1 ICL/Chart Parsing, Part 2/2005-11-10

Contents

2 Review Chart Parsing

Charts and Edges

- A chart records hypotheses about possible constituents;

- it contains a set of edges.

- Each edge has information about

  - start index of the constituent,
  - end index,
  - the hypothesized type of the constituent and its sub-constituents

- NLTK: `[A -> B C]@[i:j]`

- The content of an edge takes the form of a dotted rule: $A \rightarrow \alpha \bullet \beta$:

  - α is what we've found so far,
  - β is what we still need in order to complete an A.

Chart Parser Rules

- A chart parser rule (or function) adds new edges to the chart.

- A chart parsing strategy defines a set of rules.

- Top Down

  - top down initialization rule
  - top down predictor rule
  - fundamental rule (completer)

- Bottom Up

  - bottom up predictor rule
  - fundamental rule (completer)

Fundamental Rule

- Fundamental Rule is used by both strategies.

- If the chart contains

  - $A \rightarrow \alpha \bullet B\gamma, [i, j]$ and
  - $C \rightarrow \beta[j, k]$, then add
  - $A \rightarrow \alpha B \bullet \gamma, [i, k]$

Top Down Predictor Rule

- If the chart contains

  - $A \rightarrow \alpha \bullet C\beta, [i, j]$ then
    * for each production $C \rightarrow \gamma$, add
    * $C \rightarrow \bullet\gamma, [j, j]$

Bottom Up Predictor Rule

- If the chart contains

  - $A \rightarrow \alpha \bullet, [i, j]$ then
    * for each production $B \rightarrow A\beta$, add
    * $B \rightarrow \bullet A\beta, [i, j]$

3 Left Recursion and Ambiguity

Examples: Left Recursion

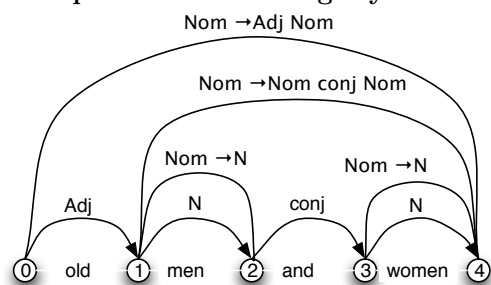Assume we are parsing NP *a flight from Denver to Boston* with the following rules:

NP $\rightarrow$ NP PP

NP $\rightarrow$ Det Nom

NP $\rightarrow$ Proper-Noun

- We construct the state (NP $\rightarrow \bullet$ NP PP, [0,0]) and add it to *chart*[0]

- The Predictor rule requires us to find a rule which expands the (non-lexical) category immediately to the right of the dot.

- Pick the first rule above, and add the state (NP $\rightarrow \bullet$ NP PP, [0,0]).

- But this is already in the chart, so we don't add it again.

Examples: Global Ambiguity
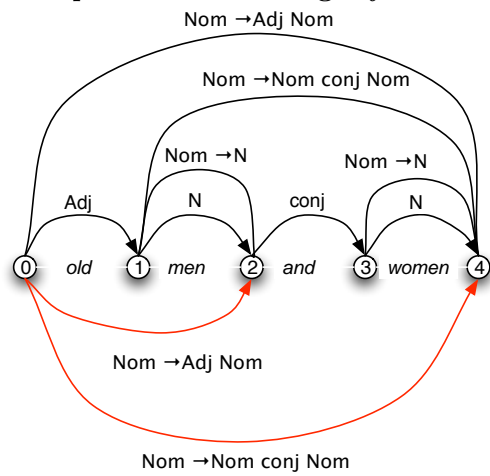
Examples: Global Ambiguity

Nom →Adj Nom

Nom →Nom conj Nom

Nom →N

Nom →N

Adj   N   conj   N

⓪   old   ①   men   ②   and   ③   women   ④

Nom →Adj Nom

Nom →Nom conj Nom

Chart Parser Demo

```
>>> from nltk_lite.draw.chart import demo
>>> demo()
```

4   Reading

Reading

- Read section 10.4 of J&M
- Read the NLTK-Lite Tutorial on Chart Parsing