Conversions for heterogeneous treebank parsing (2)

L715: Seminar on: Data manipulation for parser improvement
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Emphasizing the need for features
Zhu et al. (2011)

Source bracketing can be used as parsing constraints during decoding of a target parser

- But consider figure 1 in Zhu et al. (2011)
  - Tsinghua Chinese Treebank (TCT) tree: verb “deems” is at the right bracket of a phrase
  - Penn Chinese Treebank (CTB) tree: verb “deems” is at the left boundary of a phrase

- These annotations are inconsistent
  - A source parsing constraint may thus prune such a constituent

Alternative: use source bracketing structures as guiding information
Generic System Architecture

1. Build *source parser* & parse target treebank
2. Build a parser on (parsed-source, gold-target) sentence pairs
   ▶ heterogeneous parser: incorporates information from both styles
3. Testing: take gold source parses as input and converts them

Feature-based parsing algorithms are used, to incorporate source bracketing structures
Shift-reduce parser uses transitions between states $< S, Q >$ ($S$=stack of partial parses, $Q$=queue of word-POS pairs)

- Heterogeneous parsing works similarly to standard way
  - Tree transformed to binary tree
  - Binary tree decomposed into gold action-state sequences
  - Train classifier on states, which are represented as feature vectors
- Feature set is augmented with features bridging current state and source parse
Features

- Target-side features: same as earlier parser
- Heterogeneous features:
  - Constituent features (e.g., bracketing matches?)
  - Relation features (e.g., nodes are identical or sisters?)
  - Frontier features (e.g., words in same base phrase?)
  - Path features (e.g., syntactic path?)

Look at table 1 to unpack these a bit ...
Table 2 reports conversion accuracy

- All heterogeneous features improve conversion accuracy
- Impact of path feature is small, possibly due to sparseness

nb: this was done on top of POS conversion (96.2% accuracy)
Projected Treebank as Source Corpus

Jiang and Liu (2009)

**Problem:** Projected treebanks inherit the standard of the source

- Adapt the divergence automatically
- Boost parsing performance with additional parsed trees
Many approaches directly map from source to target

- Their method works by looking for the best consistency with source trees:

  \[
  \hat{T}_C = \arg \max_{T_C} C(T_C|T_E, A)
  \]

- Measures the degree to which Chinese tree \((T_C)\) is consistent with English tree \((T_E)\)

- They accumulate scores across all possible alignments, making it more error-tolerant

More details in the paper
Annotation Adaptation

Train source parser & parse target corpus
  ▶ Then, a target parser is trained
    ▶ crucially, with guide features extracted from source parser’s output

When testing, data is first parsed by source parser as an intermediate parsing result
  ▶ Then, the target parser with guide features is used
  ▶ Automatically learns the regularities of the intermediate parse
Guide Features

They work with MSTParser, tailoring guide features to it

- i.e., define features on dependency edges (cf. edge-factorization)
- Examine relationship between head and modifier in source parse:
  - Feature: Does the relationship exist? (cf. stacking)
  - Features: combinations of lexical features of MST models
- Define relationships as a variable covering these cases:
  - parent-child, child-parent, siblings, else
Experiments

Project English trees to Chinese & select those between 6 & 100 words and with a high enough projection confidence

- Source = PTB, Target = Penn Chinese Treebank (CTB)
- Source parser: 1st-order MST, Target parser: 2nd-order MST

Source parsers perform poorly (around 53%), while target parser is around 83-87% & higher than baseline