Conversions for heterogeneous treebank parsing (2)

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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-Based Heterogeneous Parser

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 ...

Experiments

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

### Error-Tolerant Tree Projection

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

### References