

LING/C SC 581:

Advanced Computational Linguistics

Lecture 20

Today's Topic

- Homework 8 not yet graded, no homework today
- Live demo of ChatGPT vs. WordNet for **Semantic Opposition**

Lexical Semantics




- Example:
 - John mended the **torn** dress
 - torn dress dress still **torn** ?
 - John mended the **red** dress
 - red dress dress still **red** ?
- Idea:
 - *mend* is a **change-of-state** verb
 - *X mend Y*, Y changes STATE (X doesn't change)
 - X CAUSE Y BE-IN STATE(*mended*)
 - properties of Y that contradict STATE(*mended*) are canceled

ChatGPT testing

SA

John mended the torn dress. Is the dress torn?






Based on the given sentence "John mended the torn dress," it can be inferred that the dress was torn at some point in time, but it has been mended by John. Therefore, as of now, the dress is not torn anymore.   

SA

John mended the red dress. Is the dress red?



Yes, the dress is red. The sentence "John mended the red dress" implies that the dress in question is red.   

WordNet synsets

Verb

- [S: \(v\) repair#1](#), [mend#1](#), [fix#1](#), [bushel#1](#), [doctor#3](#), [furbish up#1](#), [restore#4](#), [touch on#3](#) (restore by replacing a part or putting together what is torn or broken) *"She repaired her TV set"; "Repair my shoes please"*

John restored the torn dress. Is the dress torn?



John fixed the torn dress. Is the dress torn?



It can be inferred t

It is implied

yes, the dress was torn before Jo



John repaired the torn dress. Is the dress torn?



The given sentence, "John repaired the torn dress," implies that the dress was torn before John repaired it. Therefore, the dress was torn, but it is not torn anymore after John repaired it.

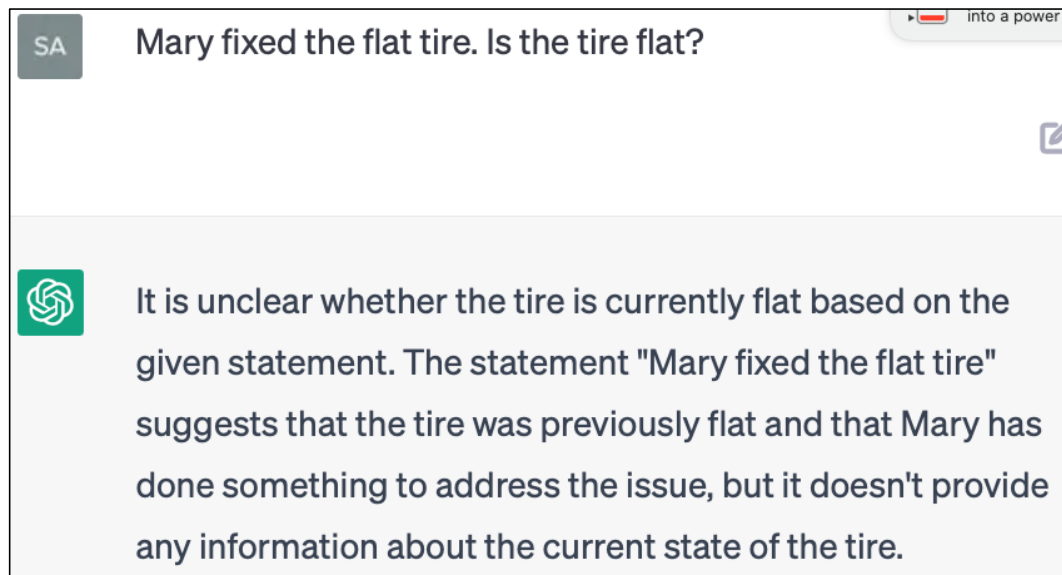


More examples

- *Event-based Models of Change and Persistence in Language* (Pustejovsky, 2000).
- Adapted examples:
 1. The waiter *filled* every *empty* glass
 2. Mary *fixed* the *flat* tire
 3. Mary *fixed* the *leaky* tire
 4. John *comforted* the *crying* child
 5. John *rescued* the *drowning* man
 6. The nurse *mixed* the *powdered* milk
- Which ones work?
- Can you think of others?

Semantic Opposition and ChatGPT

- Other accomplishment verbs:
 - The waiter filled the *empty* glass
 - Mary fixed the *flat* tire



Semantic Opposition and ChatGPT

- Other accomplishment verbs:
 - The waiter filled the *empty* glass
 - Mary fixed the *flat* tire



You

The waiter filled the empty glass. Is the glass empty?





ChatGPT




No, if the waiter filled the glass, then it is no longer empty. The action of filling it implies that something has been added to it, thus making it not empty anymore. Therefore, in the given context, the glass is not empty.

Semantic Opposition and ChatGPT

- Other accomplishment verbs:
 - Mary fixed the *leaky* tire

 **You**
Mary fixed the leaky tire. Is the tire leaky?

 **ChatGPT**
No, the tire is not leaky anymore. Mary fixed the leak, indicating that the issue causing the tire to leak air has been resolved. Therefore, the tire is no longer leaky.

Semantic Opposition and ChatGPT

- Other accomplishment verbs:
 - Mary fixed the *shiny/slippy* tire

SA

You

Mary fixed the slippy tire. Is the tire slippy?



ChatGPT

Based on the sentence "Mary fixed the slippy tire," it seems that the tire was slippy before Mary fixed it. However, once Mary fixed it, it implies that the tire is no longer slippy. So, no, the tire is not slippy after Mary fixed it.

SA

You

Mary fixed the shiny tire. Is the tire shiny?

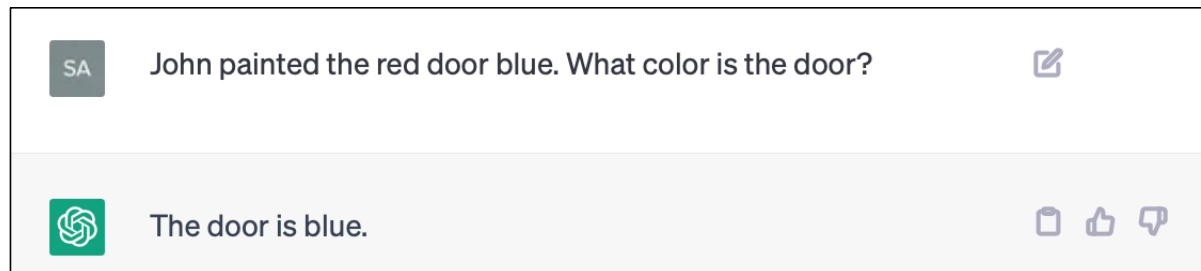


ChatGPT

Yes, based on the sentence "Mary fixed the shiny tire," it implies that the tire was shiny before Mary fixed it. Therefore, the tire is shiny. The act of fixing it doesn't necessarily change its shininess.

Semantic Opposition and ChatGPT

- Activity verbs and resultatives:
 - John painted the *red* door *blue*
 - John swept the *dirty* floor
 - John swept the *dirty* floor *clean*



Semantic Opposition and ChatGPT

- Activity verbs and resultatives:
 - John swept the *dirty* floor
 - John swept the *dirty* floor *clean*

SA John swept the dirty floor. Is the floor dirty?

Yes, based on the given statement, the floor is dirty. The statement "John swept the dirty floor" suggests that the floor was dirty and John took action to clean it.

SA John swept the dirty floor clean. Is the floor dirty?

Yes, according to the sentence "John swept the dirty floor clean", it is implied that the floor was dirty before John swept it clean.

Semantic Opposition and ChatGPT

- Other accomplishment verbs:
 - John cleaned the *dirty* floor



You

John cleaned the dirty floor. Is the floor dirty?



ChatGPT

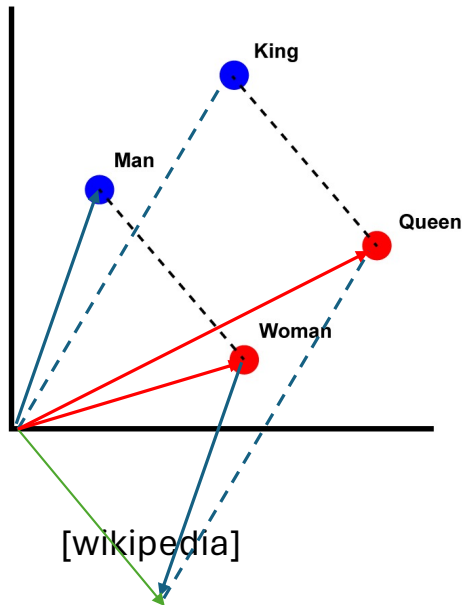
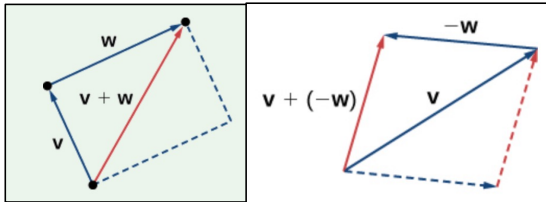
No, if John cleaned the floor, then it is no longer dirty. The action of cleaning implies that the dirt or grime has been removed, thus making the floor clean. Therefore, in the given context, the floor is not dirty.



Searching WordNet

- Idea:
 - if the shortest connection between two word senses involves an antonym relation, **Semantic Opposition** obtains.
- Program
 - `bfs.py word.pos.sense word.pos.sense`
 - BFS (Breadth First Search)
- Let's use it to test our hypothesis!

Can the word2vec model be applied?



- KeyedVectors setup:

```
import gensim
from nltk.data import find
word2vec_sample =
str(find('models/word2vec_sample/pruned.word2vec.txt'))
model =
gensim.models.KeyedVectors.load_word2vec_format(word2vec_
c_sample, binary=False)
```

- Example:

- `model.most_similar(positive=['woman','king'],negative=['man'],topn=3)`
[('queen', 0.7118193507194519), ('monarch', 0.6189674139022827), ('princess', 0.5902430415153503)]
- `model.most_similar(positive=['man','queen'],negative=['woman'],topn=3)`
[('king', 0.6958589553833008), ('kings', 0.5950952768325806), ('queens', 0.583850085735321)]

WordNet Browser

- Step 1:
identifying an
appropriate word
sense
- <http://wordnetweb.princeton.edu/perl/webwn>

Verb

- **S: (v)** [repair#1](#), [mend#1](#), [fix#1](#), [bushel#1](#), [doctor#3](#), [furbish up#1](#), [restore#4](#), [touch on#3](#) (restore by replacing a part or putting together what is torn or broken) *"She repaired her TV set"; "Repair my shoes please"*
- **S: (v)** [fasten#1](#), [fix#2](#), [secure#2](#) (cause to be firmly attached) *"fasten the lock onto the door"; "she fixed her gaze on the man"*
- **S: (v)** [specify#2](#), [set#3](#), [determine#4](#), [define#5](#), [fix#3](#), [limit#3](#) (decide upon or fix definitely) *"fix the variables"; "specify the parameters"*
- **S: (v)** [cook#2](#), [fix#4](#), [ready#1](#), [make#39](#), [prepare#2](#) (prepare for eating by applying heat) *"Cook me dinner, please"; "can you make me an omelette?"; "fix breakfast for the guests, please"*
- **S: (v)** [pay back#2](#), [pay off#6](#), [get#8](#), [fix#5](#) (take vengeance on or get even) *"We'll get them!"; "That'll fix him good!"; "This time I got him"*
- **S: (v)** [fix#6](#) (set or place definitely) *"Let's fix the date for the party!"*
- **S: (v)** [fix#7](#) (kill, preserve, and harden (tissue) in order to prepare for microscopic study)
- **S: (v)** [fixate#3](#), [fix#8](#) (make fixed, stable or stationary) *"let's fix the picture to the frame"*
- **S: (v)** [sterilize#2](#), [sterilise#2](#), [desex#1](#), [unsex#3](#), [desexualize#2](#), [desexualise#2](#), [fix#9](#) (make infertile) *"in some countries, people with genetically transmissible disabilities are sterilized"*
- **S: (v)** [fix#10](#) (influence an event or its outcome by illegal means) *"fix a race"*
- **S: (v)** [situate#2](#), [fix#11](#), [posit#1](#), [deposit#3](#) (put (something somewhere) firmly) *"She posited her hand on his shoulder"; "deposit the suitcase on the bench"; "fix your eyes on this spot"*
- **S: (v)** [fix#12](#), [prepare#1](#), [set up#15](#), [ready#2](#), [gear up#1](#), [set#7](#) (make ready or suitable or equip in advance for a particular purpose or for some use, event, etc) *"Get the children ready for school!"; "prepare for war"; "I was fixing to leave town after I paid the hotel bill"*

WordNet Browser

- Step 1:
identifying an
appropriate word
sense
- <http://wordnetweb.princeton.edu/perl/webwn>

- **S: (adj) flat#1, level#1, plane#1** (having a surface without slope, tilt in which no part is higher or lower than another) *"a flat desk"; "acres of level farmland"; "a plane surface"; "skirts sewn with fine flat seams"*
- **S: (adj) flat#2** (having a relatively broad surface in relation to depth or thickness) *"flat computer monitors"*
- **S: (adj) categoric#2, categorical#2, flat#3, unconditional#2** (not modified or restricted by reservations) *"a categorical denial"; "a flat refusal"*
- **S: (adj) flat#4, prostrate#1** (stretched out and lying at full length along the ground) *"found himself lying flat on the floor"*
- **S: (adj) flat#5** (lacking contrast or shading between tones)
- **S: (adj) flat#6** ((of a musical note) lowered in pitch by one chromatic semitone) *"B flat"*
- **S: (adj) compressed#3, flat#7** (flattened laterally along the whole length (e.g., certain leafstalks or flatfishes))
- **S: (adj) bland#1, flat#8, flavorless#1, flavourless#1, insipid#1, savorless#1, savourless#1, vapid#1** (lacking taste or flavor or tang) *"a bland diet"; "insipid hospital food"; "flavorless supermarket tomatoes"; "vapid beer"; "vapid tea"*
- **S: (adj) bland#2, flat#9** (lacking stimulating characteristics; uninteresting) *"a bland little drama"; "a flat joke"*
- **S: (adj) flat#10** (having lost effervescence) *"flat beer"; "a flat cola"*
- **S: (adj) flat#11, monotone#2, monotonic#2, monotonous#2** (sounded or spoken in a tone unvarying in pitch) *"the owl's faint monotonous hooting"*
- **S: (adj) flat#12** (horizontally level) *"a flat roof"*
- **S: (adj) two-dimensional#2, 2-dimensional#1, flat#13** (lacking the expected range or depth; not designed to give an illusion or depth) *"a film with two-dimensional characters"; "a flat two-dimensional painting"*
- **S: (adj) flat#14, mat#1, matt#1, matte#1, matted#2** (not reflecting light; not glossy) *"flat wall paint"; "a photograph with a matte finish"*
- **S: (adj) flat#15** (commercially inactive) *"flat sales for the month"; "prices remained flat"; "a flat market"*

bfs.py parameters

```
$ python bfs.py -h
usage: bfs.py [-h] [-nd] [-m MAX] start end
[others ...]
```

breadth-first search of nltk WordNet relations with 2D and 3D graphing.

positional arguments:

start	word sense pair start
end	word sense pair end
others	optional additional

pairs to search

optional arguments:

-h, --help	show this help message and exit
-nd, --nodraw	don't draw anything, use with -i flag to drop into the interpreter.
-m MAX, --max MAX	maximum number of nodes to be explored (default: 100000)

Word sense: word.pos.sense, e.g. minibike.n.01 or minibike.n.1; pos = [asrnv]
Run in interactive mode (-i): use lookup(sense1, sense2) then search() to add to the graph. Plot using draw_graph().

bfs.py parameters

Verb

- [S: \(v\) tear#1](#), [rupture#1](#), [snap#2](#), [bust#3](#) (separate or cause to separate abruptly) *"The rope snapped"; "tear the paper"*
- [S: \(v\) tear#2](#) (to separate or be separated by force) *"planks were in danger of being torn from the crossbars"*
- [S: \(v\) tear#3](#), [shoot#7](#), [shoot down#1](#), [charge#4](#), [buck#3](#) (move quickly and violently) *"The car tore down the street"; "He came charging into my office"*
- [S: \(v\) pluck#5](#), [pull#14](#), [tear#4](#), [deplume#2](#), [deplumate#1](#), [displume#2](#) (strip of feathers) *"pull a chicken"; "pluck the capon"*
- [S: \(v\) tear#5](#) (fill with tears or shed tears) *"Her eyes were tearing"*

Adjective

- [S: \(adj\) lacerate#2](#), [lacerated#2](#), [mangled#1](#), [torn#1](#) (having edges that are jagged from injury)
- [S: \(adj\) torn#2](#) (disrupted by the pull of contrary forces) *"torn between love and hate"; "torn by conflicting loyalties"; "torn by religious dissensions"*

Example

- Run:
 - `python bfs.py`
`mend.v.1 tear.v.1`

