1. How Do Words Come to Mean Anything?

- What Gives Words Their Meaning?
- Where Does this Meaning Come From?

2. What Gives Words Their Meaning?: Distributed Semantics

- Distributed Semantics
- Orthography
- Phonology
- Action-oriented
- Tactile
- Visual
- Auditory
- Kinesthetic
- Form
- Color
- 3D tele
- Phone
- Foot
- Brake
- Kettle
- Velvet
- Clouds
- Thunder

Semantics is distributed across specialized processing areas.

3. Where Does this Meaning Come From?: Correlational Semantics

Hebbian learning encodes structure of word co-occurrence.

Same idea as:
- V1 receptive field learning: learn the strong correlations.
- Latent Semantic Analysis (LSA).

4. Multiple-Choice Quiz

1. Transformation
   A. neural activation function
   B. spiking rate code membrane potential pt
   C. interactive bidirectional feedforward
   D. language generalization nonwords

2. Bidirectional Connectivity
   A. amplification pattern completion
   B. competition inhibition selection binding
   C. gradual feature conjunction spatial invariance
   D. error driven hebbian task model based

3. Cortex Learning
   A. error driven task based hebbian model
   B. error driven task based
   C. gradual feature conjunction spatial invariance
   D. competition inhibition selection binding

4. Object Recognition
   A. gradual feature conjunction spatial invariance
   B. error driven task based hebbian model
   C. amplification pattern completion

5. Attention
   A. competition inhibition selection binding
   B. gradual feature conjunction spatial invariance
   C. spiking rate code membrane potential point

6. Weight Based Priming
   A. long term changes learning
   B. active maintenance short term residual
   C. fast arbitrary details conjunctive

7. Hippocampus Learning
   A. amplification pattern completion
   B. slow integration general structure
   C. error driven hebbian task model based

8. Dyslexia
   A. surface deep phonological reading problem
   B. speech output hearing language nonwords
   C. competition inhibition selection binding

9. Past Tense
   A. overregularizations shaped curve
   B. speech output hearing language nonwords
   C. fast arbitrary details conjunctive
Sentences

Traditional approach:

```
S
  NP (subject)  VP
    Art N V NP (direct object)
      The boy chases the cats
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Alternative approach:

Distributed reps of sentence meaning: The sentence Gestalt!
Parallel to object recognition issues: 3D structural model vs. distributed reps that distinguish different objects.

Toy World

People: busdriver (adult male), teacher (adult female), schoolgirl, and pitcher (boy).

Actions: eat, drink, stir, spread, kiss, give, hit, throw, drive, rise.

Objects: spot (the dog), steak, soup, ice cream, crackers, jelly, iced tea, kool aid, spoon, knife, finger, rose, bat (animal), bat (baseball), ball, ball (party), bus, pitcher, and fur

Locations: kitchen, living room, shed, and park.

Syntax: Active & Passive, phrases.

Tests

<table>
<thead>
<tr>
<th>Task</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role assignment</td>
<td></td>
</tr>
<tr>
<td>Active semantic</td>
<td>The schoolgirl stirred the kool-aid with a spoon.</td>
</tr>
<tr>
<td>Active syntactic</td>
<td>The busdriver gave the rose to the teacher.</td>
</tr>
<tr>
<td>Passive semantic</td>
<td>The jelly was spread by the busdriver with the knife.</td>
</tr>
<tr>
<td>Passive syntactic</td>
<td>The teacher was kissed by the busdriver.</td>
</tr>
<tr>
<td>(control)</td>
<td>The busdriver kissed the teacher.</td>
</tr>
<tr>
<td>Word ambiguity</td>
<td>The busdriver threw the ball in the park.</td>
</tr>
<tr>
<td>(control)</td>
<td>The teacher threw the ball in the living room.</td>
</tr>
<tr>
<td>Concept instantiation</td>
<td>The teacher kissed someone (male).</td>
</tr>
<tr>
<td>Role elaboration</td>
<td>The schoolgirl ate crackers (with finger).</td>
</tr>
<tr>
<td>(control)</td>
<td>The schoolgirl ate (soup).</td>
</tr>
<tr>
<td>Online update</td>
<td>The child ate soup with daintiness.</td>
</tr>
<tr>
<td>(control)</td>
<td>The pitcher ate soup with daintiness.</td>
</tr>
<tr>
<td>Conflict</td>
<td>The adult drank iced-tea in the kitchen (living-room).</td>
</tr>
</tbody>
</table>
Questions

- What general processes are involved in reading, and how do these sometimes fail (e.g., in dyslexia)?
- How are we able to read “cat”, “yacht”, and “nust”?
- Why do kids say “I goed to school” after first saying “I went”?
- How do words come to mean anything?
- How do we go beyond words to sentences?