L98: Introduction to Computational Semantics
Lecture 13: Figurative Language

Simone Teufel and Weiwei Sun

Natural Language and Information Processing Research Group
Department of Computer Science and Technology
University of Cambridge

Lent 2021/22

Lecture 13: Figurative Language

Types of Figurative Language

- Simile
- Hyperbole
- Metaphor
- Idiom
- Pun
- Metonymy

According to Cruse (1986)

Simile

- Comparison takes place.
- Comparison is explicitly stated.
- Comparison is typically along one very clear dimension.
    - *Shall I* **compare** *thee to a rose.*

Hyperbole

- Purposeful and obvious exaggeration to an extreme
- Done for humorous purposes
    - *That suitcase weighed a ton!*
    - *She's going to die of embarrassment.*
    - *A mile-high ice cream cone.*

Metaphor

- A "conceptual domain" is used to represent another domain
- Example: FEELINGS ARE LIKE LIQUIDS.
- We can talk about different feelings in terms of what a liquid would do.
- Be in turmoil, be calm, be under pressure.
- We can talk of experiencers as receptacles, or any other object that has to do with liquids, e.g., boats.
- There is not only a single image.
- Many components and separate images, which are related to each other.
- We have a translation of one whole scenario into another scenario

Idiom

- *He has a* **bee in his bonnet**.

"have an idea that you are fixated on"

Pun

- Play on words, often using phonological effects
- Uses ambiguity, e.g.:
    - *If we give peas a chance, won't the lima beans feel left out?*
    - Play on well-known phrase "give peace a chance"
- Often used in headlines or shop names to get our attention.
    - Name of haberdashery shop: "Sew what?"

Neologisms

- Definition: Two word senses are combined to express a new meaning that is arguably associated with a lexical gap
- Example **"Nonversation":** *(Non+conversation), ie a worthless, content-free conversation.*
- Example **"Columbising":** *(Columbus + "verb") When white/Western people claim to have discovered something that has been around for years, decades, or centuries.*

Pre-lecture Exercise 1

Definitions (but all mixed up)

1. A person who feels more comfortable when texting to you than when talking face to face.

2. An individual who continues to talk on the mobile phone so as to be rude to people around them.

3. Someone very critical of your driving. Like a backseat driver, but in the passenger seat.

4. Learning a person's routine in order to avoid them.

5. Anxiety felt when waiting for the response to a text.

6. Getting secret information from a colleague or friend by getting them drunk.

7. A condition where a passenger falls asleep as soon as the car starts moving.

8. Childish rage displayed by a grown man when he does not get his way.

9. Piling clothes on a chair in place of a closet or dresser, see also floordrobe.

Metonymy

- Regular Metonymy: A single word stands for something quite different
  - *After **Lockerbie**, I never saw plane crashes the same way.*
  - Lockerbie is a town in Scotland, but this is talking about an event.
- Logical Metonymy: A word is dropped that can be restored from context
  - *A **fast meal***
  - ... is one that is either **cooked** fast, or **eaten** fast.
- Creative: somebody replaces something, and it happens to be something that is (funnily) obvious in the context.
  - *Why don't you sit in the **apple juice seat**?*

Regular metonymy: Markert and Nissim (2006)

- Country and organisation names are classified as metonymical or not COUNTRY-FOR-GOVERNMENT:

  Countries:
  - *Or have you forgotten that America did once try to ban alcohol and look what happened!*
  - *At one time there were nine tenants there who went to America.*

  PRODUCT-FOR-ORGANISATION:

  Organisations:
  - *How I bought my first BMW.*
  - *BMW and Renault sign recycling pact.*

- Markert and Nissim (2006): roughly 20% of country names, and 33% of organisation names are used metonymically.
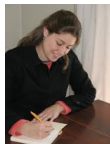
Logical Metonymy

Logical Metonymy

- Due to Pustejovsky (1991, 1995)
- Verb (or adjective) semantically selects for an event-type argument, but syntactically selects for a noun.
- Additional meaning arises for particular verb-noun and adjective-noun combinations in a systematic way
- The event is however predictable from the semantics of the noun.

I enjoyed . . . the book

- *I enjoyed* $\left\{ \begin{array}{l} \text{reading?} \\ \text{writing?} \\ \text{eating?} \end{array} \right\}$ *the book*

Ways to enjoy books:

Pusteyovsky: Qualia structure/Telic

- wood screw vs. brass screw
- A wooden screw **is for** screwing into wood.
- Not a screw that is made from wood:

- Screw is an artefact, and artefacts have a particular Qualia structure:
  - **Function** is a fixed part of that qualia structure.
  - **Material** is another part.
  - **Colour** could be another part (if "Material" does not answer this question, or if the object could be painted).

Logical Metonymy (Lapata and Lascarides, 2003)

- *a fast* $\left\{ \begin{array}{l} \text{landing?} \\ \text{taxiing?} \\ \text{flying?} \end{array} \right\}$ *plane*

BNC examples with adverbial a (= "fast") is modifying a verb e connected to noun n (= "plane") in argument relation rel (subject or object):

> The plane **went** so fast it left its sound behind.
> And the plane's **going** slightly faster than the Hercules or Andover.
> He is driven by his ambition to build a plane that **goes** faster than the speed of sound.
> Three planes **swooped in**, fast and low.
> The plane was **dropping down** fast towards Bangkok.
> The unarmed plane **flew** very fast and very high.

$\rightarrow$ cannot estimate $P(a, e, n, rel)$ this way.

(from Lapata and Lascarides (2003)

Logical Metonymy: the adjective model

$$P(a, e, n, rel) = P(e) \ P(n|e) \ P(a|e, \not{n}) \ P(rel|e, n, \not{a})$$

$f(a, e)$: look for "flies fast"
$f(rel, e, n)$: look for "plane flies" and "flies a plane"
$f(e)$: look for "flies"

$$P(a, e, n, rel) = \frac{f(a, e) f(rel, e, n)}{f(e) N}$$

Logical Metonymy: the adjective model

Frequency: verbs modified by *fast*.		Frequency: verbs taking *plane* as argument.			
f(fast,e)		f(SUBJ,e,plane)		f(OBJ,e,plane)	
go	29	**fly**	20	catch	24
grow	28	come	17	board	15
beat	27	go	15	take	14
run	16	take	14	**fly**	13
rise	14	land	9	get	12
travel	13	touch	8	have	11
move	12	make	6	buy	10
come	11	arrive	6	use	8
drive	8	leave	5	shoot	8
get	7	begin	5	see	7
work	6				
grow in	6				
learn	5				
happen	5				
walk	4				
think	4				
keep up	4				
fly	4				
fall	4				
disappear	4				

Logical Metonymy: results

Object-related interpretations for adjective-noun combinations, ranked in order of likelihood:

easy problem		**easy text**		**difficult language**	
solve	-15.14	**read**	-17.42	**understand**	-17.15
deal with	-16.12	handle	-18.79	interpret	-17.59
identify	-16.83	use	-18.83	**learn**	-17.67
tackle	-16.92	interpret	-19.05	use	-17.79
handle	-16.97	understand	-19.15	**speak**	-18.21

comfortable chair		**good umbrella**	
sink into	-18.66	keep	-21.59
sit on	-19.13	wave	-21.61
lounge in	-19.15	hold	-21.73
relax in	-19.33	run for	-21.73
nestle in	-20.51	leave	-22.28

Who cares?

Figurative language can knock out a system

Example: Summarisation

- Fang (2019) Proposition-based summariser. Works by combining information of propositions if there is an overlap in arguments (repetition or coreference).

- First sentence of input document: "In the second quarter of 2020, Apple took the crown from Amazon in the content creation market"

- We had a good parse, but summariser couldn't deal with the "crown" imagery

- Number one event in the article not understood and hence not connectable.

- Total failure of summary

Figurative language affects truth conditions

Truth conditions:

- **All the world is a stage.** So what, there are wooden planks underneath any position on the planet? There is a script for everything anybody says? Maybe not.

- **Berlin announced that it is sending RPGs to Ukraine.** So what, a city has a mouth so it can speak and hands with which to pack weapons in boxes? Maybe not.

Figurative language affects truth conditions

Truth conditions:

- **All the world is a stage.** So what, there are wooden planks underneath any position on the planet? There is a script for everything anybody says? Maybe not.

- **Berlin announced that it is sending RPGs to Ukraine.** So what, a city has a mouth so it can speak and hands with which to pack weapons in boxes? Maybe not.
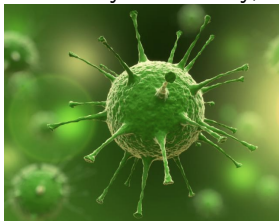
Many applications are based on semantics and truth will have exactly the same problem:

- NLI natural language inference
- QA question answering
- Reading comprehension

Figurative language influences our decision-making

Thibodeau and Boroditsky (2011) investigated how metaphor influences our decision-making.

- They read a text containing metaphors of either
  - CRIME is a VIRUS
  - CRIME is a BEAST
- The text was identical except for the metaphors.
- They were asked questions on how to tackle crime in the city
  - preventive measures
  - punishment, restraint
- They reacted very differently, according to what that had read.

Figurative language is frequent

Shutova's corpus study: every third sentence on average contains a metaphor.

Figurative language is frequent

Shutova's corpus study: every third sentence on average contains a metaphor.

We care.

Metaphor

Metaphor

A metaphor is a figure of speech that creates an analogical mapping between two conceptual domains.
Because of this mapping, the terminology of one (source) domain can be used to describe situations and objects in the other (target) domain.
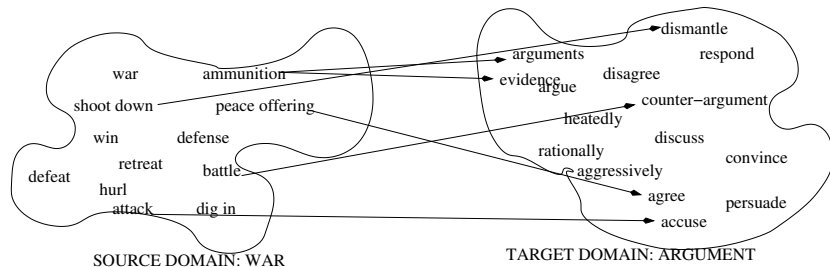
The life cycle of a metaphor (Nunberg)

- Metaphors begin their lives as novel poetic creations
  - whose comprehension requires a special imaginative leap
  - who possess strong rhetorical effects
- As time goes by, they become a part of general usage.
  - their comprehension becomes more automatic;
  - their rhetorical effect is dulled.
  - By this time they may have made it into the lexicon as a figurative word sense.
- Then they become a dead metaphor.

Lakoff and Johnson (1980): Conceptual Metaphor Theory

- Mapping between two cognitive domains (source and target)
- Usually, source domain is more concrete/evocative
- Domains include all participants, properties and events of a situation, expressed by abstract/concrete nouns, adjectives, verbs

Metaphor: ARGUMENT is WAR

- Parties **go into battle** about how high to push the bar for skills
- Villagers **launch fight** to save their primary school from closure
- How to **defend** yourself against stupid arguments

SOURCE DOMAIN: WAR

TARGET DOMAIN: ARGUMENT

war   ammunition   arguments   dismantle   respond

shoot down   peace offering   evidence   argue   disagree

win   defense   counter–argument

retreat   battle   heatedly   discuss   convince

defeat   hurl   rationally

attack   dig in   aggressively   agree   persuade

accuse

Metaphor: FEELINGS are LIQUIDS

- *A simple phone call had managed to* **stir up** *all these feelings.*
- *Now here I was,* **seething** *with anger*
- *is a kind of* **pressure valve** *for the release of* **pent-up** *nervous energy*
- *. . . provide an* **outlet** *for creativity*
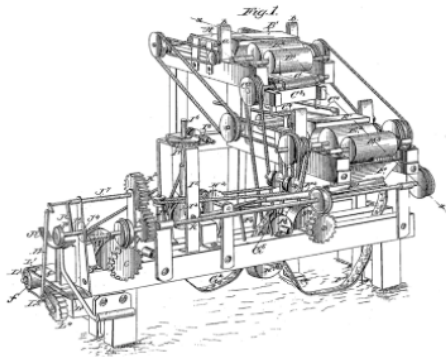- *Just ignore the* **turbulent** *feelings and turn your attention towards something else*

Metaphor: POLITICAL SYSTEM is MACHINE

"*A political machine*"

"*The wheels of Stalin's regime were well oiled and already turning*"

"*Time to mend our foreign policy*"

"*20 Steps towards a Modern, Working Democracy*"

Dead metaphor

Dead metaphor: The image that the metaphor invokes has been well-established in the language and culture, and is therefore typically not perceived as metaphor.

- *I simply cannot* **grasp** *this idea.*
- *This really made an* **impression** *on me.*

We think of it as now being contained in the "lexicon" (real or mental lexicon). This is opposed to creative, situational metaphor, which requires active resolution to understand.

Delineation Metaphor – Idiom

- Minimal semantic constituents which consist of more than one word.
  - *pull somebody's leg*
  - *be off one's rocker*
- Definition: the meaning of an idiom cannot be inferred as a compositional function of the meaning of its parts.

Syntactic Variability Tests:

- ?*Arthur has a bee, apparently, in his bonnet.* (insertion)
- ?*Arthur kicked the large bucket.* (modification)

Idiom or dead metaphor? Rephrasing Test

Rephrasing of a **dead metaphor** results in similar semantics:

- *They tried to sweeten the pill.*
  $\approx$
  They tried to sugar the medicine.
- *We shall leave no stone unturned in our search for the culprit.* $\approx$
  We shall look under every stone in our search for the culprit.

This is not the case for **idioms** (due to their non-compositional semantics):

- *John pulled his sister's leg $\not\approx$ John tugged at his sister's leg*
- *Arthur kicked the bucket $\not\approx$ Arthur tipped over the water receptacle*

Mixed Metaphor

- "Mixed metaphor" is a language phenomenon when two metaphors which share part of an overall image are merged, but the resulting metaphors are only partially compatible.

- Sometimes this is because of an error (competence).

- Sometimes it is for fun:
  "You've taken a rare orchid and shut her away in a dark outhouse. You haven't nourished her or paid her enough attention. Is it any wonder that her roots are struggling to survive? Daisy is a trapped bird whose wings have been broken, she is a Fabergé egg that you have boiled for four minutes and eaten for your breakfast."
  Sue Townsend, Adrian Mole: The Prostrate Years. Penguin, 2010

  Other great examples of mixed metaphor at
  https://www.thoughtco.com/what-is-a-mixed-metaphor-1691395

What is "mixed" in these images?

- Daisy as a delicate, precious object:
    - *orchid*
    - *bird*
    - *Faberge egg*
- Images of neglect, coercion and destruction:
    - *shutting away in dark place (orchid)*
    - *not nourishing (orchid)*
    - *trapping (bird)*
    - *breaking wings (bird)*
    - *boiling (egg)*
    - *eating (egg)*
- *Results of neglect:*
    - *her roots struggling to survive (orchid)*

Prelecture exercises

Attempts at answers

1. *Biting the hand that rocks the cradle*
   - bite the hand that feeds you = being unthankful to somebody who you profit from
   - the hand that rocks the cradle = female power over children/society via education

2. *it would somehow bring the public school system crumbling to its knees.*
   - bring somebody to their knees = destroy of defeat something
   - on knees = humiliated
   - crumble = building disintegrating

3. *She's been burning the midnight oil at both ends.*
   - burning the midnight oil = staying up late
   - burn the candle at both ends = go to bed late and get up early

Prelecture exercise: Answers

4 *He took to it like a fish out of water.*
- taking to something like a duck to water = to learn how to do something very quickly and to enjoy doing it/being talented at it.
- a fish out of water = to feel awkward because you are in a situation that you have not experienced before

5 *He wanted to get out from under his father's coat strings.*
- ride on (family member's) coat tails = to use someone else's success as a means to achieve one's own
- hide behind your mother's skirts or: to still tied to your mother's apron strings = seek parent's approval; be insecure

6 *If we can hit that bullseye then the rest of the dominoes will fall like a house of cards... Checkmate.*
- Hitting the bullseye: getting something exactly right
- Image of quick, unstoppable progression: Dominos falling
- Image of complete, decisive success: Checkmate
- Image of something delicate collapsing after one little, insignificant intervention: house of cards.

Automatic Approaches

Automatic Approaches to Metaphor Recognition

- Metaphors violate selectional restrictions (Wilks 79; Fass 91, Wilks et al. 2013)

- is-a metaphors such as *all the world is a stage* violate WN-hyponymy (Krishnakumaran and Zhu, 2007)

- Metaphors such as "dark humour" involve the use of an abstract and and a concrete word (Turney et al. 2011, Neuman et al. 2013, Gandy et al. 2013)

- Metaphors are a special kind of word sense (Steen et al. 2010)

- Metaphors' source and target domains can be found by clustering arguments of verbs and vice versa (Shutova, 2013)

- Specific metaphors can be found with manually created metaphor-specific knowledge bases (Martin 1980; Narayanan 1999; Barnden and Lee 2002)

- Metaphors can be found by reformulations on definitions (Veale and Hao 2008)

A Symbolic Approach to Metaphor Interpretation

SLIPNET (Veale and Hao 2008) relates two concepts via definitions, allowing for deletions, insertions and substitutions.
Goal: to find a connection between source and target concepts.
Example:
Make-up is a Western Burqa

make-up =>
      typically worn by women
      expected to be worn by women
      must be worn by women
      must be worn by Muslim women
burqa <=

Abstractness-based systems

- metaphorical use of adjective (*dark humour*) vs. literal use of adjective (*dark hair*)

- Classify verbs and adjectives as literal or metaphorical, based on their level of concreteness (or abstractness) in relation to the noun they appear with (Turney, 2011)

- Separate learning of concreteness ratings for words (starting from a set of examples)

- Search for expressions where a concrete adjective or verb is used with an abstract noun

- What about *broken heart*, where both parts are concrete, but the entire NP is a metaphor?

- Neuman et al. (2013) adds selectional restriction filter to also deal with this.

Context-based Supervised Metaphor Recognition (Gedigian et al. (2006))

Corpus of contexts containing MOTION and CURE frames in FrameNet (from PropBank), classified into metaphorical or not:

- MET: *Texas Air has* run into *difficulties.*
- LIT: *I nearly broke my neck* running *upstairs to see*
- Hand annotation plus supervised ML (maximum entropy classifier)
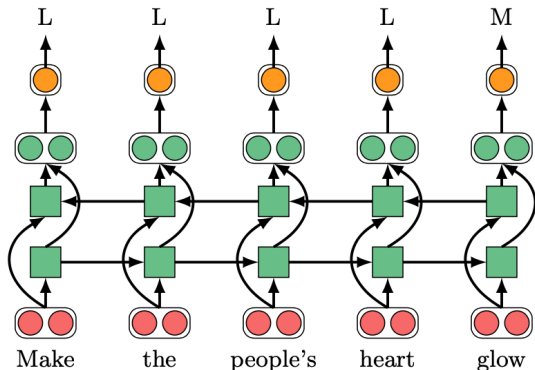
Dominant paradigm: Word-based Metaphor detection

- Token-level metaphor corpus VUA (Steen et al. 2010)
- Token-level metaphor corpus TOEFL
- Shared Task for supervised learning

Rank	Team	P	R	F1	Approach
				All POS (Overall)	
1	THU NGN	0.608	0.700	0.651	word embeddings + CNN + Bi-LSTM
2	OCOTA	0.595	0.680	0.635	word embeddings + Bi-LSTM + linguistic
3	bot.zen	0.553	0.698	0.617	word embeddings + LSTM RNN
4	Baseline 2	0.510	0.696	0.589	UL + WordNet + CCDB + Logistic Regression
5	ZIL IPIPAN	0.555	0.615	0.583	dictionary-based vectors + LSTM
6	Baseline 1	0.521	0.657	0.581	UL + Logistic Regression
7	DeepReader	0.511	0.644	0.570	word embeddings + Di-LSTM + linguistic
8	Samsung_RD_PL	0.547	0.575	0.561	word embeddings + CRF + context
9	MAP	0.645	0.459	0.536	word embeddings + Bi-LSTM + CRF
10	nsu_ai	0.183	0.111	0.138	linguistic + CRF

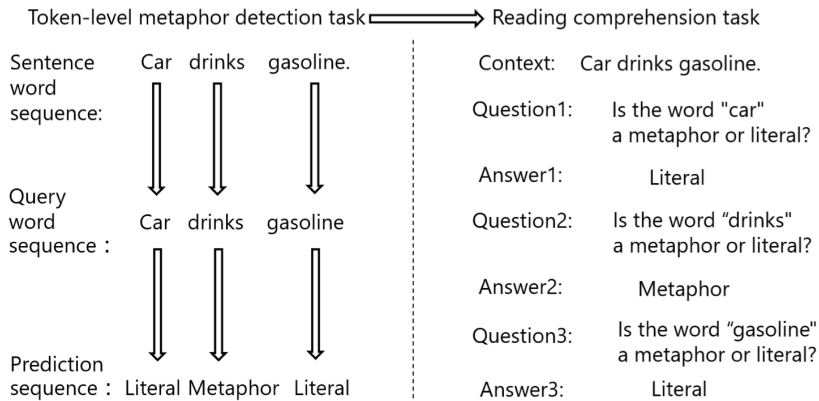Results for 2018 Shared task Metaphor Detection

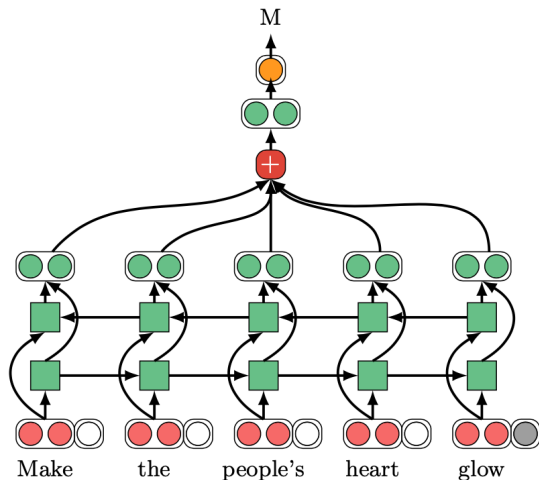Leong et al. (2020)

Together with neural networks

- We see this architecture in named entity recognition (L90 practical)
- We see this architecture in POS tagging (L90 lecture)
- We see this architecture in supervised WSD (lecture 2)
- We see this architecture in syntax-agnostic SRL (lecture 3)
- Adding some hand-crafted features helps.

Another "see-it-everywhere" architecture

Token-level metaphor detection task ⟹ Reading comprehension task

Sentence word sequence: Car drinks gasoline.

Query word sequence: Car drinks gasoline

Prediction sequence: Literal Metaphor Literal

Context: Car drinks gasoline.

Question1: Is the word "car" a metaphor or literal?

Answer1: Literal

Question2: Is the word "drinks" a metaphor or literal?

Answer2: Metaphor

Question3: Is the word "gasoline" a metaphor or literal?

Answer3: Literal

- As a reading comprehension
- The winning system of the 2020 shared task.

Yet another "see-it-everywhere" architecture

- Classification-based on "sentence embedding".
- Is there a significant difference from the "reading comprehension" architecture?

TOEFL example

Topic: "It is better to have broad knowledge of many academic subjects than to specialize in one specific subject."

I ultimately agree with the fact that it is better to be specialized on a specific subject than to **spread** energy on different subjects. However I say ultimately, because being and staying **focused** on one subject means always to **discard** other subjects. I found the **focus** necessary and very important at a certain **late stage** of the personal working career or academic career. The reason behind this you **build up** some "**spikes** of knowledge" on a **broad** knowledge **platform**. These **sharp spikes** of knowledge will allow you to promote yourself and to **pull** with you the society **forward**.

Klebanov et al. (2018), NAACL

VUA and TOEFL corpus stats

Datasets	VUA		TOEFL	
	Train	**Test**	**Train**	**Test**
#texts	90	27	180	60
#sents	12,123	4,081	2,741	968

Datasets	VUA				TOEFL			
	Verbs		**All POS**		**Verbs**		**All POS**	
	Train	**Test**	**Train**	**Test**	**Train**	**Test**	**Train**	**Test**
#tokens	17,240	5,873	72,611	22,196	7,016	2,301	26,737	9,014
%M	29%	—	18%	—	13%	—	7%	—

Results for 2020 Shared task (VUA)

Rank	Team	P	R	F1
	All POS			
1	DeepMet	.756	.783	.769
2	Go Figure!	.721	.748	.734
3	illiniMet	.746	.715	.730
4	rowanhm	.727	.709	.718
5	Baseline 3: BERT	.712	.725	.718
6	zhengchang	.696	.729	.712
7	chasingkangaroos	.702	.704	.703
8	Duke Data Science	.662	.699	.680
9	Zenith	.630	.716	.670
10	umd_bilstm	.733	.601	.660
11	atr2112	.599	.672	.633
12	PolyU-LLT	.556	.660	.603
13	iiegn	.601	.591	.596
14	UoB team	.653	.548	.596
15	Baseline 2: bot.zen	.612	.575	.593
16	Baseline 1: UL + + WN + CCDB	.510	.696	.589

Results for 2020 Shared task (TOEFL)

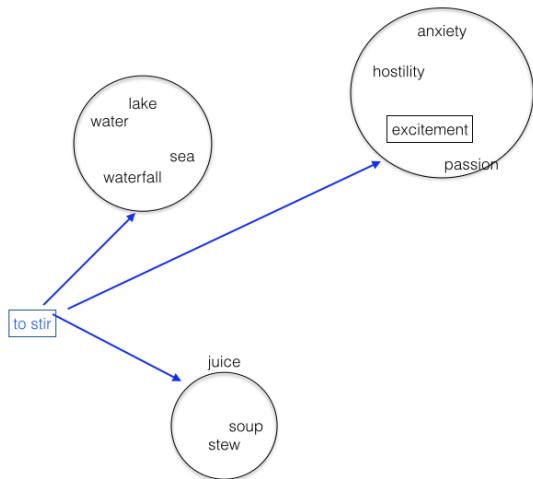| Rank	Team	P	R	F1
	All POS			
1	DeepMet	.695	.735	.715
2	zhengchang	.755	.666	.707
3	illiniMet	.709	.697	.703
4	Go Figure!	.669	.717	.692
5	Duke Data Science	.688	.651	.669
6	Baseline 3: BERT	.701	.563	.624
7	Zenith	.607	.634	.620
8	umd_bilstm	.629	.593	.611
9	iiegn	.596	.579	.587
10	PolyU-LLT	.523	.602	.560
11	Baseline 2: bot.zen	.590	.517	.551
12	Baseline 1: UL + + WN + CCDB	.488	.576	.528

Shutova et al.'s (2010) Clustering approach

- Input: small seed set including a literal verb and metaphorical direct object or subject (verb in source domain; e.g., *stir excitement* and *swallow anger*)
- Output: other sourceVerb–targetNoun pairs in same concetual metaphor
- For instance, find *pour scorn* (and many others)
- Not just rephrasings
- Main idea: use verb→noun clustering, and noun→verb clustering

Shutova et al. (2010): Algorithm I

- Step 1: Collect all subjects and arguments that occur with the seed sourceVerb (eg *stir*).
  - Most of these are sourceNouns (eg. *soup*; non-metaphors), but some are targetNouns (*anger*).
- Step 2: verb→noun clustering: Cluster these nouns according to their semantics by verb association
  - The targetNoun cluster is the most "abstract" cluster
  - Half the job is done once we find the targetNoun cluster (the one that contains the targetNoun; the one whose average coherence is lower). Harvest all other nouns in that cluster.
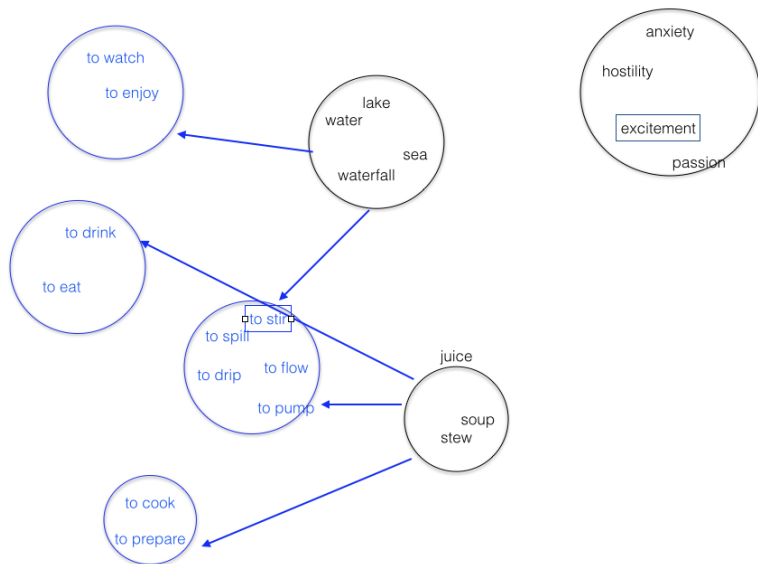 - We now need to find more sourceVerbs.

Shutova et al. (2010): Algorithm II

- Step 3: Start from sourceNoun clusters found in Step 1 (not from targetNoun cluster!) and project "backwards" into verb space (noun→ verb clustering)
    - Cluster the verbs they cooccur with
    - The cluster which has the seed verb(s) in it is the sourceVerb cluster (should also be the least coherent cluster).

Shutova et al. (2010): Algorithm II

Metaphor Recognition – Examples (Emotions are Liquids)

Target domain N cluster		Source domain V cluster
desire hostiliy anxiety passion excitement doubt fear anger curiosity enthusiasm impulse instinct emotion feeling suspicion rage	⇔	*gulp drain stir empty pour sip spill swallow drink pollute seep flow drip purify ooze pump bubble splash ripple simmer boil tread*

Summary

- Logical Metonymy can be solved by individual associations of implicit verb with explicitly mentioned lexical items
- Regular Metonymy typically addressed as supervised classification with features similar to supervised WSD.
- Unsupervised metaphor detection by seed clustering
- Concreteness and metaphoricity

Reading

- Lapata and Lascarides (2003), A probabilistic account of logical metonymy. *Computational Linguistics.*

- Shutova et al. (2013). Statistical metaphor processing. *Computational Linguistics*

- Leong et al (2020). A Report on the 2020 VUA and TOEFL Metaphor Detection Shared Task. In: Proceedings of the Second Workshop on Figurative Language Processing

- Su et al (2020). DeepMet: A Reading Comprehension Paradigm for Token-level Metaphor Detection. In: Proceedings of the Second Workshop on Figurative Language Processing