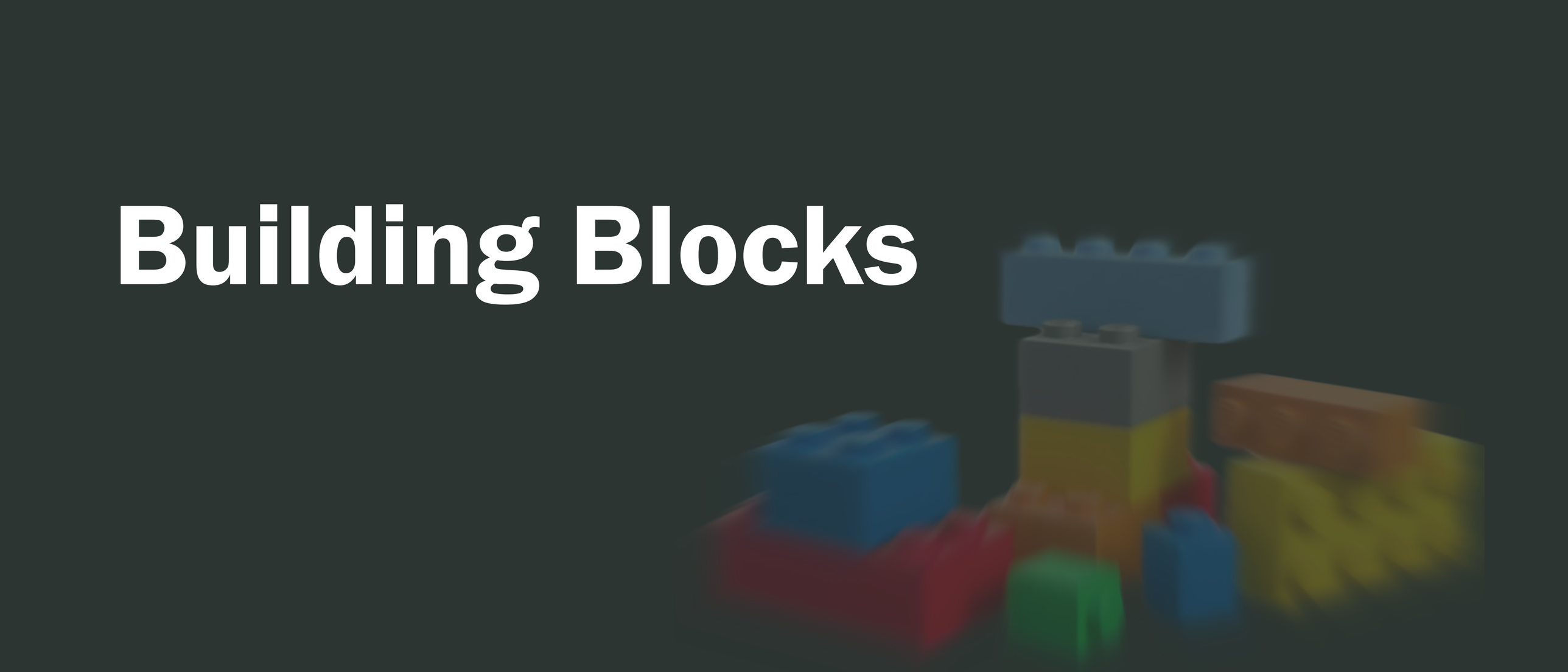
Add Dimension Through Typing

Apply context to content by matching N-grams with dictionaries and other algorithms to achieve entity extraction:

word1	word2	n	type
united	states	7,151	Country
state	department	6,233	Org
white	house	4,699	Org
department	state	3,812	Org
prime	minister	3,392	Title
secretary	state	3,187	Title
secretary	office	3,014	Org
human	rights	2,544	Phrase
secretary	clinton	2,448	Phrase
foreign	policy	2,029	Phrase
middle	east	1,988	Phrase



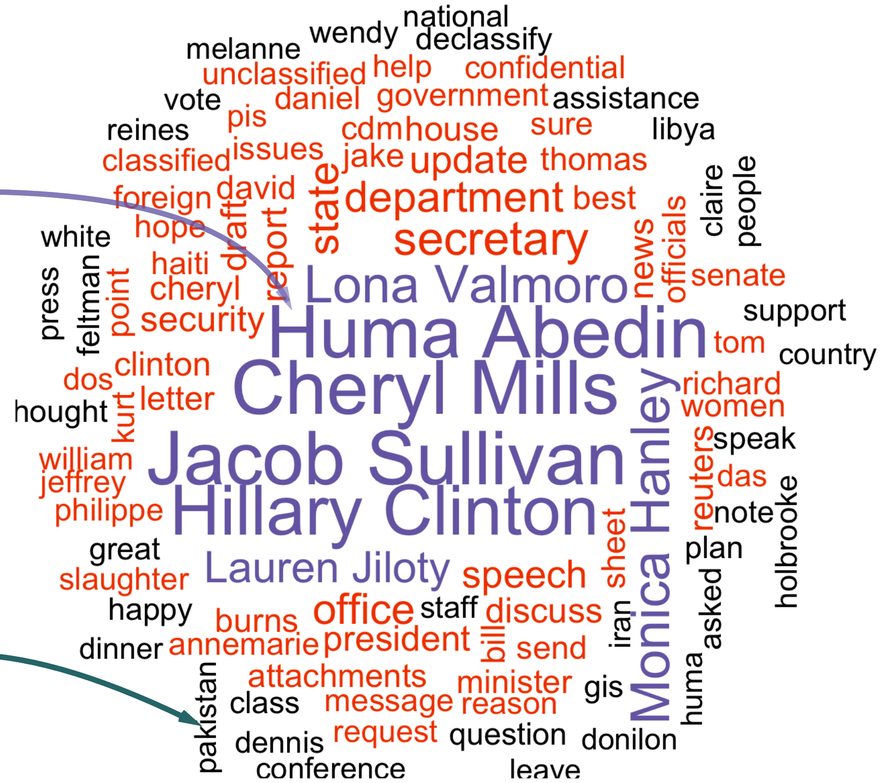
Building Blocks



Steps towards better understanding…

Highlight key persons, organizations, or other easily identified info

Increase stop words to make room for more interesting content

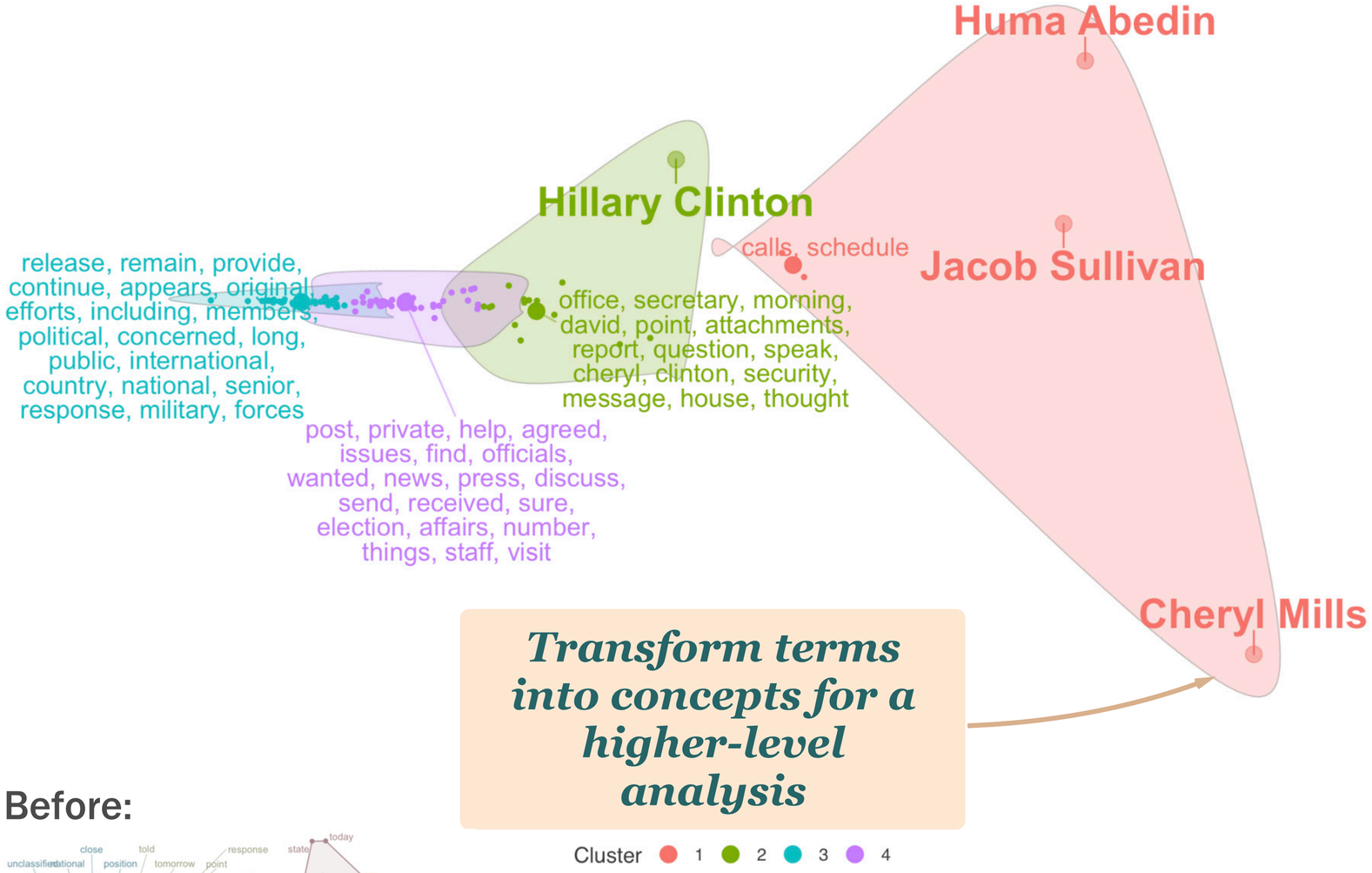


Filter Noisy Content

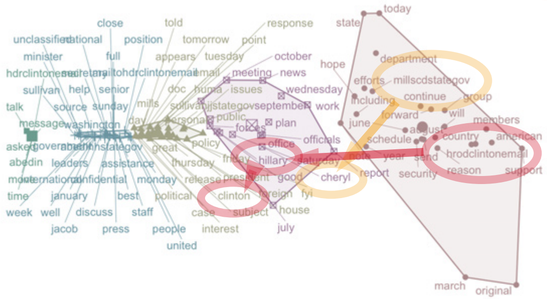
Fixed stop word lists are insufficient; tune stop words to the content and use case

Focus on Logical Relationships

Normalization gets you closer to the concepts



Before:



Add Depth

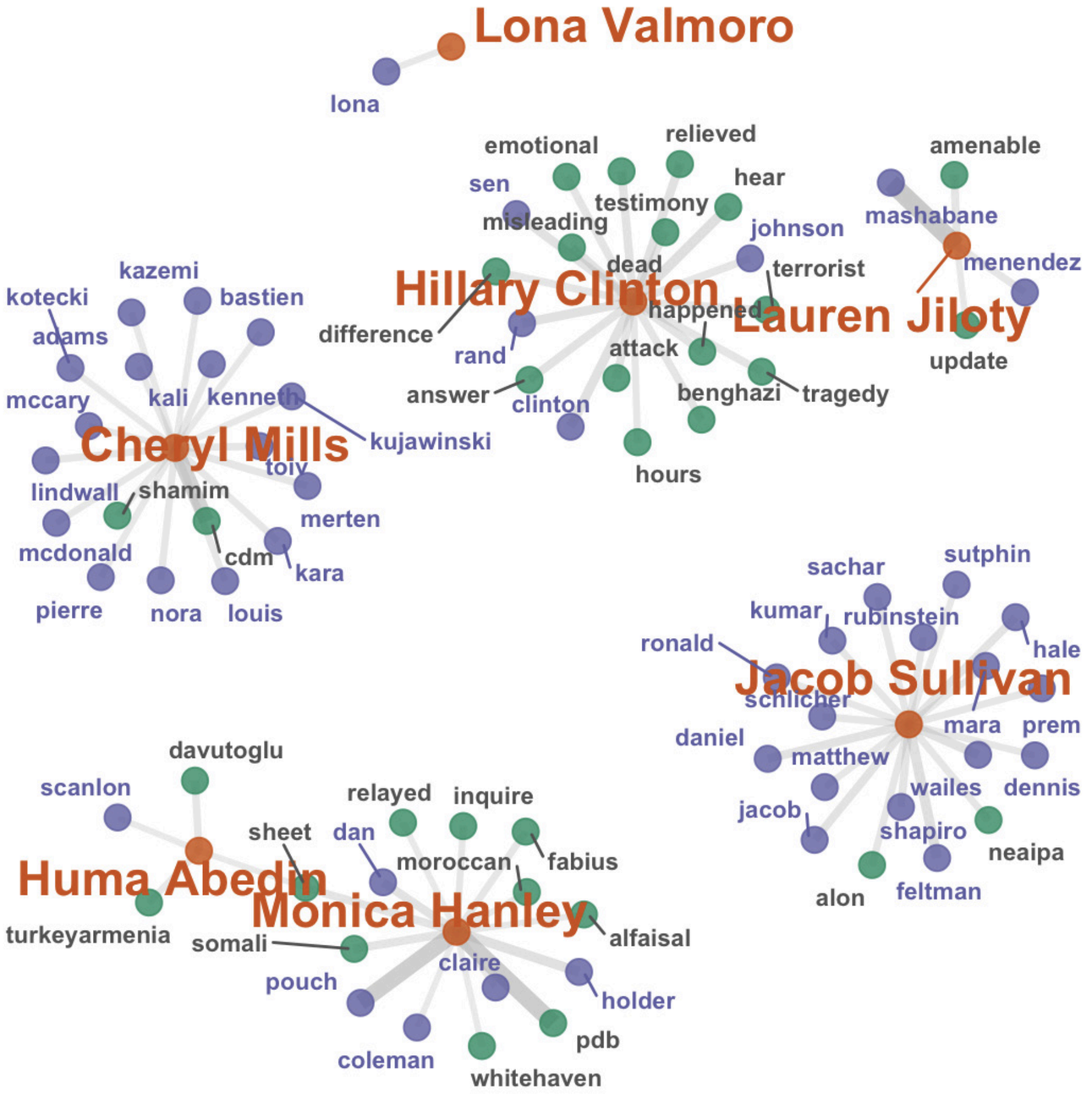
Within limits, multi-variate graphs enhance not only contextual understanding, but basic readability

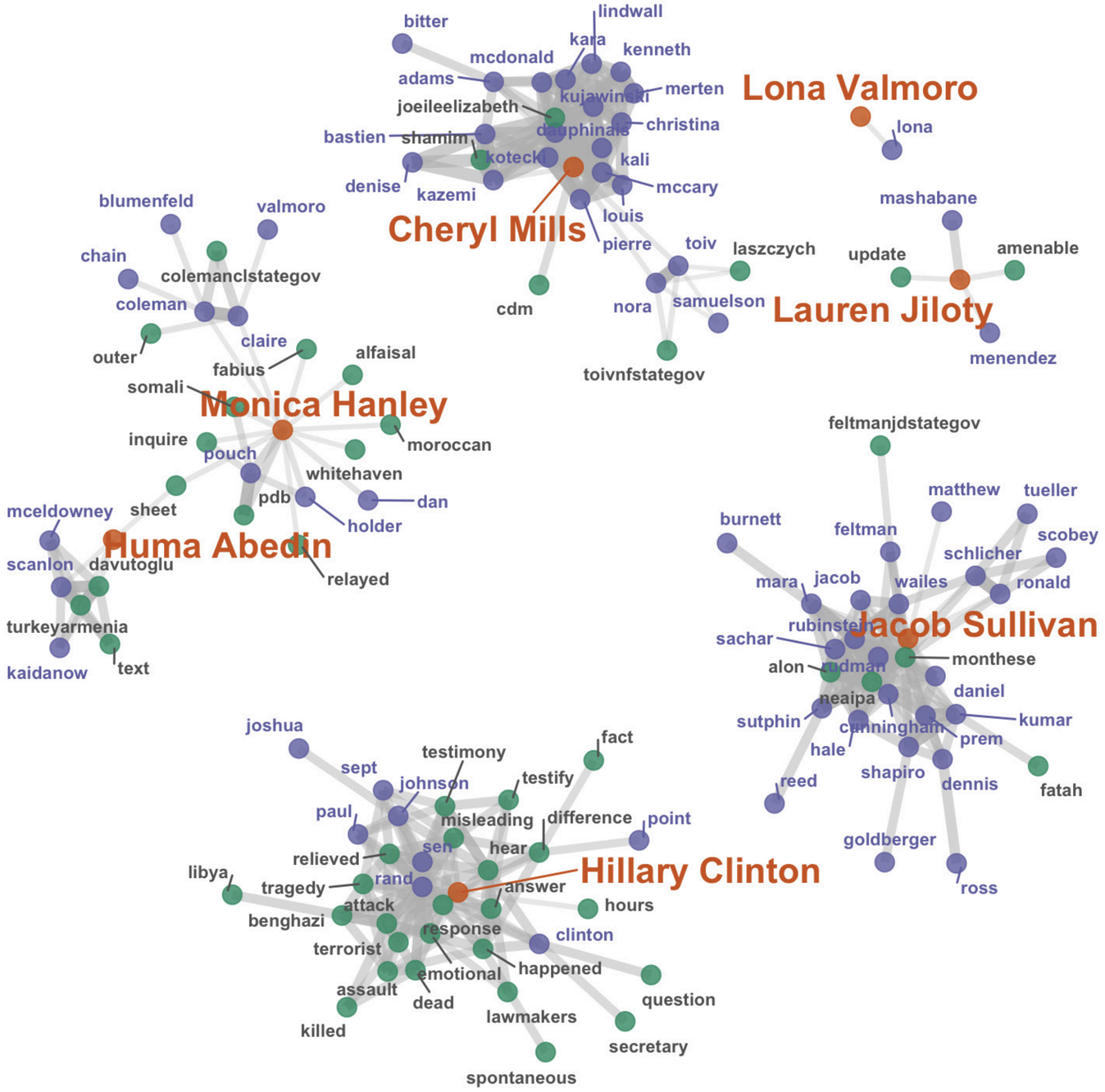
Boosting Signal in Unstructured Data Analytics

Surfacing buried insights...

Term Clustering by Person

Build topical interest clouds by correlating term relationships to normalized persons



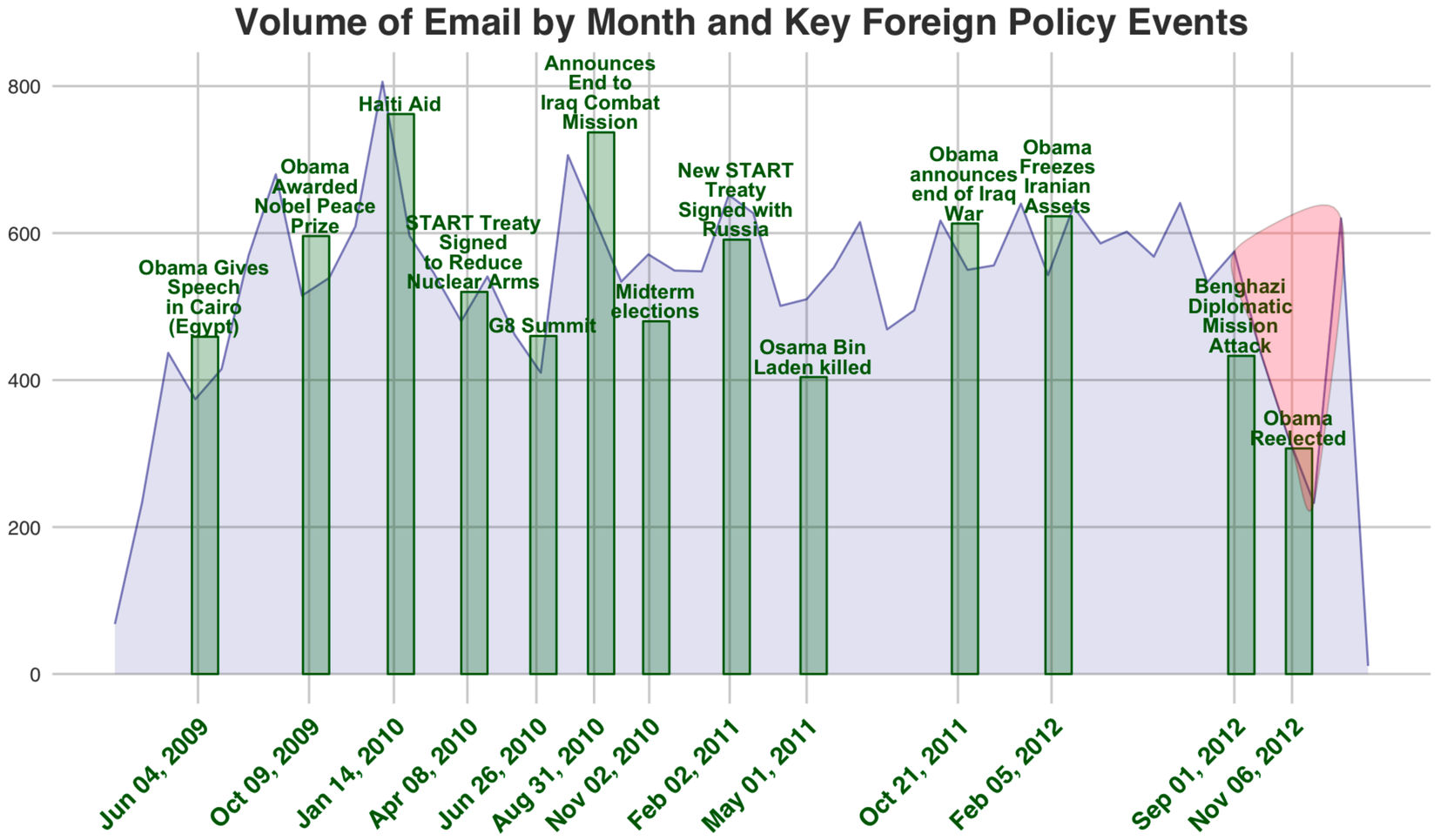


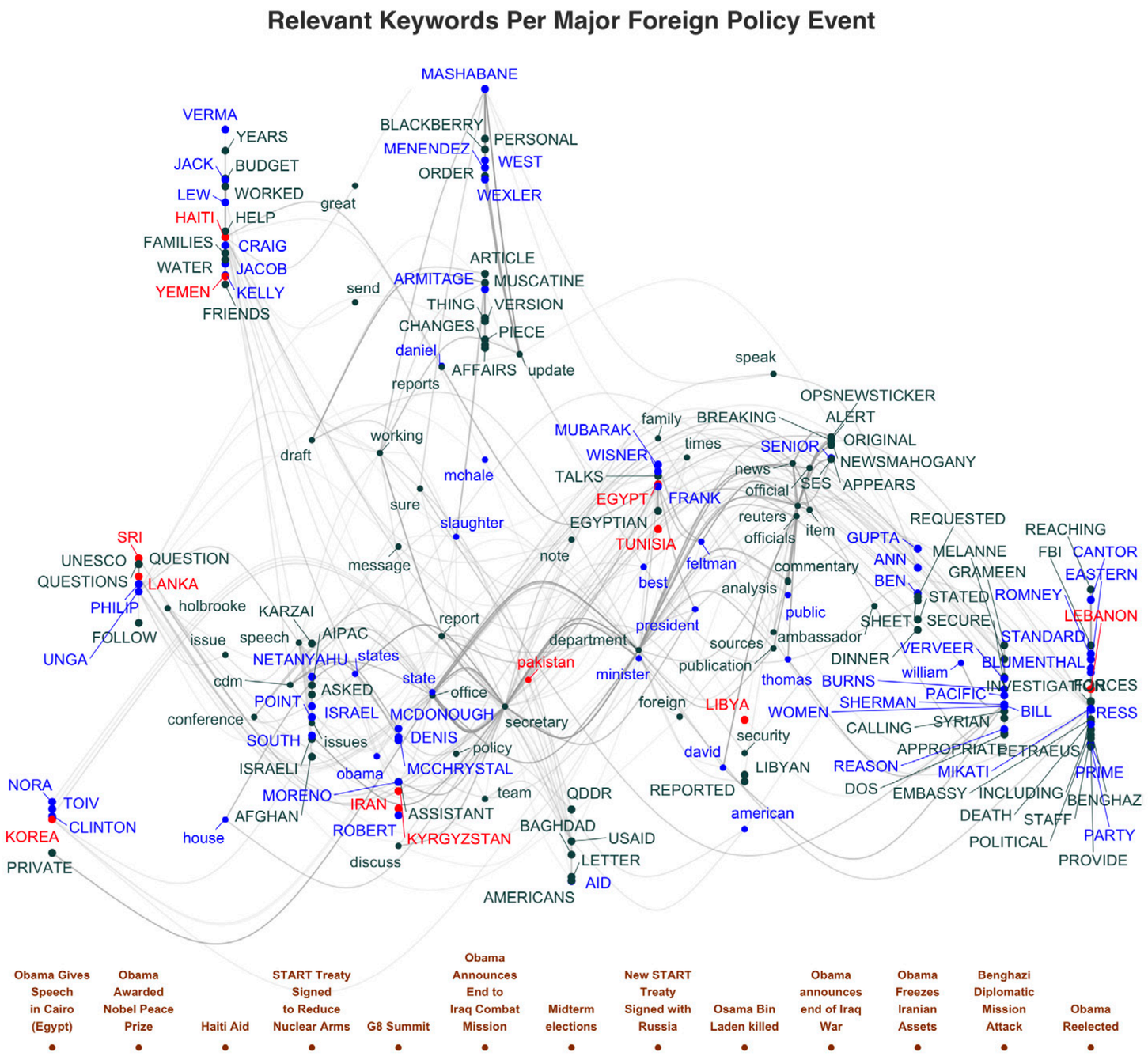
N-Gram Clustering by Person

Extending the analysis to greater depths sometimes reveals additional patterns

Analyzing by Time

Collect key event data and tag content as to its event relationship, or correlation in time

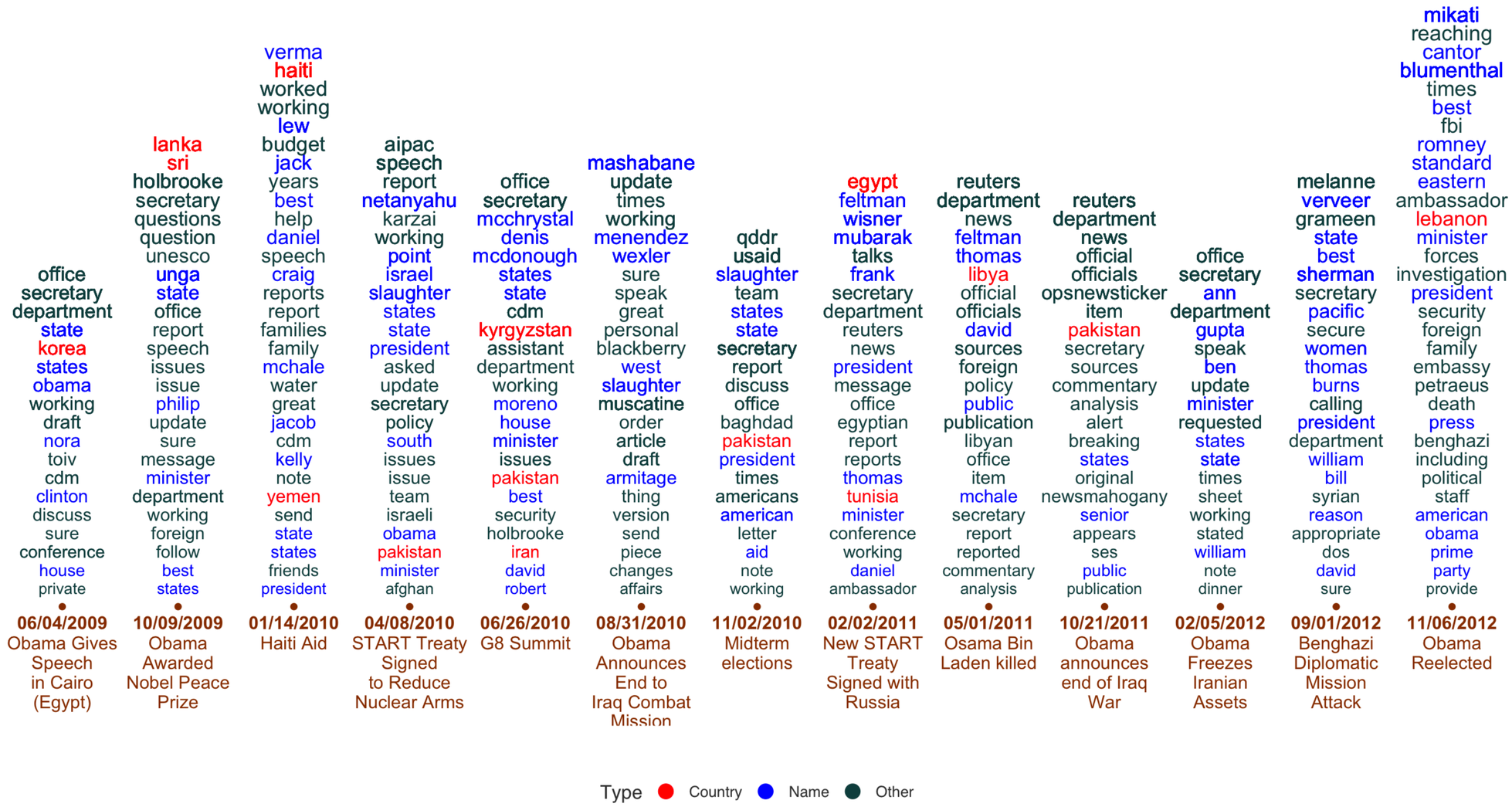




N-Grams by Key Event

4 Variables:

- *Event (X)*
- *Frequency (Y)*
- *Correlation (Edges & Case)*
- *Type (Color)*



Simple Version: N-Grams by Key Event

Learn More:

For a full article, including complete R-language source code and additional examples, see:

http://www.corpus.live/signal-boost

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