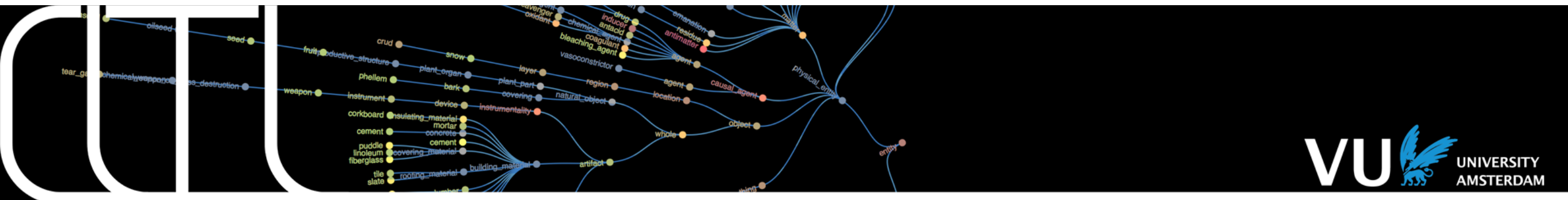This is not just a precision/recall paper

ReferenceNet

a semantic-pragmatic network for capturing reference relations

Piek Vossen, Marten Postma and Filip Ilievski
VU University Amsterdam, Netherlands
{piek.vossen, m.c.postma, f.ilievski}@vu.nl

What is a ReferenceNet?

lego

toy

pet

mother

child

population

eyes

nose

ears

Sets of word meanings used to make reference to the same instances in a similar topical context

Given an instance in the world in a topical context, what is the set of word that can be used to make reference to it?

WordNet and word embeddings do not foresee in this.

Semantics in context

Sense and Reference:

1. Sense (Sinn): WordNet synsets and word embeddings capture variation in local contexts -> synonymy

2. Reference (Bedeutung): we make reference to the same entity or event across different local contexts, shifting roles and perspectives within a topical contexts and across different local contexts -> variation beyond synonymy (orthogonal but still consistent with the type hierarchy)

The paper

- Why do we need a ReferenceNet?

- What is a ReferenceNet?

- How to get a ReferenceNet?

- Some problems and results

- Future work

The paper

- Why do we need a ReferenceNet?

- What is a ReferenceNet?

- How to get a ReferenceNet?

- Some problems and results

- Future work

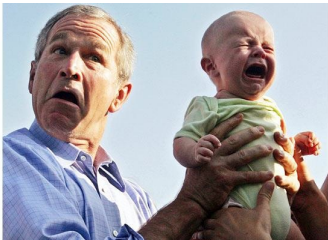# Word sense disambiguation & reference resolution are a joint problem

Ambiguity

Variation

Sources   Signal

Instance

Mentions

The world

Some model of the world

Sources Signal Concepts Instance

PLANT PERSON

ambiguity

Mentions

Symbol ambiguity

bush

him

mr. president variation

Symbol

visual word
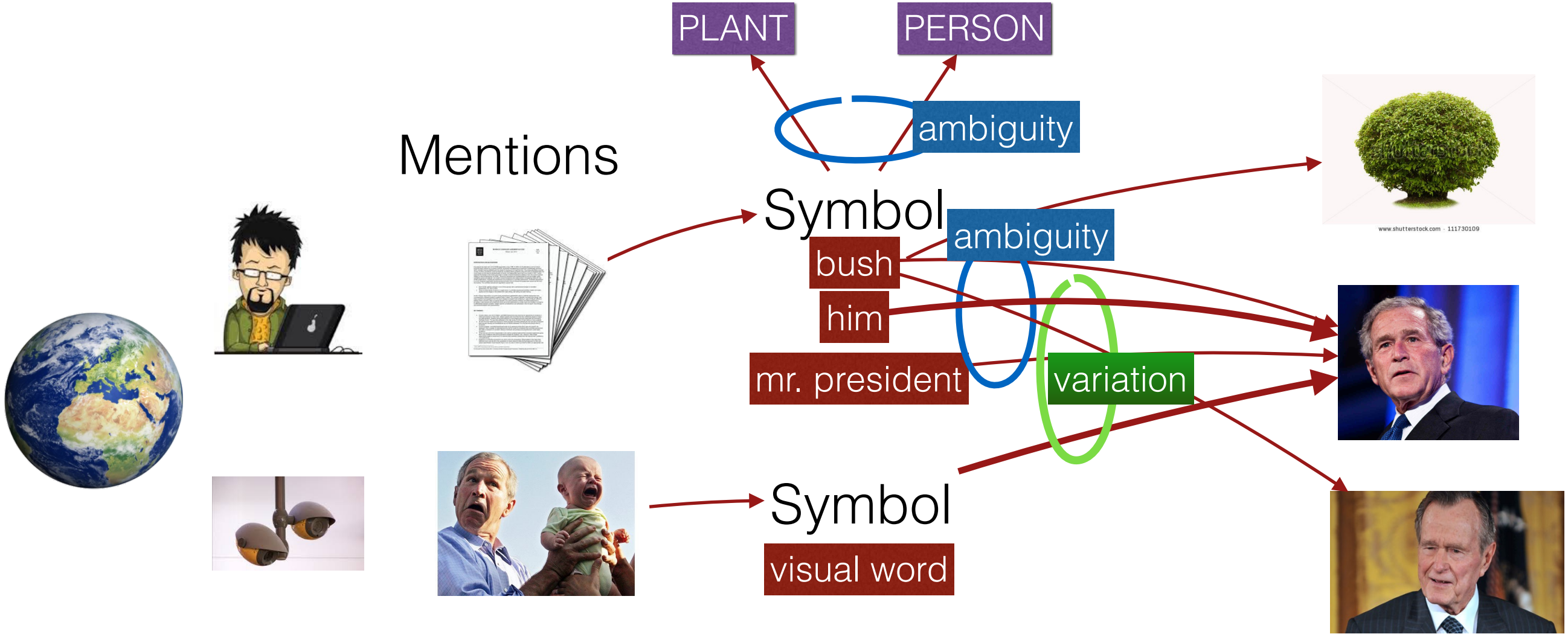
- Identity, reference & perspective
- ambiguity and variation

The paper

Model of a ReferenceNet

1. Collection of ReferenceSets, where each ReferenceSet consists of:

   1. Words and expressions used to make reference to the same instance (event or entity) in a topical context

   2. Synsets associated with these words and expressions in this context

   3. Topical context in which the reference relation was observed

2. ReferenceSets that abstract from the instance reference to instance type level

single incident

Investigators continue to look for **suspects** . after one **person** was **killed** and four **others** were **injured** when **gunfire** erupted overnight at a bar in Home- wood . ..... Several witnesses , [...] They believe the **gunman** was not searched by the four security guards who left the business before police arrived

Man Gets 15 - 30 Years For **Deadly Shooting** At Homewood Bar . PITTSBURGH (KDKA) A **man** has pleaded guilty in a 2014 **shooting** that left four **men injured** and one **dead** . **Cornell Poindexter** , 30 , appeared in court Monday and pleaded guilty to one count of 3rd degree **murder** , four counts of aggravated **assault** and one count of person not to possess a firearm . ... According to our partners at The Pittsburgh Post - Gazette , 23-year - old **Corey Clark** was originally accused of being the **gunman** , but those charges were dropped .

```
 <ReferenceSet topic="gun-violence">
  <synset-ref corefcount="2" wid="pwn30:eng-10287213-n" iid="i90357">  <!-- gunman, gun -->
    <surface-form "tokencount="2">gunman</surface-form>
  </synset-ref>
  <synset-ref corefcount="2" wid="pwn30:eng-10152083-n" iid="i91182">  <!--  man, adult_male -->
    <surface-form "tokencount="2">man</surface-form>
  </synset-ref>
  <synset-ref corefcount="1" wid="pwn30:eng-10681383-n" iid=" i93471">  <!--  suspect -->
    <surface-form "tokencount="1">suspect</surface-form>
    <proper-name "tokencount="2"/>
  </synset-ref>
 </ReferenceSet>
<ReferenceSet topic="gun-violence">
  <synset-ref corefcount="3" wid="pwn30:eng-00007846-n" iid=" i35562">  <!--  person, individual,
                                                                someone, somebody,
                                                                mortal, soul -->

    <surface-form "tokencount="1">person</surface-form>
  <synset-ref corefcount="2" wid="pwn30:eng-10152083-n" iid="i91182">  <!--  man, adult_male -->
    <surface-form "tokencount="1">man</surface-form>
  </synset-ref>
  </synset-ref>
 </ReferenceSet>
```

Suspect

Victim

```xml
<ReferenceSet  topic="gun-violence">
  <synset-ref corefcount="1" wid="pwn30:eng-00355365-v" iid="i23513"> <!-- kill -->
    <surface-form "tokencount="1">kill</surface-form>
  </synset-ref>
<synset-ref corefcount="1" wid="pwn30:eng-00095280-a" iid=" i500">      <!-- dead -->
  <surface-form "tokencount="1">dead</surface-form>
  </synset-ref>
  <synset-ref corefcount="1" wid="pwn30:eng-00045888-s" iid=" i233">      <!-- deadly -->
    <surface-form "tokencount="=1">deadly</surface-form>
  </synset-ref>
<synset-ref corefcount="1" wid="pwn30:eng-00220522-n" iid=" i36562"> <!-- murder, slaying, execution -->
    <surface-form "tokencount="1">murder</surface-form>
  </synset-ref>
</ReferenceSet>
<ReferenceSet  topic="gun-violence">
  <synset-ref corefcount="2" wid="pwn30:eng-00260470-v" iid="i23019">  <!-- hurt, injure -->
    <surface-form "tokencount="2">injure</surface-form>
  </synset-ref>
<ReferenceSet  topic="gun-violence">

</ReferenceSet>
  <synset-ref corefcount="2" wid="pwn30:eng-00225150-n" iid=" i36591"> <!-- shooting -->
    <surface-form "tokencount="2">shooting</surface-form>
  </synset-ref>
  <synset-ref corefcount="1" wid="pwn30:eng-00123783-n" iid=" i36562"> <!-- gunfire, gunshot -->
    <surface-form "tokencount="1">gunfire</surface-form>
  </synset-ref>
</ReferenceSet>
<ReferenceSet  topic="gun-violence">
    <synset-ref corefcount="1" wid="pwn30:eng-00767826-n" iid=" i39445"> <!-- assault -->
    <surface-form "tokencount="1">assault</surface-form>
  </synset-ref>
```
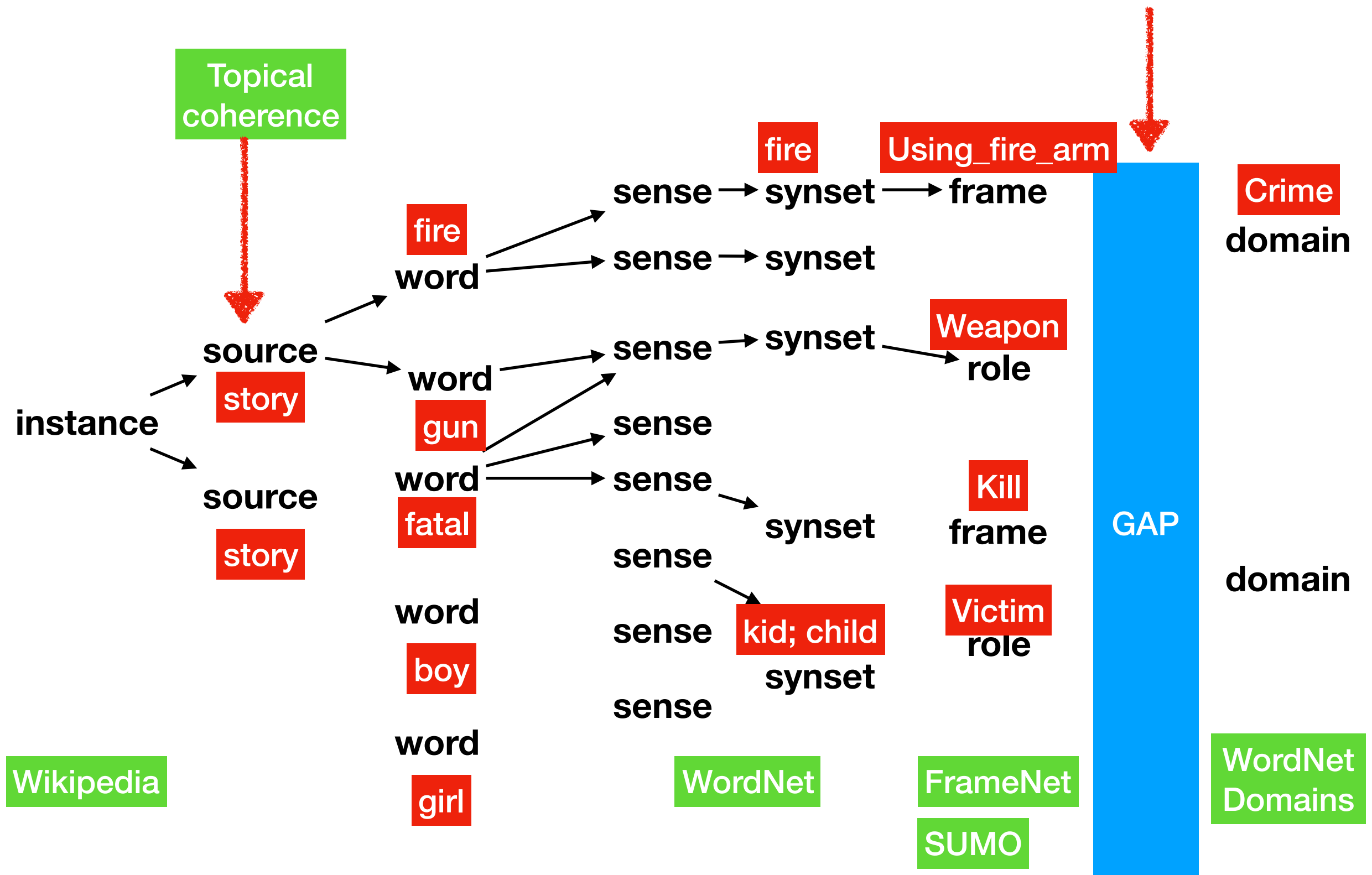
Dead

Injure

Use gun

Incident

What is a ReferenceNet?

The paper

From-text-to-data

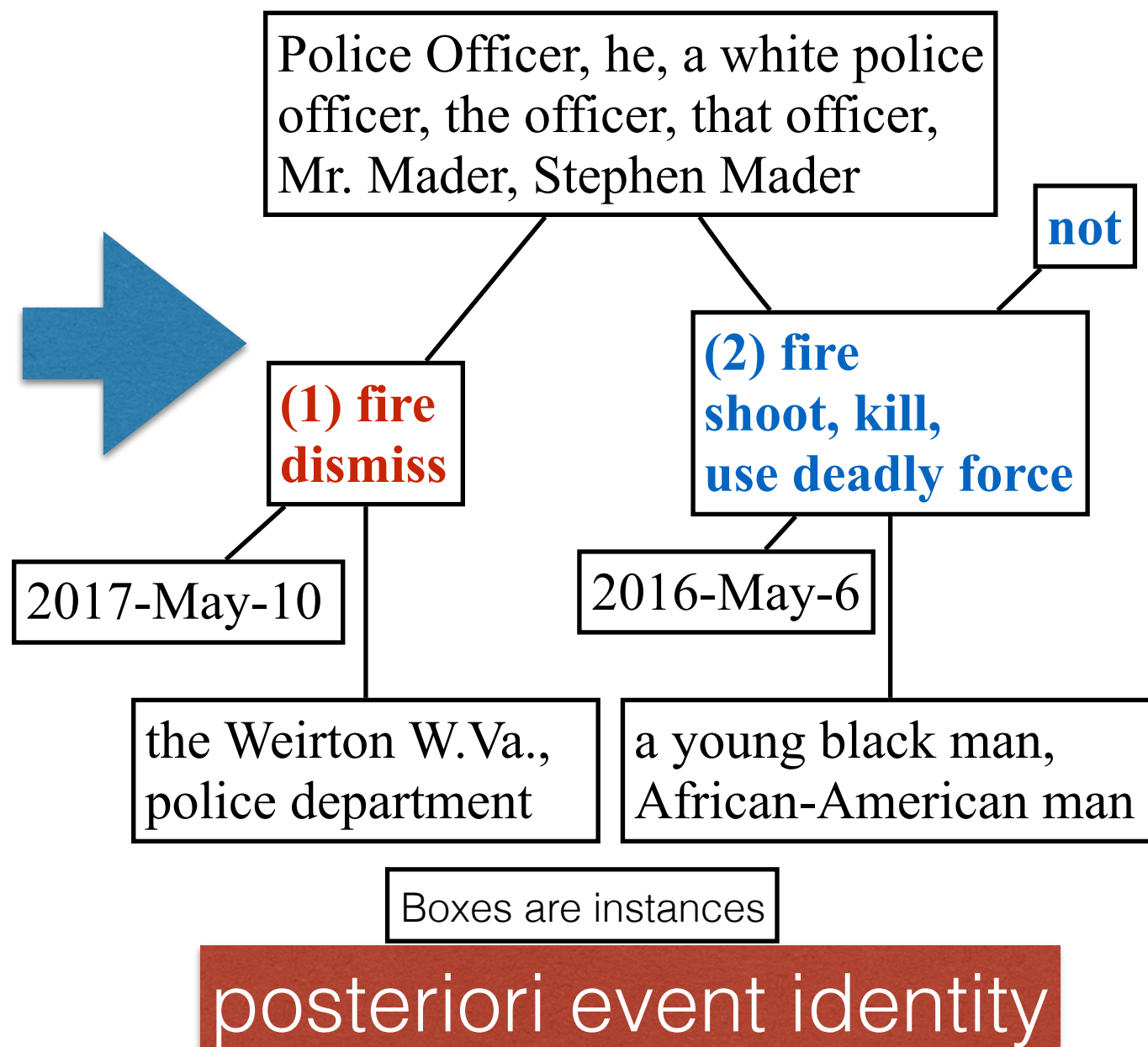**Mention-to-Instance**

News texts → **WSD and (co-)reference** → Event-centric Knowledge Graph

The New York Times

Police Officer Says He Was Fired (1) for Not Shooting (2). .. The officer could have fired (2) a shot, but he didn't. That officer, Stephen Mader, now 26, was dismissed (1) weeks later by the Weirton, W.Va., police department.

Newsweek

The Weirton Police Department terminated (1) Mr. Mader's employment because he chose not to use deadly force to shoot (2) and kill (2) and African-American man, who was suicidal, and whom Mr. Mader reasonably believed did not pose a risk of death or serious bodily injury,

Police Officer, he, a white police officer, the officer, that officer, Mr. Mader, Stephen Mader

not

(1) fire dismiss

(2) fire shoot, kill, use deadly force

2017-May-10

2016-May-6

the Weirton W.Va., police department

a young black man, African-American man

Boxes are instances

posteriori event identity

Text-to-data drawbacks

- Entity and event detection is reasonable (F-scores 65-80%) although still not very good!

- **But** co-reference performance is very low both for humans and machines (F-scores 50-60%)

- Clustering methods compare surface forms of mentions and therefore generate ReferenceSets that tend to lack variation

- Manually annotated reference data is limited (Ilievski, Postma & Vossen 2016):

  - The volume of annotated coreference data is small (few thousand documents) —> rarely find multiple documents on the same incident

  - Evaluation sets lack variation because annotators are uncertain about coreference relations across different words (one referent per word, 1-2 variant words per referent)

Event coreference data

Table 1: Existing data sets with event-reference annotations for English text. Other data sets with event annotations such as Propbank, FactBank and TimeML are not listed because they lack (co-)reference relations.

Name	Literature	Nr. of docs	Nr of event mentions	event mentions / doc	Nr of coreference clusters	event mentions / cluster	cross doc
ACE2005	Peng et al. 2016	599	5.268	8,79	4.046	1,30	NO
KBP2015	Mitamura et al. 2015	360	13.113	36,43	2.204	5,95	NO
OntoNotes	Pradhan et al. 2007	1.187	3.148	2,65	2.983	1,06	NO
IC	Hovy et al. 2013	65	2.665	41,00	1.300	2,05	NO
EECB	Lee et al. 2012	482	2.533	5,26	774	3,27	YES
ECB+	Cybulska & Vossen 2014a	982	6.833	6,96	1.958	3,49	YES
MEANTIME	Minard et al. 2016	120	2.096	17,47	1.717	1,22	YES
EER	Hong et al. 2016	79	636	8,05	75	8,48	YES
RED	O'Gorman et al. 2016	95	8.731	91,91	2.390	3,65	YES
Total		3.874	36.292	9,37	15.057	2,41	

But people already register events as structured data!!!!

LAST 72 HOURS

View Results   Export as CSV   Interactive Map

Thanks for your interest in our statistics! Unfortunately, we must limit result sets for the general queries.

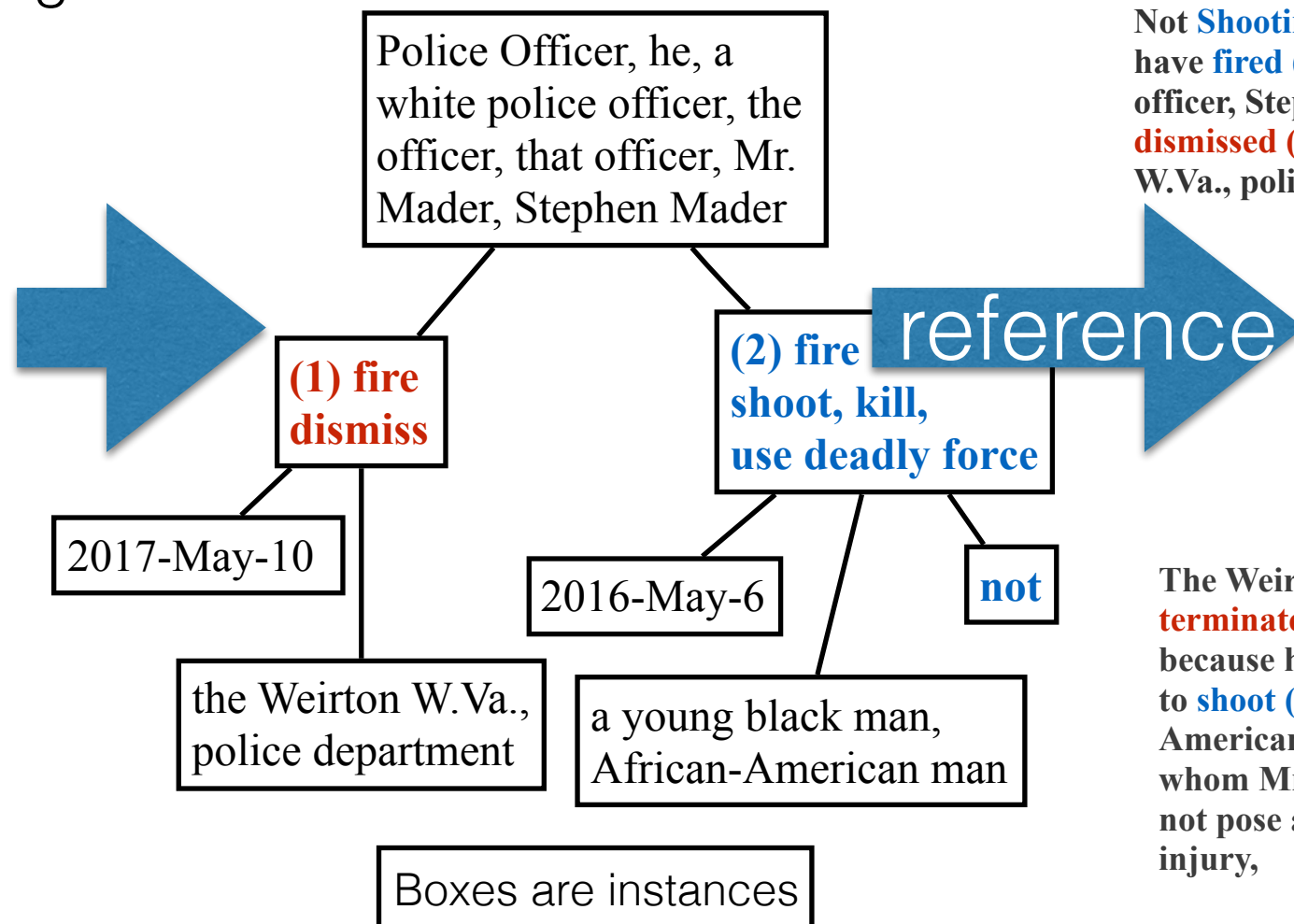| Incident Date ▾	State	City Or County	Address	# Killed	# Injured	Operations
September 18, 2017	Kentucky	Louisville	1600 block of Prentice St	1	0	View Incident View Source
September 18, 2017	Ohio	Cincinnati	1800 block of Clarion Avenue	0	1	View Incident View Source
September 18, 2017	Ohio	Cincinnati	1800 block of Rutland Avenue	1	1	View Incident View Source
September 18, 2017	Montana	Dillon	104 N Pacific St	0	0	View Incident View Source
September 18, 2017	Indiana	Clay (county)	I-70	0	0	View Incident View Source
September 18, 2017	Kentucky	Louisville	S 23rd St	0	1	View Incident View Source
September 18, 2017	Louisiana	Morgan City	2400 Tiger Dr	0	0	View Incident View Source
September 18, 2017	Arizona	Phoenix	24th Ave and McDowell Rd	1	0	View Incident View Source
September 18, 2017	Massachusetts	Boston	77 Maple St	0	1	View Incident View Source
September 18, 2017	Massachusetts	Boston	Columbia and Camody	0	0	View Incident View Source
September 18, 2017	Massachusetts	Boston	128 Zeigler St	0	0	View Incident View Source
September 18, 2017	Massachusetts	Pittsfield	East Ave and Appleton Ave	0	0	View Incident View Source
September 18, 2017	Nebraska	Omaha	15350 Shepard St	0	1	View Incident View Source

From-data-to-text

Event registry

www.gunviolencearchive.org

GUN VIOLENCE Archive 2017

Total Number of Incidents	44,092
Number of Deaths[1]	10,996
Number of Injuries[1]	22,083
Number of Children (age 0-11) Killed or Injured[1]	517
Number of Teens (age 12-17) Killed or Injured[1]	2,305
Mass Shooting[2]	257
Officer Involved Incident Officer Shot or Killed[2]	212
Officer Involved Incident Subject-Suspect Shot or Killed[2]	1,460
Home Invasion[2]	1,760
Defensive Use[2]	1,439
Unintentional Shooting[2]	1,432

Microworld

Police Officer, he, a white police officer, the officer, that officer, Mr. Mader, Stephen Mader

(1) fire dismiss

2017-May-10

the Weirton W.Va., police department

(2) fire shoot, kill, use deadly force

2016-May-6

not

a young black man, African-American man

Boxes are instances

reference

a priori event identity

Reference text

Police Officer Says He Was Fired (1) for Not Shooting (2). .. The officer could have fired (2) a shot, but he didn't. That officer, Stephen Mader, now 26, was dismissed (1) weeks later by the Weirton, W.Va., police department

The New York Times

The Weirton Police Department terminated (1) Mr. Mader's employment because he chose not to use deadly force to shoot (2) and kill and African-American man, who was suicidal, and whom Mr. Mader reasonably believed did not pose a risk of death or serious bodily injury,

Newsweek

From-data-to-text

- **Advantages**:

- Structured information for establishing reference is already given (validate instead of annotate)

- Not everything in a text needs annotation but just what matches the structured data

- Everything that matches the structured data needs to be annotated

- less conservative annotations, more (true) variation

- faster, higher agreement

- better starting point for cross-lingual interoperability

Event registries

Name	Source	Topic	Nr docs	Nr inci-dents	from	to	structured data	locations	Ref texts
GunViolence	http://gunviolencearchive.org/reports/	gun violence	*70k	33.395	2012	present	fatalities, locations, time, participants, roles, weapon.	USA	news
FireIncidentReports	https://www.firerescue1.com/incident-reports/	fire disasters	644	644	2004	present	publishing time and location,	USA	reports
ASN incident database	https://aviation-safety.net/database/	aircraft safety occurrences	31.723	21.149	1919	2017	fatalities, locations, time, and many other domain-specific data (aircrafts, crew, airports, etc.)	world	news, reports, social media
ASN Wikibase	https://aviation-safety.net/wikibase/	aircraft safety occurrences (wider set of aircrafts)	310.240	206.827	1905	2017	fatalities, locations, time, and many other domain-specific data (aircrafts, crew, airports, etc.)	world	news, reports, social media
Railwaysarchive	http://www.railwaysarchive.co.uk/eventlisting.php	railway accidents	4.520	9.015	1803	2017	casualties, locations, time, vehicle of operators	UK & Ireland	news
GVDB	http://gun-violence.org/	gun violence	130K	2.423	2000	2017	location, time, participants, circumstances of shooting	USA	news
Legible news	https://legiblenews.com/	multiple (science, sports, business and economics, armed conflicts and attacks, law and crime, politics and elections, arts and culture, international relations, disasters and accidents, etc.)	*20K	*15K	2014	present	NO	world	news
Global non-violent action DB	http://nvdatabase.swarthmore.edu/browse	social justice/protests	*5.895	1.179	1955	present	location, time	world	various
Techcrunch & Crunchbase	https://www.crunchbase.com/#/home/index	technology companies	43.212	*500K	2010	2013	investment, product, acquisition, company name, management team, employees	world	news
TOTAL			600K	781K					
Event registry	http://eventregistry.org/search?type=events	general	185.191.253	6.399.988	2014	present	NO	world	news
EMM Event corpus	http://labs.emm4u.eu/events.html	Natural Disaster, Man-mad Disaster, Civic-Political Action, Crime or Violence, Military Action and Other	17.536	7.934	2009	2015	NO	world	news

Structured event data 2

DBpedia (Knuth et al., 2015; Elbassuoni et al., 2010), Wikidata (Vrandečić and Krötzsch, 2014), and YAGO2 (Hoffart et al., 2013)

event class	wikidata ID	# events
explosion	Q179057	55
crime	Q83267	1.468
natural disaster	Q8065	1.160
accident	Q171558	2.126
sport competition	Q13406554	41.245
election	Q40231	8.178
referendum	Q43109	134
voting	Q189760	17.110
TOTAL		71.476

SKIP

query for crimes

a crime incident

structured data for crime incident

link to Wikipedia

link to References

Reference text with mentions

Wikidata Query

```
#SELECT (count(distinct ?event) as ?cnt)
SELECT ?event ?eventLabel
WHERE
{
  # find events
  ?event wdt:P31/wdt:P279* wd:Q83267.
  #?event wdt:P31 wd:Q83267.
  # with a point in time - start date
  OPTIONAL { ?event wdt:P585 ?date. }
  OPTIONAL { ?event wdt:P580 ?date. }
  # but at least one of those
  FILTER(BOUND(?date) && DATATYPE(?date) = xsd:dateTime).
  # not in the future, and not more than 31 days ago
  BIND(NOW() - ?date AS ?distance)
  FILTER(0 <= ?distance && ?distance < 36500).
  # and get a label as well
  OPTIONAL {
    ?event rdfs:label ?eventLabel.
    FILTER(LANG(?eventLabel) = "en").
  }
}
# limit to 10 results so we don't timeout
LIMIT 90
```

90 Results in 367 ms

event	eventLabel
wd:Q211087	Pan Am Flight 103
wd:Q217528	Oklahoma City bombing
wd:Q211...	Xian Incident
wd:Q4838217	Baby Bones case
wd:Q460731	Sinking of the Rainbow Warrior
wd:Q536935	1986 West Berlin discotheque bombing
wd:Q569287	Bologna massacre
wd:Q590776	Invergordon Mutiny

wd:Q4838217

WIKIDATA

Baby Bones case (Q4838217)

No description defined

In more languages

Language	Label	Description	Also known as
English	Baby Bones case	No description defined	
Dutch	No label defined	No description defined	
German	No label defined	No description defined	
French	No label defined	No description defined	

Statements

instance of — murder
0 references
+ add reference
+ add

country — United States of America
0 references
+ add reference
+ add

point in time — 15 August 2002
edit

Wikipedia (1 entry) edit
en Murder of Jon-Niece Jones

Wikibooks (0 entries) edit
Wikinews (0 entries) edit
Wikiquote (0 entries) edit
Wikisource (0 entries) edit
Wikiversity (0 entries) edit
Wikivoyage (0 entries) edit
Wiktionary (0 entries) edit
Other sites (0 entries) edit

WIKIPEDIA
The Free Encyclopedia

Article   Talk   Read   Edit   View history

Murder of Jon-Niece Jones

From Wikipedia, the free encyclopedia

Jon-Niece Jones (previously known as **"Baby Bones"**) was an American girl whose unidentified skeletal remains were found near the gated forest of New Jersey's Six Flags Great Adventure theme park, by a hunter in search of deer.[2][3] The case was showcased by America's Most Wanted in 2009 in hopes of generating leads for the unsolved case.[4] Jones was identified in October 2012. Her mother had already died; yet her aunt, her aunt's boyfriend and an uncle were charged with concealing evidence of the child's death, believed to have been the result of abuse suffered from her mother.[5]

Jon-Niece Jones

Reconstruction of the victim by the National Center for Missing & Exploited Children

Contents [hide]
1 Discovery
2 Investigation
3 Identification and convictions
References

6. ^ a b c Zezima, Katie (11 October 2012). "Jon-Niece Jones' Body Found: 3 Charged As 'Baby Bones' Victim Identified As Child In New Jersey". Huffington Post. Retrieved 21 July 2015.
7. ^ a b "Wrist-slap sentences for 'Baby Bones' death cover-up". Post Wire Services. New York Post. March 2, 2014. Retrieved 21 July 2015.
8. ^ a b c "Case File 479UFNJ". The Doe Network. 9 November 2012. Retrieved 21 July 2015.
9. ^ Baxter, Christopher (10 October 2012). "3 New Yorkers charged in connection with grisly N.J. 'Baby Bones case'". Retrieved 21 July 2015.
10. ^ a b "3 Plead Guilty Related to "Baby Bones" Case". NBC New York. NBC. 19 December 2013. Retrieved 21 July 2015.
11. ^ "Nine-year-old whose skeletal remains were found in the woods is identified as three charged with covering up her death". Daily Mail. Associated Press. 10 October 2012. Retrieved 21 July 2015.
12. ^ Flammia, Dino (10 October 2013). "Three Charged in Upper Freehold "Baby Bones" Case". New Jersey 101.5. Retrieved 21 July 2015.
13. ^ a b "'Baby Bones' suspects plead guilty in Jon-Neice Jones death". Asbury Park Press. Gannett. 20 December 2013. Retrieved 21 July 2015.
14. ^ a b c d e Goodman, J. David (10 October 2012). "Remains Found in '05 Are of Harlem Girl, Authorities Say". New York Times. Retrieved 21 July 2015.
15. ^ Corley, Jacklyn (10 October 2012). "Trio Charged in Upper Freehold 'Baby Bones' Child Death Case". New Jersey Patch. Retrieved 21 July 2015.

20. ^ Villalva, Brittney R. (11 October 2012). "Baby Bones Victim Identified: 9-Year-Old Set on Fire by Aunt and Uncle". Christian Post. Retrieved 21 July 2015.
21. ^ Ross, David (2012). "3 arrested 7 years after finding child skeleton in New Jersey". Today Breaking World News. Retrieved 21 July 2015.
22. ^ Bellini, Danica (10 October 2012). "Baby Bones Victim Identified, 3 Charged in NJ for Covering up Abused Child's Death". MStars News. Retrieved 21 July 2015.
23. ^ Zezima, Katie (11 October 2012). "Jon-Niece Jones' Body Found: 3 Charged As 'Baby Bones' Victim Identified As Child In New Jersey". Huffington Post. Retrieved 21 July 2015.
24. ^ Warren, Matthew R. (10 October 2013). "3 Arrested in Connection with "Baby Bones" Case". NBC New York. Retrieved 21 July 2015.
25. ^ "3 New Yorkers Indicted In 'Baby Bones' Case". CBS New York. CBS. 7 January 2013. Retrieved 21 July 2015.
26. ^ Key, Rosetta (25 February 2013). "Not Guilty Pleas Entered in Baby Bones Case". WOBM. Retrieved 21 July 2015.
27. ^ "Suspects Plead Not Guilty In New Jersey 'Baby Bones' Case". CBS New York. CBS. 25 February 2014. Retrieved 21 July 2015.
28. ^ "Three people sentenced in 'Baby Bones' case". Cape Cod Times. 1 March 2014. Retrieved 21 July 2015.
29. ^ Mongelli, Tom (20 December 2013). "Guilty Pleas in "Baby Bones" Case". WOBM. Retrieved 21 July 2015.

Police in New Jersey have identified a child whose skeletal remains were found in 2005 as a New York City girl who was the victim of years of abuse. They also charged three people, including her aunt and uncle, with covering up her death.

A tip received within the last two months enabled authorities to identify the victim in what came to be known as the "Baby Bones" case as 9-year-old Jon-Niece Jones, of Harlem, Acting Monmouth County Prosecutor Christopher Gramiccioni said Wednesday.

The investigation found that the girl died at the Harlem home of her aunt, Likisha Jones, on Aug. 15, 2002, following years of abuse by the child's mother, Elisha Jones, the prosecutor said.

The paper

- Where did it start?

- Why do we need a ReferenceNet?

- What is a ReferenceNet?

- How to get a ReferenceNet?

- Some problems and results

- Future work

Experiment

- Documents from incidents within a single topical domain: gun violence.

- Manually annotated with events and (cross-)document coreference relations.

- Two automatic methods for event detection and coreference:

  - knowing which mentions report on the same incident (simulating data-to-text)

  - comparing all event mentions across all documents (simulating text-to-data)

- Compare ReferenceSets derived from the coreferential mentions (measure the false positive and false negatives)

Gun violence data set

- 510 documents annotated by two students in two months working 8 hours per week

- IAA = 70%

- 1,197 event instances with 6,942 event mentions for 250 incidents

- Event coreference based on the incident and the implication of the change:

  - **incident**: the incident as a whole is referred to, corresponding to an entry in the structured database.

  - **firing a gun**: the event of operating a gun without implying somebody got hit.

  - **hit**: somebody got hit as a result of shooting without implying death or injury.

  - **miss**: a gun was used but the bullet missed a person.

  - **injure**: somebody got injured as a result of being hit.

  - **die**: somebody died as a result of being hit.

Data-to-text annotation

Long Tail Annotation Tool: Mention Annotation

Logged user: **piek**

Logout

Back to dashboard

170442   Load incident

Location: Kenneth Drive, Killingly, Connecticut
Date: August 5, 2014
Killed: 1, **Injured:** 0
Event type: -Please pick an event type-
Cardinality: unknown

Event types legend: incident firing a gun hit miss injury death other generic
Selection legend: selected to be added selected to be removed

ID	Status	Type	Gender	Age	Age Group	Name
1	Killed	Victim	Male	16	-	Matthew Regula
2	Unharmed	Subject-Suspect	Male	22	-	Kyle Carney

Submit event   Submit multiword unit   Remove annotation   Clear selection

Vigil held for teenager shot$_1$^{UNK} and killed$_1$^{UNK} in Killingly - WFSB 3 Connecticut *(Published on: 2014-08-15)*   Mark non-relevant

Friends and family were on hand on Friday night to remember the life of a teenager from Killingly , who was killed$_1$^{UNK} earlier this month .
A special vigil for 16-year - old Matthew Regula was held at 8 p.m. at Davis Park in Danielson .
Police said 22-year - old Kyle Carney shot$_1$^{UNK} and killed$_1$^{UNK} Regula inside a home on Kenneth Drive on Aug. 5 .
Carney is now facing charges after he is accused of " recklessly pointing a firearm in the direction of the victim when the rifle discharged$_{NONE}$^{UNK} . " He was charged with second - degree manslaughter$_{ALL}$^{ALL} and second - degree reckless$_{ALL}$^{ALL} endangerment$_{ALL}$^{ALL} .
Carney reportedly told police the shooting$_{NONE}$^{UNK} was accidental .
Regula reportedly attended H.H. Ellis Regional Vocational Technical School in Danielson and was supposed to be starting his senior year in just a few weeks .
Carney , who has been previously arrested for disorderly conduct and possession of drugs , is expected to appear at Danielson Superior Court on Sept. 11 . He has already been arraigned in this case , but not entered a plea .
Police said they know who the gun was registered to , however , they are not releasing those details
Copyright 2014 WFSB (Meredith Corporation) . All rights reserved .

Connecticut State Police : 16-year - old boy dies$_1$^{UNK} after accidental shooting$_{NONE}$^{UNK} *(Published on: 2014-08-06)*
Mark non-relevant

Killingly (AP) — Connecticut State Police say a 16-year - old has died$_1$^{UNK} after being accidentally shot$_1$^{UNK} in the face by a man who was pointing a gun in his direction .
Police say they got a call for a shooting$_{NONE}$^{UNK} around 7 p.m. Tuesday at a home in Killingly . They found a boy unresponsive$_1$^{UNK} in an upstairs bedroom . He was taken to Day Kimball Hospital in Putnam , where he was later pronounced dead^{UNK} .
Authorities say 22-year - old Kyle Carney of Killingly had been pointing a rifle in the boy 's direction when it accidentally discharged$_{NONE}$^{UNK} .
Carney was taken into custody and charged with manslaughter$_{ALL}$^{ALL} and reckless$_{ALL}$^{ALL} endangerment$_{ALL}$^{ALL} . He 's being held on a $ 500,000 bond and was due to appear in court Wednesday .
The victim 's name had n't been released as of Wednesday morning .

Inferred chains

d#1#UNK
(killed,killed,killed,dies,died,dead)
h#1#UNK
(shot,shot,shot)
s#NONE#UNK
(discharged,shooting,shooting,shooting,discharged)
b#ALL#ALL
(manslaughter,reckless endangerment,manslaughter,reckless endangerment)
i#1#UNK
(unresponsive)

Automatic within document Event & coreference detection

- Extracts events with Mate tool (Johansson and Nugues 2008) trained on PropBank (Kingsbury and Palmer, 2002) and NomBank (Meyers et al., 2004)

- Assign synsets using WSD to content word: UKB (Agirre and Soroa 2009) and IMS (Zhong and Ng 2010)

- **ReferenceSet-1** with lemma mentions and collect the synsets with highest cumulative WSD scores, e.g. threshold 80% of max cumulative score.

- Determine WordNet similarity (Leacock and Chodorow 1998) across lemma sets by comparing their top-scoring synsets, e.g. threshold is set to 1.5 similarity (empirically set)

- **ReferenceSet-2** with similar lemmas, their top-scoring synsets, the lowest-common-subsumer (if any) and the hypernyms of the top-scoring synsets

Within-document matching

Curry Bryson , the father of the 11-year -
old who police say **shot** and **killed** a 3-year
- old , appeared in court today for a hear-
ing . ... Barney says it is not the charges
against him that have **torn** his client apart
It is the fact Bryson 's 11-year - old son is
accused of **shooting** and **killing** 3-year -

shoot: WSD scored synsets using UKB and IMS

kill

tear

`ReferenceSet-1`

`ReferenceSet-2`

```
<coref id="coevent13" type="event">
 <span> <target id="t4"/> </span>  <!--shooting-->
 <span> <target id="t35"/> </span><!--shot-->
 <span> <target id="t104"/> </span> <!--torn-->
 <exReferences>
  <exRef conf="1.38" ref="eng-30-02055267-v" source="lcs"/>
  <exRef conf="0.85" ref="eng-30-01134781-v" source="dom"/>
  <exRef conf="0.70" ref="eng-30-01597286-v" source="dom"/>
  <exRef conf="0.74" ref="eng-30-01002740-v" source="dom"/>
  <exRef conf="0.75" ref="eng-30-02061495-v" source="dom"/>
  <exRef conf="1.0" ref="eng-30-02484570-v" source="hyp"/>
  <exRef conf="0.72" ref="eng-30-01003249-v" source="dom"/>
  <exRef conf="0.70" ref="eng-30-02055267-v" source="dom"/>
  <exRef conf="0.90" ref="eng-30-01137138-v" source="dom"/>
 </exReferences>
</coref>
```

buck;charge;shoot down;shoot;tear

kill by firing a missile

Within-document matching

Curry Bryson , the father of the 11-year -
old who police say **shot** and **killed** a 3-year
- old , appeared in court today for a hear-
ing . ... Barney says it is not the charges
against him that have **torn** his client apart .
It is the fact Bryson 's 11-year - old son is
accused of **shooting** and **killing** 3-year -
old Elijah Walker

An 11-year - old Detroit boy
has been **charged** with
manslaughter in the **fatal
shooting** of 3-year - old Elijah
Walker

`ReferenceSet-2`

```
<coref id="coevent28" type="event">
 <span> <target id="t148"/></span><!--shooting-->
 <exReferences>
  <exRef conf="0.83" ref="eng-30-00225150-n" source="dom"/>
  <exRef conf="1.0" ref="eng-30-00122661-n" source="hyp"/>
 </exReferences>
</coref>
```

the act of firing a projectile

`ReferenceSet-2`

```
<coref id="coevent13" type="event">
 <span> <target id="t4"/> </span> <!--shooting-->
 <span> <target id="t35"/> </span><!--shot-->
 <span> <target id="t104"/> </span> <!--torn-->
 <exReferences>
  <exRef conf="1.38" ref="eng-30-02055267-v" source="lcs"/>
  <exRef conf="0.85" ref="eng-30-01134781-v" source="dom"/>
  <exRef conf="0.70" ref="eng-30-01597286-v" source="dom"/>
  <exRef conf="0.74" ref="eng-30-01002740-v" source="dom"/>
  <exRef conf="0.75" ref="eng-30-02061495-v" source="dom"/>
  <exRef conf="1.0" ref="eng-30-02484570-v" source="hyp"/>
  <exRef conf="0.72" ref="eng-30-01003249-v" source="dom"/>
  <exRef conf="0.70" ref="eng-30-02055267-v" source="dom"/>
  <exRef conf="0.90" ref="eng-30-01137138-v" source="dom"/>
 </exReferences>
</coref>
```
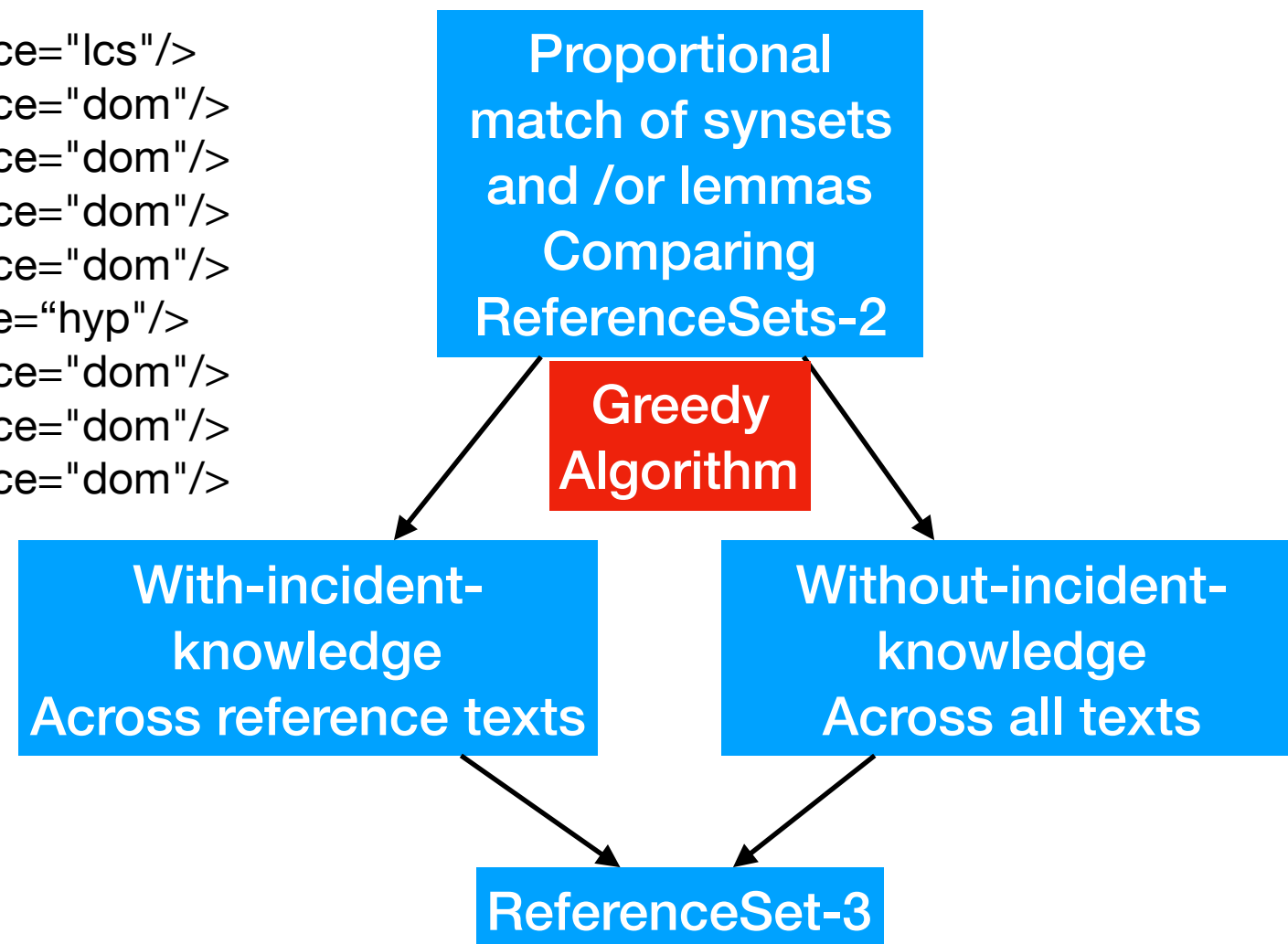
buck;charge;shoot down;shoot;tear

kill by firing a missile

Aggregate across documents

```
<coref id="coevent28" type="event">
  <span> <target id="t148"/></span><!--shooting-->
  <exReferences>
    <exRef conf="0.83" ref="eng-30-00225150-n" source="dom"/>
    <exRef conf="1.0" ref="eng-30-00122661-n" source="hyp"/>
  </exReferences>
</coref>
```

```
<coref id="coevent13" type="event">
  <span> <target id="t4"/> </span>  <!--shooting-->
  <span> <target id="t35"/> </span><!--shot-->
  <span> <target id="t104"/> </span> <!--torn-->
  <exReferences>
    <exRef conf="1.38" ref="eng-30-02055267-v" source="lcs"/>
    <exRef conf="0.85" ref="eng-30-01134781-v" source="dom"/>
    <exRef conf="0.70" ref="eng-30-01597286-v" source="dom"/>
    <exRef conf="0.74" ref="eng-30-01002740-v" source="dom"/>
    <exRef conf="0.75" ref="eng-30-02061495-v" source="dom"/>
    <exRef conf="1.0" ref="eng-30-02484570-v" source="hyp"/>
    <exRef conf="0.72" ref="eng-30-01003249-v" source="dom"/>
    <exRef conf="0.70" ref="eng-30-02055267-v" source="dom"/>
    <exRef conf="0.90" ref="eng-30-01137138-v" source="dom"/>
  </exReferences>
</coref>
```

Proportional match of synsets and /or lemmas Comparing ReferenceSets-2

Greedy Algorithm

With-incident-knowledge Across reference texts

Without-incident-knowledge Across all texts

ReferenceSet-3

Output

- Manual = all words referring to the same incident per type

- With-incident-knowledge = comparing documents belonging to the same incident

- Without-incident-knowledge = comparing all events across all documents

False negatives

False positives

Table 5: ReferenceSets at the event type level, derived from automatic annotation for 20 incidents on gun-violence

Type	Manual	Reference set with-incident-knowledge	Reference set without-incident-knowledge
incident	[accident:39, murder:15, hunting:14, reckless:14, tragedy:9, happen:8, felony:7, manslaughter:5, what:5, homicide:4, shooting:4, assault:3, case:2, endanger:2, endangerment:2, that:2, violence:2, crime:1, event:1, go:1, mistake:1, situation:1]	[accident:3] [act:1] [action:1] [case:3] [crime:1] [happen:14, fact:1] [hunting:1] [manslaughter:1] [murder:1] [shootout:1] [tragedy:1] [victim:3]	[accident:3] [call:9, make:4, name:2, act:1, action:1, holler:1] [case:3] [crime:1] [happen:14, occur:2, fact:1] [hunt:2, hunter:1, hunting:1] [manslaughter:1, murder:1] [shootout:1] [tragedy:1] [victim:3]
use gun	[shooting:48, fire:25, discharge:16, go:12, shot:9, pull:7, gunman:6, gun:5, gunshot:4, firing:3, shoot:2, turn:2 , accidental:1, act:1, action:1, handle:1, it:1, return:1, shootout:1, shotgun:1]	[discharge:3] [fire:5] [gun:1] [gunman:1] [address:1, deal:1, handle:1, speak:1] [pull:4] [return:3] [turn:3] [use:2, mother:1]	[fire:5, discharge:3, release:3, complete:2] [gun:1] [gunman:1] [pull:4, force:1] [return:3] [turn:3, grow:2, raise:2] [mother:6, use:2,bill:1]
hit	[shot:131, discharge:17, shooting:17, strike:16, hit:4, blast:3, victim:3, striking:2, gunshot:1, turn:1]	[shoot:5, shooting:4, shot:2] [shoot:26, shot:7, shooting:4, hit:3, charge:1] [shoot:2, charge:1] [hit:3, shoot:3] [strike:2]	[shoot:23, shot:5, charge:3, hit:3, shooting:2] [strike:2]
injury	[wound:36, surgery:13, treat:5, injure:3, stable:3, injurious:2, send:2, bodily:1, critical:1, hit:1, hospitalize:1, hurt:1, injury:1, put:1, stabilize:1, unresponsive:1]	[send:7, post:4, message:1] [message:1, send:1] [treat:2] [wound:3] [hurt:3]	[send:6, carry:5, post:5, letter:1, message:1, transport:1] [handling:3, treat:2, deal:1, handle:1, manage:1] [wound:3] [hurt:3, back:2, suffer:2,support:2]
dead	[death:60, die:52, dead:45, kill:34, fatal:13, lose:9, fatally:7, loss:7, autopsy:6, body:4, take:3, homicide:2, claim:1, deadly:1, life:1, murder:1]	[death:7, die:4] [die:9, death:7, run:1] [kill:12] [house:2, live:2, life:1] [life:8, live:5, house:2] [lose:4] [loss:1] [put:4, place:1] [place:1, put:1] [say:52, take:21, involve:10, need:9, come:8, get:8, tell:3, ask:2, bring:2, carry:2, want:2, conduct:1] [involve:10, come:8, get:8, take:4, need:3, bring:2, want:2] [carry:2, take:2]	[die:9, death:5, run:5] [kill:12] [family:13, life:7, home:5, live:4, house:1] [lose:4, loss:1] [put:4, place:2, set:2 lay:1] [say:146, tell:17, take:14, involve:7, need:6, ask:5, conduct:3, statement:2, want:2, bring:1] [ask:2, take:2, need:1]

Table 5: ReferenceSets at the event type level, derived from automatic annotation for 20 incidents on gun-violence

Type	Manual	Reference set with-incident-knowledge	Reference set without-incident-knowledge
incident	[accident:39, murder:15, hunting:14, reckless:14, tragedy:9, happen:8, felony:7, manslaughter:5, what:5, homicide:4, shooting:4, assault:3, case:2, endanger:2, endangerment:2, that:2, violence:2, crime:1, event:1, go:1, mistake:1, situation:1]	[accident:3] [act:1] [action:1] [case:3] [crime:1] [happen:14, fact:1] [hunting:1] [manslaughter:1] [murder:1] [shootout:1] [tragedy:1] [victim:3]	[accident:3] [call:9, make:4, name:2, act:1, action:1, holler:1] [case:3] [crime:1] [happen:14, occur:2, fact:1] [hunt:2, hunter:1, hunting:1] [manslaughter:1, murder:1] [shootout:1] [tragedy:1] [victim:3]
use gun	[shooting:48, fire:25, discharge:16, go:12, shot:9, pull:7, gunman:6, gun:5, gunshot:4, firing:3, shoot:2, turn:2 , accidental:1, act:1, action:1, handle:1, it:1, return:1, shootout:1, shotgun:1]	[discharge:3] [fire:5] [gun:1] [gunman:1] [address:1, deal:1, handle:1, speak:1] [pull:4] [return:3] [turn:3] [use:2, mother:1]	[fire:5, discharge:3, release:3, complete:2] [gun:1] [gunman:1] [pull:4, force:1] [return:3] [turn:3, grow:2, raise:2] [mother:6, use:2, bill:1]
hit	[shot:131, discharge:17, shooting:17, strike:16, hit:4, blast:3, victim:3, striking:2, gunshot:1, turn:1]	[shoot:5, shooting:4, shot:2] [shoot:26, shot:7, shooting:4, hit:3, charge:1] [shoot:2, charge:1] [hit:3, shoot:3] [strike:2]	[shoot:23, shot:5, charge:3, hit:3, shooting:2] [strike:2]
		take:4, need:3, bring:2, want:2] [carry:2, take:2] [ask:2, take:2, need:1]	

Output

False positives

Table 5: ReferenceSets at the event type level, derived from automatic annotation for 20 incidents on gun-violence

Type	Manual	Reference set with-incident-knowledge	Reference set without-incident-knowledge
incident	[accident:39, murder:15, hunting:14, reckless:14, tragedy:9, happen:8,	[accident:3] [act:1] [action:1] [case:3] [crime:1] [happen:14, fact:1] [hunting:1]	[accident:3] [call:9, make:4, name:2, act:1, action:1, holler:1] [case:3] [crime:1]
injury	[wound:36, surgery:13, treat:5, injure:3, stable:3, injurious:2, send:2, bodily:1, critical:1, hit:1, hospitalize:1, hurt:1, injury:1, put:1, stabilize:1, unresponsive:1]	[send:7, post:4, message:1] [message:1, send:1] [treat:2] [wound:3] [hurt:3]	[send:6, carry:5, post:5, letter:1, message:1, transport:1] [handling:3, treat:2, deal:1, handle:1, manage:1] [wound:3] [hurt:3, back:2, suffer:2, support:2]
dead	[death:60, die:52, dead:45, kill:34, fatal:13, lose:9, fatally:7, loss:7, autopsy:6, body:4, take:3, homicide:2, claim:1, deadly:1, life:1, murder:1]	[death:7, die:4] [die:9, death:7, run:1] [kill:12] [house:2, live:2, life:1] [life:8, live:5, house:2] [lose:4] [loss:1] [put:4, place:1] [place:1, put:1] [say:52, take:21, involve:10, need:9, come:8, get:8, tell:3, ask:2, bring:2, carry:2, want:2, conduct:1] [involve:10, come:8, get:8, take:4, need:3, bring:2, want:2] [carry:2, take:2]	[die:9, death:5, run:5] [kill:12] [family:13, life:7, home:5, live:4, house:1] [lose:4, loss:1] [put:4, place:2, set:2 lay:1] [say:146, tell:17, take:14, involve:7, need:6, ask:5, conduct:3, statement:2, want:2, bring:1] [ask:2, take:2, need:1]

want:2, conduct:1] [involve:10, come:8, get:8, take:4, need:3, bring:2, want:2] [carry:2, take:2] [ask:2, take:2, need:1]

Results from paper

Mentions (874 gold)		Lemmas (77 gold)	
with-i	without-i	with-i	without-i
r	20.25%	18.19%	49.35%	49.35%
p	59.80%	35.57%	62.30%	46.34%
f	30.26%	24.07%	55.07%	47.80%

38 news items
20 incidents
138 event instances
874 event mentions

- incident-based more fine-grained and shows less drift

- incident-based higher precision (+14 mentions, +16 lemmas)

- both have low recall:

  - Propbank and Nombank coverage that drive Mate's event detection

  - Wide interpretation of event: fatally, gunman, bodies, pull the trigger, use a gun, is not captured by any of the WordNet relations

Conclusions

- We introduced the notion of ReferenceSets filling a gap of topical coherence relations between synsets, frames and domains

- We motivated the need for coreference resolution, word sense disambiguation but also perspective analysis

- We described a method to acquire initial sets using a data-to-text method

- We provide evidence that this results in more precise and fine-grained sets compare to bottom-up coreference

- We demonstrated that recall is low due to the fact that WordNet does not capture these coreference relations

Future work

- We plan to build large data sets of references texts linked to event registries

- Include nominal and entity coreference in the analysis

- Bootstrap the extraction of ReferenceSets by analysing the reference sets per topic or domain

- Experiment with replacing explicit domains by topical domain repositories
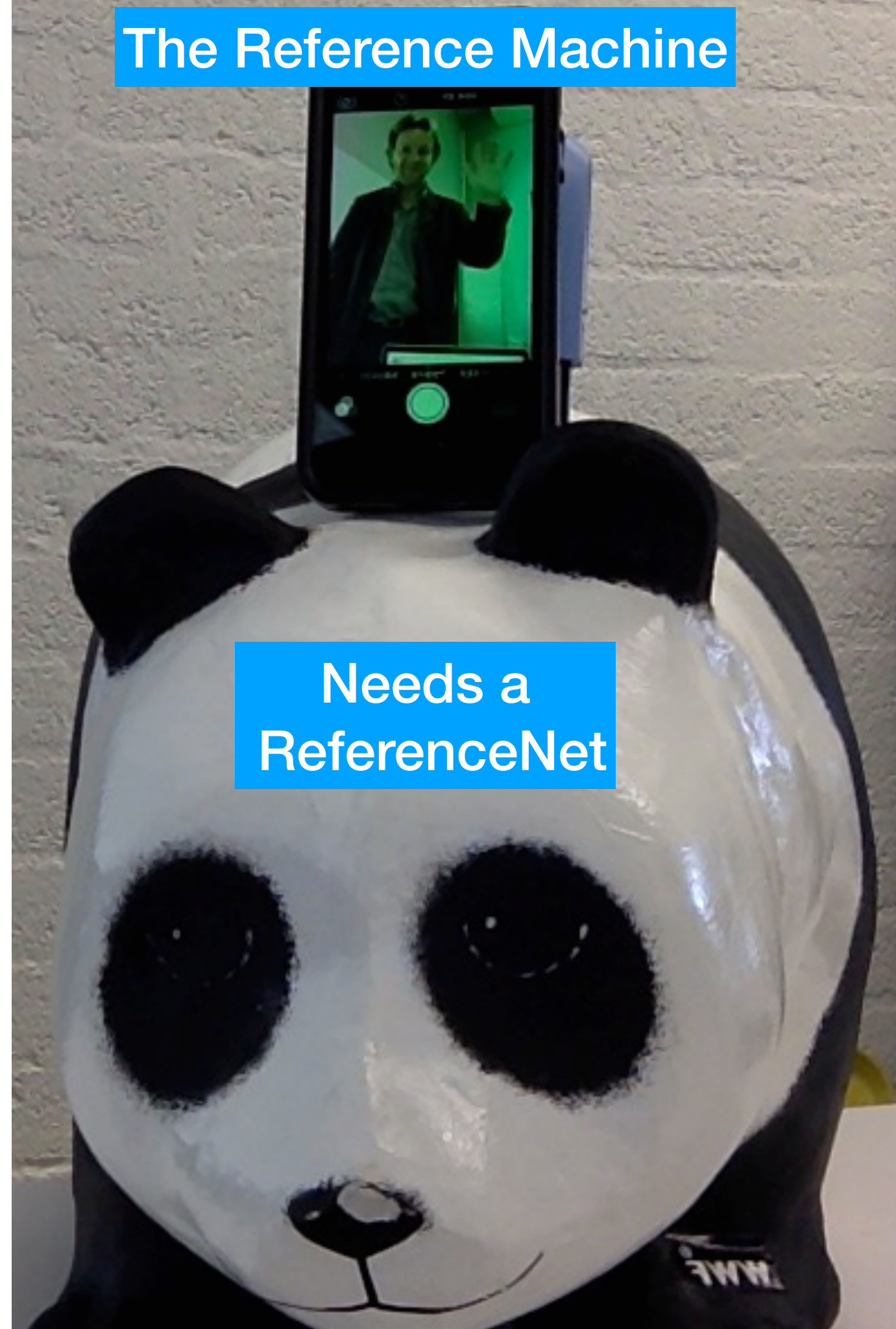
Thank you for your attention

QUESTIONS?

The Reference Machine

Needs a ReferenceNet
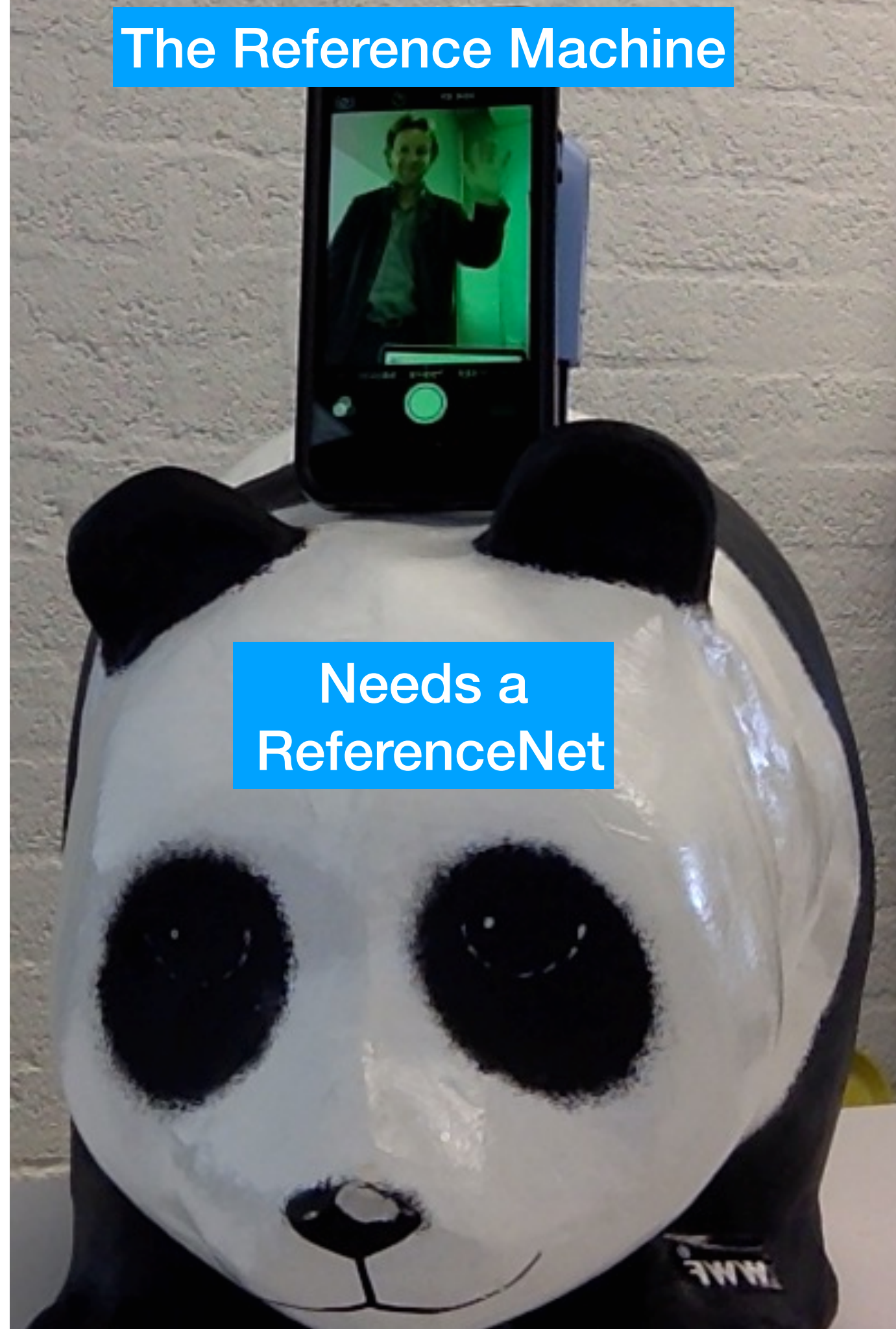
Ultimate goal

- A machine that can observe the world

- Make reference to the world through language

- Taking into account semantic-pragmatic factors

  - shared background

  - perspective

  - motivation

  - (un)certainty

The Reference Machine

Needs a ReferenceNet

Using a wordnet
to get from visual world to language

Beyond ImageNet

naarling, beroerling, ellendeling, etterbak, etterbuil, fielt, fluim, gemenerik, hond, hondenlul, kankerlijer, kelerelijder, kelerelijer, klerelijer, kloot, kloothommel, klootspiraal, klootzak, kwal, lamgat, lammeling, lamstraal, lamzak, lazersteen, lazerstraal, loeder, lul, lulhannes, lulletje, miesgasser, mispunt, onverlaat, paardelul, paardenlul, patjakker, pleurislijder, ploert, plurk, pokkenlijer, pokkenvent, pooier, rasploert, reptiel, rotzak, schoelje, schoft, serpent, smeerlap, stinker, teringlijder, tyfuslijer, vuilak, zakkenwasser, zwijn, zak, hondelul, etter, lelijkerd, smiecht, pokkenlijder, sekreet, stinkerd, individu

huichelaar, Januskop, draaikont, farizeeër, hypocriet, januskop, jezuïet, smoelentrekker, valsaard, valserik, veinzaard, veinzer

onruststoker, aanstoker, aanzetter, agitator, herrieschopper, onrustzaaier, oproerkraaier, opruier, paniekzaaier, provocateur, raddraaier, roervink, stemmingmaker, stokebrand, stoker, woelgeest

8.643 dutch words for a person

Which one to pick for him?