Today's Topics

• 538 Presentations
• Homework 13 Review
• Finish off our left to right recursive grammar transformation
538 Presentations

• From the syllabus
  • 438
    • homeworks: 100%
  • 538
    • homeworks: 75%
  • sub-chapter presentation: 25%

If you are currently taking 438, and you plan to do the HLT Master's Program consider volunteering to do the presentation for a waiver later.
538 Presentations

538 presentations

• *We can’t cover as many topics as we’d like this semester*

• **next semester this course continues as 581**

• Select a **topic** from some sections from the textbook
  • **not a full chapter**
  • *don’t pick something too big or too small ...*

• Range: chapter 14 through 25
  • you can’t pick the same thing as your classmate
  • First come, first served basis
538 Presentations

Your job:
• present the selected topic in class
• produce slides (send to me first)
• you’ll be evaluated on the quality of the presentation
  • don’t just simply copy the textbook!
  • important: you'll be evaluated on how well you communicate the essential ideas employed
  • communicate your understanding of the tradeoffs and limitations etc. be prepared to take questions from me and your fellow classmates
538 Presentations

• Scheduling
  • Topic selection: **begins now**
  • Talk length: 8-10 mins
  • first come, first served basis
  • **Email me** your 1\(^{st}\), 2\(^{nd}\) and 3\(^{rd}\) choices
  • **Email me** your 1\(^{st}\) and 2\(^{nd}\) choice of presentation dates:
    • November 30\(^{th}\)
    • December 5\(^{th}\)
Homework 13 Review

- Cognate Object Construction (COC) examples:
  - He fought a heroic fight
  - He fought (the enemy)
  - She lived a happy life
  - She lived
  - They died a gruesome death
  - They died
  - You smiled a happy smile
  - You smiled

- According to Levin's EVCA (1993), CO-taking verbs include:
  - Verbs of Nonverbal Expression (some), e.g. laugh, smile, yawn;
  - Waltz Verbs, e.g. boogie, dance, waltz;
  - Other Verbs: e.g. dream, fight, live, sing, sleep, think;

Tables:

<table>
<thead>
<tr>
<th>co_verb(V,N)</th>
<th>verb_form(V,Tag,Form)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 co_verb (boogie, boogie).</td>
<td>13 verb_form (boogie, vbd, boogied).</td>
</tr>
<tr>
<td>2 co_verb (dance, dance).</td>
<td>14 verb_form (dance, vbd, danced).</td>
</tr>
<tr>
<td>3 co_verb (die, death).</td>
<td>15 verb_form (die, vbd, died).</td>
</tr>
<tr>
<td>4 co_verb (dream, dream).</td>
<td>16 verb_form (dream, vbd, dreamed).</td>
</tr>
<tr>
<td>5 co_verb (fight, fight).</td>
<td>17 verb_form (fight, vbd, fought).</td>
</tr>
<tr>
<td>6 co_verb (live, life).</td>
<td>18 verb_form (live, vbd, lived).</td>
</tr>
<tr>
<td>7 co_verb (sing, song).</td>
<td>19 verb_form (sing, vbd, sang).</td>
</tr>
<tr>
<td>8 co_verb (sleep, sleep).</td>
<td>20 verb_form (sleep, vbd, slept).</td>
</tr>
<tr>
<td>9 co_verb (smile, smile).</td>
<td>21 verb_form (smile, vbd, smiled).</td>
</tr>
<tr>
<td>10 co_verb (think, thought).</td>
<td>22 verb_form (think, vbd, thought).</td>
</tr>
<tr>
<td>11 co_verb (waltz, waltz).</td>
<td>23 verb_form (waltz, vbd, waltzed).</td>
</tr>
<tr>
<td>12 co_verb (yawn, yawn).</td>
<td>24 verb_form (yawn, vbd, yawned).</td>
</tr>
</tbody>
</table>
Homework 13 Review

?- s(Parse,[he,yawned,a,good,yawn],[[]]).
Parse = s(np(prp(he)), vp(vbd(yawned)), np(dt(a), jj(good), nn(yawn)))) ;
false.

?- s(Parse,[he,yawned,a,good,thought],[[]]).
false.

?- [\]

Let's write some grammar rules!
psg2.pl

1s(s(NP,VP)) --> np(NP,P,N), vp(VP,Tag), [subjverb(P,N,Tag)].
2np(np(NNP),P,N) --> nnp(NNP,P,N).
3np(np(DT,NN),P,N) --> dt(DT,N), nn(NN,P,N).
4% np(np(NP,PP),P,N) --> np(NP,P,N), pp(PP).
5np(NP,P,N) --> nnp(NNP,P,N), w(NP, np(NP)).
6np(NP,P,N) --> dt(DT,N), nn(NN,P,N), w(NP, np(DT,NN)).
7w(np(X,PP),X) --> pp(PP).
8w(NP,X) --> pp(PP), w(NP, np(X,PP)).
9dt(dt(a),sg) --> [a].
10dt(dt(the),sg) --> [the].
11dt(dt(the),pl) --> [the].
12nn(nn(Noun),3,sg) --> [Noun], {sgNoun(Noun)}.
13nn(nn(men),3,pl) --> [men].
14nn(nn(fish),3,pl) --> [fish].
15nnp(nnp(john),3,sg) --> [john].
16nnp(nnp(mary),3,sg) --> [mary].
17vp(vp(V,NP),Tag) --> v(V,Tag), np(NP,_,_).
18% vp(vp(V,PP),Tag) --> vp(VP,Tag), pp(PP).
19vp(VP,Tag) --> v(V,Tag), np(NP,_,_), w vp(vp(V,VP)).
20w vp(vp(X,PP),X) --> pp(PP).
21w vp(NP,X) --> pp(PP), w vp(vp(NP,VP)).
22v vbd(saw),vbd) --> [saw].
23v vbd(kicked),vbd) --> [kicked].
24v vbp(kick),vbp) --> [kick].
25v vbz(kicks),vbz) --> [kicks].
26pp(pP(NP)) --> p(P), np(NP,_,_).
27p p(in(with)) --> [with].
28
29 sgNoun(N) :: sgNouns(Ns), member(N,Ns).
30 sgNouns(\{ball, boy, limp, telescope, man, fish\}).
31
32 subjverb(_,_,vbd).
33 subjverb(3,sg,vbz).
34 subjverb(1,_,vbp).
35 subjverb(2,_,vbp).
36 subjverb(3,pl,vbp).
Transformation

- Transform left recursion in x to right recursion in w

\[
\begin{align*}
  x(x(x,y)) & \rightarrow x(X), [y]. \\
  x(x(z)) & \rightarrow [z].
\end{align*}
\]

In psg2.pl

\[
\begin{align*}
  x(x(X)) & \rightarrow [z], w(X,x(z)) \\
  x(x(z)) & \rightarrow [z]. \\
  w(W,X) & \rightarrow [y], w(W,x(X,y)). \\
  w(x(x,y),X) & \rightarrow [y].
\end{align*}
\]
Testing the NP rules

?- [psg].
  true.

?- np(Parse,P,N,[the,boy],[[]]).
  Parse = np(dt(the), nn(boy)),
  P = 3,
  N = sg ;
  false.

?- np(Parse,P,N,[the,boy,with,a,limp],[[]]).
  Parse = np(np(dt(the), nn(boy)), pp(in(with), np(dt(a), nn(limp))),
  P = 3,
  N = sg ;
  false.

?- np(Parse,P,N,[the,boy,with,a,limp,with,mary],[[]]).
  Parse = np(np(dt(the), nn(boy)), pp(in(with), np(np(dt(a), nn(limp)), pp(in(with),
  np(npn(mary)))))),
  P = 3,
  N = sg ;
  Parse = np(np(np(dt(the), nn(boy)), pp(in(with), np(dt(a), nn(limp)))}, pp(in(with)
  , np(npn(mary)))),
  P = 3,
  N = sg ;
  false.

Note: two possible parses!
1. with Mary attaches to a limp
2. with Mary attaches to the boy with a limp
Sentence Parses

• PP-attachment ambiguity example:

```prolog
?- s(Parse, [a, man, saw, the, boy, with, a, telescope], []).
Parse = s(np(dt(a), nn(man)), vp(vbd(saw), np(np(dt(the), nn(boy)), pp(in(with), np(dt(a), nn(telescope))))));
Parse = s(np(dt(a), nn(man)), vp(vp(vbd(saw), np(dt(the), nn(boy))), pp(in(with), np(dt(a), nn(telescope)))));
false.
```

![Diagram of sentence parses]
Berkeley Parser
Parses

• PP-attachment ambiguity example:

?- s(Parse, [a, man, saw, the, boy, with, a, ball, with, a, telescope], []).
Parse = s(np(dt(a), nn(man)), vp(vbd(saw), np(np(dt(the), nn(boy)), pp(in(with), np(dt(a), nn(ball))))), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)), pp(in(with), np(dt(a), nn(boy)), pp(in(with), np(np(dt(a), nn(ball)))))))))));
Parses

• PP-attachment ambiguity example: (1)
Parses

- PP-attachment ambiguity example: (2)
Parses

• PP-attachment ambiguity example: (3)
Parses

- PP-attachment ambiguity example: (4)
Parses

• PP-attachment ambiguity example: (5)
Class Poll

A man saw the boy with a ball with a telescope
• Which one would you vote for?

#1 saw
boy
ball
telescope

#2 saw
boy
ball
telescope

#3 saw
boy
ball
telescope

#4 saw
boy
ball
telescope

#5 saw
boy
ball
telescope
Berkeley Parser

(S
  (NP (DT A) (NN man))
  (VP (VBD saw)
    (NP (DT the) (NN boy))
    (PP (IN with)
      (NP
        (NP (DT a) (NN ball))
        (PP (IN with)
          (NP (DT a) (NN telescope))))))))

= Parse #4 above
saw
  boy
    ball
telecope
Stanford Parser

Parse

(ROOT
  (S
    (NP (DT A) (NN man))
    (VP (VBD saw)
      (NP (DT the) (NN boy))
      (PP (IN with)
        (NP (DT a) (NN ball)))
      (PP (IN with)
        (NP (DT a) (NN telescope))))
  (. .))))

= Parse #3 above

saw

boy

ball

telescope
Machines vs. 438/538 students

Stanford parser

Berkeley parser

most 438/538 students