Catching up...

WordNet

• Did everyone manage to install?
  1. WordNet 3.0 package
  2. wnb (WordNet browser)
     • shell:
       – export PATH=/usr/local/WordNet-3.0/bin:$PATH
  3. WordNet::QueryData Perl Module

Need them to do your homework (out today)
Supplied bfs code

- Use my breadth-first search (BFS) Perl code as a starting point (previous lecture) or roll your own …
  - you’ll need to map word into word#pos#sense, e.g.

```
bash-3.2$ perl senses.perl bank
bank#n#1  bank#n#2  bank#n#3  bank#n#4  bank#n#5  bank#n#6  bank#n#7  bank#n#8  bank#n#9  bank#n#10
bank#v#1  bank#v#2  bank#v#3  bank#v#4  bank#v#5  bank#v#6  bank#v#7  bank#v#8
bash-3.2$
```

```perl
use WordNet::QueryData;
my $wn = WordNet::QueryData->new( noload => 1);
my @r = $wn->validForms($ARGV[0]);
foreach $wpos (@r) {
  @r2 = $wn->querySense($wpos);
  print "@r2 \n";
}
```
Word Smart for the GRE
acumen, remarking on his company’s financial successes, but I think his fashion sense is much more interesting.

- Her acumen in anticipating her opponent’s strategy is legendary; it’s what makes her so hard to beat.

<table>
<thead>
<tr>
<th>Q=U+I+C+K • Q=U+I+Z #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match each word in the first column with its definition in the second column. Check your answers in the back of the book.</td>
</tr>
<tr>
<td>1. accolade a. deviating</td>
</tr>
<tr>
<td>2. aberrant b. keen insight</td>
</tr>
<tr>
<td>3. abate c. abolish</td>
</tr>
<tr>
<td>4. abscond d. lessen in intensity</td>
</tr>
<tr>
<td>5. acumen e. sour or bitter</td>
</tr>
<tr>
<td>6. acerbic f. depart secretly</td>
</tr>
<tr>
<td>7. abscission g. building up</td>
</tr>
<tr>
<td>8. accretion h. renounce</td>
</tr>
<tr>
<td>9. abjure i. removal</td>
</tr>
<tr>
<td>10. abrogate j. praise</td>
</tr>
</tbody>
</table>

ADMONISH v to reprove; to express warning or disapproval

- How many times has your roommate admonished you to put the toilet seat down?

- An admonition is a warning or a scolding and admonitory means expressing warning or disapproval.

- He tried to admonish us not to open the secret passageway, but his admonition fell on deaf ears. Man, were we sorry we hadn’t listened to him when our monsters came rushing out!

- Dad’s admonitory tone made us feel guilty about ruining our appetites with pre-dinner cookies.

- When he was a kid he could get people to do what he wanted.

- Although her adroit handling of the situation minimized the damage, nothing could really save the conference after the room flooded.

- Since he is ambidextrous, he is equally adroit at shooting marbles with either hand.

\(\text{Maladroit}\) means clumsy or bungling.

ADULATION n excessive praise; intense adoration

- Leif Garrett was the object of much adolescent adulation.

- Samuel had taken his little brother’s adulation for granted until his brother grew four inches taller and was no longer as easily impressed.

ADULTERATE v to reduce purity by combining with inferior ingredients

- There was a huge scandal when customers discovered that the health food store had been adulterating the wheat grass juice with clippings from the front lawn.

- In an effort to determine why the house’s foundation was crumbling, the inspectors tested the concrete to see if it had been improperly adulterated when it was mixed.

Adulteration is the process or effect of adulterating. Unadulterated, appropriately enough, means pure.

- I could tell that what her used car salesman was saying was one hundred percent, pure, unadulterated hogwash.

ADUMBRATE v to foreshadow vaguely, intimate, suggest, or outline sketchily

- The possibilities for further cooperation between the two nations were adumbrated at the first private
Homework

**Task:** use Wordnet to determine which words best match which definitions

– (Quiz 5 from *Word Smart for the GRE*)

<table>
<thead>
<tr>
<th></th>
<th>Word</th>
<th>Definition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>arcane</td>
<td>outdated</td>
<td>a.</td>
</tr>
<tr>
<td>2.</td>
<td>arduous</td>
<td>mysterious</td>
<td>b.</td>
</tr>
<tr>
<td>3.</td>
<td>arabesque</td>
<td>hold one's attention</td>
<td>c.</td>
</tr>
<tr>
<td>4.</td>
<td>asperity</td>
<td>impudent</td>
<td>d.</td>
</tr>
<tr>
<td>5.</td>
<td>ascetic</td>
<td>strenuous</td>
<td>e.</td>
</tr>
<tr>
<td>6.</td>
<td>arrant</td>
<td>complex design</td>
<td>f.</td>
</tr>
<tr>
<td>7.</td>
<td>artless</td>
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<td>8.</td>
<td>archaic</td>
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<td>h.</td>
</tr>
<tr>
<td>9.</td>
<td>arrest</td>
<td>natural</td>
<td>i.</td>
</tr>
</tbody>
</table>
## Homework

- (Quiz 8 from *Word Smart for the GRE*)

<table>
<thead>
<tr>
<th></th>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>bellicose</td>
<td>inclination</td>
</tr>
<tr>
<td>2.</td>
<td>bent</td>
<td>misrepresent</td>
</tr>
<tr>
<td>3.</td>
<td>blandish</td>
<td>carefree</td>
</tr>
<tr>
<td>4.</td>
<td>bolster</td>
<td>belligerent</td>
</tr>
<tr>
<td>5.</td>
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</tr>
<tr>
<td>6.</td>
<td>blithe</td>
<td>support</td>
</tr>
<tr>
<td>7.</td>
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</tr>
<tr>
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</tr>
<tr>
<td>9.</td>
<td>bombastic</td>
<td>adorn</td>
</tr>
</tbody>
</table>
Homework

• (Quiz 16 from *Word Smart for the GRE*)

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. discordant</td>
<td>harsh denunciation</td>
<td>a.</td>
</tr>
<tr>
<td>2. discomfit</td>
<td>intended to teach</td>
<td>b.</td>
</tr>
<tr>
<td>3. disabuse</td>
<td>tool used for shaping</td>
<td>c.</td>
</tr>
<tr>
<td>4. din</td>
<td>shy</td>
<td>d.</td>
</tr>
<tr>
<td>5. dilettante</td>
<td>stray from the point</td>
<td>e.</td>
</tr>
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<td>6. dilatory</td>
<td>causing delay</td>
<td>f.</td>
</tr>
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<td>7. digress</td>
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<td>g.</td>
</tr>
<tr>
<td>8. diffident</td>
<td>loud noise</td>
<td>h.</td>
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<tr>
<td>9. die</td>
<td>undeceive</td>
<td>i.</td>
</tr>
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<td>10. didactic</td>
<td>frustrate</td>
<td>j.</td>
</tr>
<tr>
<td>11. diatribe</td>
<td>conflicting</td>
<td>k.</td>
</tr>
</tbody>
</table>
Homework

• Write a program that automatically matches up words with definitions for the 3 quizzes.
  – Report your results
    • the number your program got right for each quiz
  – Explain the heuristics you chose
  – For cases that don’t work, explain why?
    • Is it your algorithm? Is it WordNet? …
  – Your conclusion:
    • is Wordnet adequate to the task of connecting up the words with the definitions?
Sample ideas

• **Heuristics**
  – cost = # relations in (a) shortest path
    • `bfs3.perl stops when it finds a shortest path`
  – overall lowest cost for the quiz
    • *looks at all possible assignments from words to definitions*
    • *there could be other same lowest cost paths*
  – stopwords
    • *prepositions, articles, etc.*
  – multi-word definitions
    • *check match for word to all of the non-stopwords*
    • *discounted cost if multiple matches*
# Answers

## Quiz 5:

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
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</table>

1 b  
2 e  
3 f  
4 h  
5 g  
6 d  
7 i  
8 a  
9 c
## Answers

**• Quiz 8:**

<table>
<thead>
<tr>
<th>Word</th>
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</tr>
</thead>
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<tr>
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## Answers

### Quiz 16:

<table>
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<tr>
<th>Word</th>
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</tr>
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<tbody>
<tr>
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</tr>
</tbody>
</table>
Example

- Word:
  - cadge
  - brook
  - cacophony

- Definition:
  - mooch
  - tolerate
  - discordant sound

- Same synset:
  - cadge hype obtain hype get hypo buy enta pay deriv payer deriv pay hype tolerate
  - brook hype permit hype accept deri acceptation deri accept hype get hypo obtain hypo mooch#v#1
  - cacophony hype dissonance hype sound_property hype property hypo strength hypo endurance deri tolerate
  - cacophony hype noise hype sound

- Ants:
  - discordan

- Deriv:
  - communication
  - agreement
  - acceptable
  - accordant
  - accordant
Using WordNet: Example

- **Semantic Opposition:**
  1. John mended the *torn* dress
  2. John mended the *red* dress

- **Semantic Bleaching:**
  2. #Kim *boxed* the present in a *paper bag* 
     ... to *land* a hydroplane on *water*

- **Logical Metonymy:**
  3. Mary enjoyed the *sonata*  (listen to/play)
  4. #Mary enjoyed the *door*   (?? telic role)
Using WordNet: Example

Persistence and Change of State Verbs

Event-based Models of Change and Persistence in Language (Pustejovsky, 2000):

John mended the torn dress
John mended the red dress

Mary cleaned the dirty table
The waiter filled every empty glass
Mary fixed the flat tire
Bill swept the dirty floor
Bill swept the dirty floor clean
Nero built the gleaming temple
Nero ruined the splendid temple

Change of State
Activity
Accomplishment
Creation
Destruction
Using WordNet: Example

Event Template Representation

Change of State Verbs:

<table>
<thead>
<tr>
<th>John mended the <strong>torn/red</strong> dress</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>mend</em>: x CAUS y BECOME &lt;STATE (mended)&gt;</td>
</tr>
<tr>
<td>John CAUS the <strong>torn/red</strong> dress BECOME &lt;STATE (mended)&gt;</td>
</tr>
</tbody>
</table>

- Antonym relation between adjective and end state
Using WordNet: Example

- Find shortest link with antonym relation in derivation chain:

  - mend -> repair (antonym)
  - repair -> break
  - break -> bust₁
  - bust₁ -> bust₂
  - bust₂ -> tear (verb.contact)

- mend -> tear: reachable in 6 ways.
### Using WordNet: Example

#### Results

<table>
<thead>
<tr>
<th>Candidate Pair</th>
<th>Shortest Chain</th>
<th>Semantic Opposition</th>
<th>Search Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>mend-torn</td>
<td>5</td>
<td>Yes</td>
<td>1261</td>
</tr>
<tr>
<td>mend-red</td>
<td>-</td>
<td>No</td>
<td>11974</td>
</tr>
<tr>
<td>fix-leaky</td>
<td>5</td>
<td>Yes</td>
<td>12167</td>
</tr>
<tr>
<td>fix-blue</td>
<td>11</td>
<td>No</td>
<td>14553</td>
</tr>
<tr>
<td><strong>fix-flat</strong></td>
<td>-</td>
<td>No*</td>
<td>12286</td>
</tr>
<tr>
<td>mix-powdered</td>
<td>6</td>
<td>Yes</td>
<td>11931</td>
</tr>
<tr>
<td>comfort-crying</td>
<td>9</td>
<td>Yes</td>
<td>11359</td>
</tr>
<tr>
<td><strong>blue-white</strong></td>
<td>-</td>
<td>No*</td>
<td>24431</td>
</tr>
<tr>
<td>rescue-drowning</td>
<td>13</td>
<td>Yes</td>
<td>9142</td>
</tr>
<tr>
<td>clean-dirty</td>
<td>1</td>
<td>Yes</td>
<td>61</td>
</tr>
<tr>
<td>fill-empty</td>
<td>1</td>
<td>Yes</td>
<td>48</td>
</tr>
</tbody>
</table>
Using WordNet: Example

1. Thresholding

No upper limit on the length of the shortest chain.

<table>
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<tr>
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</table>

Diagram showing relationships between words and concepts.
Using WordNet: Example

2. Shortest Path Criterion

Take the shortest chain.

<table>
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<tr>
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</table>
Using WordNet: Example

3. Color and Opposition

**WORDNET** organizes color by chromaticity.

<table>
<thead>
<tr>
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<th>Search Space</th>
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</table>

John painted the **red door** **blue**
Mary painted the white tiles grey
Semantic Bleaching

Three Problems

- Semantic Opposition:

  1. John mended the **torn** dress
     John mended the **red** dress

     *Event-based Models of Change and Persistence in Language* (Pustejovsky, 2000)

- Semantic Bleaching:

  2. #Kim **boxed** the present in a **paper bag**
     ... to **land** a hydroplane on **water**

     *Remarks on Denominals* (Kiparsky, 1997)

- Logical Metonymy:

  3. Mary enjoyed the **sonata** (listen to/play)
     #Mary enjoyed the **door** (?? telic role)

     *Generative Lexicon* (Pustejovsky, 1995)
Semantic Bleaching

Denominal Verbs: Box and Butter

Remarks on Denominals (Kiparsky, 1997):

John boxed the present
John PUT present IN <box> Location

John boxed the present in a gift box
#John boxed the present in a paper bag

John buttered the bread
John PUT <butter> ON bread Locatum

John buttered the bread with margarine
#John buttered the bread with marmalade/onions
Semantic Bleaching

Partial Bleaching

Peter *shelved* the books on the *windowsill/mantelpiece/stand/table*

#Peter *shelved* the books on the *ball/spike/ceiling/floor/balcony*

Sue *breadcrued* the fish with *breadcrumbs/shredded coconut/crushed almonds*

#Sue *breadcrued* the fish with *marmalade/butter/treacle/ice*
Semantic Bleaching

Full Bleaching

Location verbs:

to land a hydroplane on water
to dump garbage by the roadside
to ditch a car in a vacant lot
to warehouse the empty crates in the silo

Locatum verbs:

highways blanketed with fog
burgers blanketed with onions
streets blanketed with cars
a steep embankment blanketed with dense foliage
Semantic Bleaching

Full Bleaching

Locatum verb (blanket):

- highways blanketed with fog
- burgers blanketed with onions
- streets blanketed with cars
- a steep embankment blanketed with dense foliage

Locatum verb (blindfold):

- blindfolded with his own shirt/duct tape/a filthy rag/a teacosy

- Note: blindfold, dump are de-verbals (diachronically)
Semantic Bleaching

**Question**

Can WordNet be used to predict and account for semantic bleaching?

Spectrum of bleaching:

- box butter
- shelf bread
- blanket blindfold
- none partial full
Semantic Bleaching

Using WORDNET

- Concept of *shelf* as a horizontal support:

- Web search (*shelved* +on *<location*>):
  - windowsill
  - mantel
  - case
  - radiator
  - table
  - stand
  - carrel
  - bookstand
  - bookshelf
Semantic Bleaching

Support and Shelf

<noun.artifact> shelf
  -- (a support that consists of a horizontal surface for holding objects)
  => <noun.artifact> support
  -- (any device that bears the weight of another thing)
Semantic Bleaching

Table and Shelf

Cannot account for *table*:

- Notion of “functional” hyponymy
Semantic Bleaching

Hyponyms of Support

andiron, firedog, dog, dogiron, arch support, back, backrest, backboard, baluster, base, pedestal, stand, bearing, bearing wall, bedpost, bookend, brace, bracket, bridge, foot, foothold, footing, handrest, hanger, harness, harp, headstock, leg, perch, pier, pillow block, rack, stand, rest, rib, rocker, seat, shelf, skeg, sling, spoke, radius, step, stair, stirrup, stirrup iron, stock, gunstock, structural member, tailstock, tee, football tee, undercarriage, yoke
Semantic Bleaching

WordNet and Non-Bleaching Verbs

Asphalt and tarmac:

the crew asphalted/tarmaced the road with fresh asphalt/new tarmac

#the crew asphalted/tarmaced the road with concrete

#the crew asphalted/tarmaced the road with cobblestones
Semantic Bleaching

Paving Materials

Hypothesis: Denominal leaf nodes are non-bleaching
Semantic Bleaching

Bleaching and Leaf Concepts

- **Counterexamples**: *blanket* and *blindfold*

  highways **blanketed** with fog
  burgers **blanketed** with onions
  streets **blanketed** with cars
  a steep embankment **blanketed** with dense foliage
Semantic Bleaching

Blanket

Functional superordinate: covering
Semantic Bleaching

Bleaching of Blanket

Web Data:

snow, fog, parachutes, sauce, smog, debris, ash, flowers, glaze, wildflowers, bacon, forest, garland, mixed grill, turkey, ham, smoke, compost, clippings, mulch, cheese, onions, plants, fallout, panels, bodies, pines, mixture, foliage, tephra, blast material, craters, salsa, yogurt, shards, paper, scrub, cars, till, wilderness, loess, crabmeat, fondue, logos, landmines, deposits, Teflon, bags, turf, notices, bracken, heather, moss, mud, fronds, trees, groves, posters, handbills, doorknobs, powder, haze, sand, absorbent, leaves, stars, crickets, peanuts, plaques, foul air, particles, ice, rainforest, spruce, cedar, coating
Semantic Bleaching

Bleaching of Blanket

Exclude metaphorical uses:

The countryside is blanketed in snow, but it is also blanketed with concern. [BBC NEWS]

Event semantics:

x PUT <blanket> ON/OVER y
x PUT <covering> ON/OVER y

Same goes for blindfold...
Semantic Bleaching

Spindle and Spear

the dragon has been spindled on a spear
x PUT y on <spindle>

WordNet hierarchy:
Semantic Bleaching

Components of a Spear

WordNet hierarchy:

- Two senses for *spear*:
  1. an implement with a *shaft* and a barbed point used for catching fish
  2. a long pointed *rod* used as weapon

- Notion of Indirect Functionality: *sharpened shaft* or *rod*
Logical Metonymy

Three Problems

• Semantic Opposition:

1. John mended the *torn* dress
   John mended the *red* dress
   *Event-based Models of Change and Persistence in Language* (Pustejovsky, 2000)

• Semantic Bleaching:

2. #Kim boxed the present in a *paper bag*
   ... to *land* a hydroplane on *water*
   *Remarks on Denominals* (Kiparsky, 1997)

• Logical Metonymy:

3. Mary enjoyed the *sonata* *(listen to/play)*
   #Mary enjoyed the *door* *(?? telic role)*
   *Generative Lexicon* (Pustejovsky, 1995)
Logical Metonomy

Eventive Verbs: Begin and Enjoy


John began the novel \( (reading/writing) \)
The author began the unfinished novel back in 1962 \( (writing) \)

novel:
  telic role: read \( (purpose/function) \)
  agentive role: writing \( (creation) \)

event/non-eventive noun mismatch: coercion
Logical Metonomy

Eventive Verbs: Begin and Enjoy


John began the novel \((reading/writing)\)
The author began the unfinished novel back in 1962 \((writing)\)

Mary enjoyed the novel \((reading)\)
!!The visitor enjoyed the door \((?telic\ role)\)
Mary enjoyed the garden \((seeing...)\)
Logical Metonomy

Multiple Telic Roles

Mary enjoyed the garden  (seeing)
Mary enjoyed *inspecting* the garden
Mary enjoyed *visiting* the garden
Mary enjoyed *strolling* through the garden
Mary enjoyed *rollerblading* in the garden
Mary enjoyed *sitting* in the garden
Mary enjoyed *dozing* in the garden
Logical Metonomy

Discourse and Telic Roles

Easily defeasible:

My goat eats anything.
He really enjoyed your book  (reading)
(eating)
(Lascarides & Copestake, 1995)

My dog eats everything.
!He really enjoyed your shoe  (eating)
Logical Metonymy

**WordNet and Telic Roles**

John enjoyed the cigarette  
*(smoking)*
Logical Metonymy

Contextual Function Search Rules

Principle of Specificity: Prefer $R_i$ to $R_j$ in

$$R_i \rightarrow C_i \rightarrow \cdots \rightarrow C_j$$

Override possible but requires strong contextual support

Principle of Locality: Plausibility of $R_i$ scales with $m$
and inversely with $l$

$$R_i \rightarrow C_i \rightarrow \cdots \rightarrow C_T$$

$l$ and $m$
Logical Metonomy

Polysemy

!John enjoyed the dirt

Diagram:
- dirt
  - earth
  - body waste
  - gossip
    - report
      - hear
    - read
  - material
    - substance
      - physical object
  - speech act
    - act
Logical Metonomy

Type/Function Distinction

Mary enjoyed the wine  \((drinking)\)
Logical Metonomy

Type/Function Distinction

Mary enjoyed the amphetamine  \((abuse)\)
Logical Metonymy

Grammatical Constraint

\[ \text{EXP enjoy NP} \]
\[ \text{EXP_i enjoy [PRO_i [V(ing) NP]]} \]

!!John enjoyed the door

- door
  - movable barrier
  - entrance
    - enter
  - block
    - barrier
      - obstruction
        - artifact
          - physical object
    - access
      - way
        - create
          - verbs of perception

\[ x \text{ block } y \]
\[ x \text{ enter } y \]
Logical Metonomy

Grammatical Constraint

!He enjoyed your shoe [PRO [V(ing) shoe]]
Logical Metonomy

Summary

• Linguistic phenomena as benchtests for WordNet relations
  
  Antonymy: Semantic Opposition
  Hypernymy: Semantic Bleaching and Logical Metonymy

• Linguistic phenomena help point out problems and possible refinements
  
  Semantic Opposition: representation of color
  Bleaching: distinguish functional/non-functional hypernymy
  Logical Metonymy: telic role annotation

• Other issues
  
  Language specificity? Variation in N->V conversion
Other Lexical Resources

- Framenet
  - https://framenet.icsi.berkeley.edu/fndrupal/
Predicate-Argument Structure

• Example:
  - John ate the sandwich
  - _eat_: predicate
  - _eat_ has two arguments: eater, something that is eaten
  - eater = John
  - something to be eaten = the sandwich

• A Possible Representation
  - _in Prolog term-like notation_
  - eat(<eater>,<something to be eaten>)
  - eat(john,sandwich)

• Linguists generally try to choose more general labels for the arguments
  - less verb-specific
  - eat(<agent>,<patient>)
  - <agent> someone/something who performs some action
  - <patient> undergoes change of state etc.
  - eat(<agent>,<theme>)
  - <theme> something applies to this argument but doesn’t undergo change of state
Predicate-Argument Structure

It can be difficult to precisely specify the meaning of the arguments via thematic labels of this sort:

- Here is a list of the major thematic relations:
  - **Agent**: deliberately performs the action
    - (e.g. Bill ate his soup quietly)
  - **Experimenter**: receives sensory or emotional input
    - (e.g. The smell of lilies filled Jennifer’s nostrils).
  - **Theme**: undergoes the action but does not change its state
    - (Sometimes used interchangeably with patient)
    - (e.g. Bill kissed Mary).
  - **Patient**: undergoes the action and has its state changed
    - (Sometimes used interchangeably with theme)
    - (e.g. The falling rocks crushed the car).
  - **Instrument**: used to carry out the action
    - (e.g. Jamie cut the ribbon with a pair of scissors).
  - **Natural Cause**: mindlessly performs the action
    - (e.g. An avalanche destroyed the ancient temple).
  - **Location**: where the action occurs
    - (e.g. Johnny and Linda played carelessly in the park).
  - **Goal**: what the action is directed towards
    - (e.g. The caravan continued on toward the distant oasis).
  - **Recipient**: a special kind of goal associated with verbs expressing a change in ownership, possession.
    - (e.g I sent John the letter)
  - **Source**: where the action originated
    - (e.g. The rocket was launched from Central Command).
  - **Time**: the time at which the action occurs
    - (e.g. The rocket was launched yesterday)
  - **Beneficiary**: the entity for whose benefit the action occurs
    - (e.g. I baked Reggie a cake)
Predicate-Argument Structure

- **Passives**
  - The sandwich was eaten by John
  - John ate the sandwich
  - eat(<eater>,<object to undergo eating>)
  - eat(<agent>,<patient>)
  - eat(john,sandwich)

  - The sandwich was eaten
  - eat(_,sandwich)
  - an incomplete or underspecified predicate argument structure

- **Not all Noun Phrases seem to have a meaningful thematic relation associated with them**
  - It rains
  - It is likely that John ate the sandwich
  - John is likely to eat the sandwich
  - It seems that John ate the sandwich
  - John seemed to eat the sandwich
  - There seems to be a sandwich over there
  - A sandwich seems to be over there
Framenet

- Lexical unit index:
  - https://framenet.icsi.berkeley.edu/fndrupal/index.php?q=luIndex

Let's take a look at LU eat
Frame: Ingestion

https://framenet.icsi.berkeley.edu/

Ingestion

Definition:

An Ingestor consumes food or drink (Ingestibles), which entails putting the Ingestibles in the mouth for delivery to the digestive system. This may include the use of an Instrument. Sentences that describe the provision of food to others are NOT included in this frame.

FEs:

Core:

Ingestibles [Ingible]
   The Ingestibles are the entities that are being consumed by the Ingestor.

Ingestor [Ing]
   The Ingestor is the person eating or drinking.

Semantic Type: Sentient
   Non-Core:

Degree [Degr]
   The extent to which the Ingestibles are consumed by the Ingestor.

   The wolves DEVORRED the carcass completely

   Semantic Type: Degree

Duration [Dur]
   The length of time spent on the ingestion activity.

   They’ve been EATING for hours!
Frame: Ingestion

Duration [Dur]
The length of time spent on the ingestion activity.
They've been eating for hours!

Instrument [Ins]
Semantic Type: Physical_entity

Manner [Manr]
Semantic Type: Manner

Means [Mns]
Semantic Type: State_of_affairs

The instrument with which an intentional act is performed.

Manner of performing an action.

An act performed by the ingestor that enables them to accomplish the whole act of ingestion.
The thing ate by snaking its long tongue out and grabbing with it.

Place [Place]
Semantic Type: Locative_relation

Purpose [pur]
Semantic Type: State_of_affairs

Source [Src]
Semantic Type: Source

Time [Time]
Semantic Type: Time

Where the event takes place.

The action that the ingestor hopes to bring about by ingesting.

Place from which the ingestor takes the ingestibles.

When the event occurs.
Frame: Ingestion

Frame-frame Relations:
Inherits from: **Ingest substance**, **Manipulation**
Is Inherited by:
Perspective on:
Is Perspectivized in:
Uses: **Cause motion**
Is Used by: **Food**, **Tasting**
Subframe of:
Has Subframe(s):
Precedes:
Is Preceded by:
Is Inchoative of:
Is Causative of:
See also:

Lexical Units:

breakfast.v, consume.v, devour.v, dine.v, down.v, drink.v, eat.v, feast.v, feed.v, gobble.v, gulp.n, gulp.v, guzzle.v, have.v, imbibe.v, ingest.v, lap.v, lunch.v, munch.v, nibble.v, nosh.v, nurse.v, put away.v, put back.v, quaff.v, sip.n, sip.v, slurp.n, slurp.v, snack.v, sup.v, swig.n, swig.v, swill.v, tuck.v
Example

WordNet Search - 3.1
- WordNet home page - Glossary - Help

Word to search for:  eat  Search WordNet

Display Options:  (Select option to change)  :  Change

Key: "S:" = Show Synset (semantic) relations, "W:" = Show Word (lexical) relations
Display options for sense: (gloss) "an example sentence"

Verb

- S: (v) eat  (take in solid food)  "She was eating a banana";  "What did you eat for dinner last night?"
- S: (v) eat  (eat a meal; take a meal)  "We did not eat until 10 P.M. because there were so many phone calls";  "I didn’t eat yet, so I gladly accept your invitation"
- S: (v) feed, eat  (take in food; used of animals only)  "This dog doesn’t eat certain kinds of meat";  "What do whales eat?"
- S: (v) eat, eat on  (worry or cause anxiety in a persistent way)  "What’s eating you?"
- S: (v) consume, eat up, use up, eat, deplete, exhaust, run through, wipe out  (use up (resources or materials))  "This car consumes a lot of gas";  "We exhausted our savings";  "They run through 20 bottles of wine a week"
- S: (v) corrode, eat, rust  (cause to deteriorate due to the action of water, air, or an acid)  "The acid corroded the metal";  "The steady dripping of water rusted the metal stopper in the sink"
**Example**

Verb

- **S**: (v) *eat* (take in solid food) "*She was eating a banana*"; "*What did you eat for dinner last night?*"
  - *direct troponym* / *full troponym*
  - *verb group*
  - *entailment*
  - *direct hypernym* / *inherited hypernym* / *sister term*
- **S**: (v) *eat* (eat a meal; take a meal) "*We did not eat until 10 P.M. because there were so many phone calls*"; "*I didn't eat yet, so I gladly accept your invitation*"
  - **S**: (v) *consume, ingest, take in, take, have* (serve oneself to, or consume regularly) "*Have another bowl of chicken soup!*"; "*I don't take sugar in my coffee*"
  - **S**: (v) *consume, ingest, take in, take, have* (serve oneself to, or consume regularly) "*Have another bowl of chicken soup!*"; "*I don't take sugar in my coffee*"
  - *derivationally related form*
  - *sentence frame*
- **S**: (v) *eat* (eat a meal; take a meal) "*We did not eat until 10 P.M. because there were so many phone calls*"; "*I didn't eat yet, so I gladly accept your invitation*"

**eat -> ingest -> ingestion**
Example

Lexical Units (LU):
breakfast.v, consume.v, devour.v, dine.v, down.v, drink.v, eat.v, feast.v, feed.v, gobble.v, gulp.n, gulp.v, guzzle.v, have.v, imbibe.v, ingest.v, lap.v, lunch.v, munch.v, nibble.v, nosh.v, nurse.v, put away.v, put back.v, quaff.v, sip.n, sip.v, slurp.n, slurp.v, snack.v, sup.v, swig.n, swig.v, swill.v, tuck.v

perl bfs3.perl eat#v#1 gobble#v#1
Found at distance 1 (11 nodes explored)
gobble#v#1 hypo eat#v#1
Example

Sense 1

eat\#1 -- (take in solid food; "She was eating a banana"; "What did you eat for dinner last night?")
  => wash down\#1 -- (eat food accompanied by lots of liquid; also use metaphorically; "She washed
down her dinner with a bottle of red wine"; "He washed down his worries with a nightly glass of
whisky")
  => gluttonize\#1, gluttonise\#1, fress\#1 -- (eat a lot and without restraint)
  => wolf\#1, wolf down\#1 -- (eat hastily; "The teenager wolfed down the pizza")
  => slurp\#1 -- (eat noisily; "He slurped his soup")
  => fare\#2 -- (eat well)
  => pitch in\#1, dig in\#2 -- (eat heartily; "The food was placed on the table and the children pitched in")
  => pick at\#2, peck at\#1, peck\#4 -- (eat like a bird; "The anorexic girl just picks at her food")
  => peck\#2, pick up\#15 -- (eat by pecking at, like a bird)
  => gobble\#1, bolt\#6 -- (eat hastily without proper chewing; "Don't bolt your food!")
  => garbage down\#1, gobble up\#1, shovel in\#2, bolt down\#2 -- (eat a large amount of food quickly;
  "The children gobbled down most of the birthday cake")
  => nibble\#3, pick\#12, piece\#4 -- (eat intermittently; take small bites of; "He pieced at the sandwich
  all morning"; "She never eats a full meal--she just nibbles")
  => ruminate\#1 -- (chew the cuds; "cows ruminant")
  => dunk\#3, dip\#2 -- (dip into a liquid while eating; "She dunked the piece of bread in the sauce")
  => devour\#4, guttle\#1, raven\#3, pig\#2 -- (eat greedily; "he devoured three sandwiches")
  => eat up\#1, finish\#5, polish off\#3 -- (finish eating all the food on one's plate or on the table; "She
  polished off the remaining potatoes")
  => devour\#3, down\#2, consume\#1, go through\#4 -- (eat immoderately; "Some people can down a
  pound of meat in the course of one meal")
  => fill up\#4, fill\#7 -- (eat until one is sated; "He filled up on turkey")
Example

Lexical Units (LU):
breakfast.v, consume.v, devour.v, dine.v, down.v, drink.v, eat.v, feast.v, feed.v, gobble.v, gulp.n, gulp.v, guzzle.v, have.v, imbibe.v, ingest.v, lap.v, lunch.v, munch.v, nibble.v, nosh.v, nurse.v, put away.v, put back.v, quaff.v, sip.n, sip.v, slurp.n, slurp.v, snack.v, sup.v, swig.n, swig.v, swill.v, tuck.v

perl bfs3.perl eat#v#2 breakfast#v#1
Found at distance 1 (14 nodes explored)
breakfast#v#1 hypo eat#v#2
Example

Lexical Units (LU):
breakfast.v, consume.v, devour.v, dine.v, down.v, drink.v, eat.v, feast.v, feed.v, gobble.v, gulp.n, gulp.v, guzzle.v, have.v, imbibe.v, ingest.v, lap.v, lunch.v, munch.v, nibble.v, nosh.v, nurse.v, put away.v, put back.v, quaff.v, sip.n, sip.v, slurp.n, slurp.v, snack.v, sup.v, swig.n, swig.v, swill.v, tuck.v

- perl bfs3.perl eat#v#1 munch#v#1
- Found at distance 2 (101 nodes explored)
- crunch#v#3 hypo chew#v#1 enta eat#v#1

- perl bfs3.perl eat#v#2 munch#v#1
- Found at distance 3 (369 nodes explored)
- crunch#v#3 hypo chew#v#1 enta eat#v#1 hypo eat#v#2
Example

Sense 2

**eat**#2 -- (eat a meal; take a meal; "We did not eat until 10 P.M. because there were so many phone calls"; "I didn't eat yet, so I gladly accept your invitation")

=> take out#12, take away#5 -- (buy and consume food from a restaurant or establishment that sells prepared food; "We'll take out pizza, since I am too tired to cook")

=> victual#3 -- (take in nourishment)

=> eat in#1, dine in#1 -- (eat at home)

=> eat out#1, dine out#1 -- (eat at a restaurant or at somebody else's home)

=> dine#1 -- (have supper; eat dinner; "We often dine with friends in this restaurant")

=> picnic#1 -- (eat alfresco, in the open air; "We picnicked near the lake on this gorgeous Sunday")

=> eat#1 -- (take in solid food; "She was eating a banana"; "What did you eat for dinner last night?")

=> break bread#1 -- (have a meal, usually with company; "The early Christian disciples broke bread together")

=> nosh#1, snack#1 -- (eat a snack; eat lightly; "She never loses weight because she snacks between meals")

=> mess#1 -- (eat in a mess hall)

=> lunch#1 -- (take the midday meal; "At what time are you lunching?")

=> brunch#1 -- (eat a meal in the late morning; "We brunch in Sundays")

=> breakfast#1 -- (eat an early morning meal; "We breakfast at seven")

=> feast#1, banquet#2, junket#3 -- (partake in a feast or banquet)

=> gorge#1, ingurgitate#1, overindulge#1, glut#1, englut#1, stuff#4, engorge#1, overgorge#1, overeat#1, gormandise#1, gourmandise#1, binge#1, pig out#1, satiate#2, scarf out#1 -- (overeat or eat immodestly; make a pig of oneself; "She stuffed herself at the dinner"; "The kids binged on ice cream")