

Improving Data Driven Dependency Parsing Using Clausal Information

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May 24, 2010



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Outline

- 1 Introduction
 - Data Driven Dependency Parsing
- 2 Why Clausal Information?
 - Definition
 - Importance
 - Identification
 - Stage1 Parse
- 3 Experiments
 - Baseline
 - Clausal Information
 - Results
- 4 Analysis
 - Dependency Accuracy Vs Distance
 - Non-projective Dependencies
- 5 Conclusion



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Clause Definition

Definition

Traditionally, a clause is a group of words that consist of a subject and a predicate.

Example

I went to the market yesterday, where, I found a beautiful watch.

Exact definition in experiments section



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I went to the market yesterday, **where**, I found a beautiful watch.

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Motivation for using Clausal Information

*Most of the dependencies of words appear inside the same clause.
The dependencies of the words are mostly localized to the clause boundary.*

- Parsing: Finding the correct parent/child of a word in the sentence
- Use of the clause boundary information
 - Reduces the search space of the parser to find the dependent
 - Makes the parser less prone to errors?



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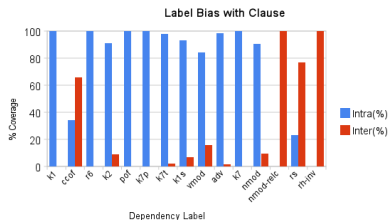
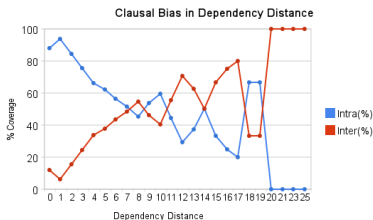
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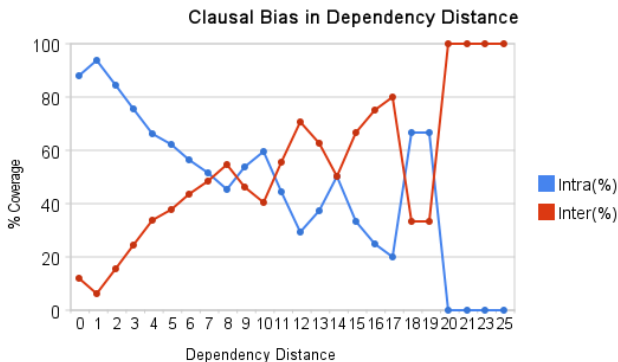
Does it really work?

Indian Languages

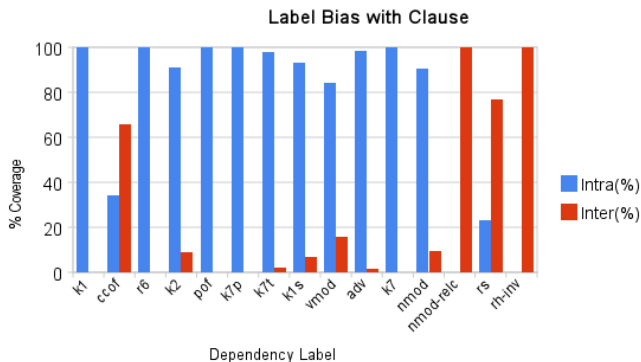
- Relatively-free word order languages
- Dependency framework is best suited
- Paninian framework proved to be helpful (Bharti et al., 93,95, etc...)



Dependency Distance Vs Clause



Dependency Label Vs Clause



Clause Identification

Stage1 Parse

- Bharti et al., 93 proposed a two stage method in which
 - Only Intra Clausal dependencies are resolved in Stage1
 - Only Inter Clausal dependencies are resolved in Stage2
- Successfully tried for Indian Languages (Bharti et al., 2008,09)
- Husain et al., 2009 proposed data- driven Two-Stage Parsing
- Stage1 parse of Husain et al., used as the clausal information provider

For us, a clause is a group of words having a single verb, unless the verb is a child of another verb



Stage1 Parse Details

- To do the Stage1 Parsing, Husain et al., 09
 - Adds a *dummy* node
 - The clauses are attached to it by *dummy* relations
 - The treebank is converted to this format by rules
 - Trains MSTParser on this, to get the stage1 model
- Here, we use MaltParser instead of MSTParser
- The output is post processed to get the clausal information

¡ A figure needs to be included here which makes the process clear.¿



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Data, Parser

- Hindi dataset released as part of the ICON09 parsing contest ()
- Training: 1500, Development: 150, Testing: 150
- Sentences are annotated using syntactico semantic relations based on Paninian framework (Begum et al., 2008)
- Dependency relations exist between chunks
- Malt Parser is used
 - Arc-eager
 - Turkish SVM settings



Baseline Features and Accuracy

- Data specific features
 - Tense, Aspect, Modality for Verbs
 - Vibhakti(Post-position) for Nouns
- General features
 - Lexical items (Stack,Input) window size: ?
 - POS,Chunk tags (Stack, Input) window size: ?
 - Clausal Features

	Precision	Recall
Clause Boundary	84.83	91.23
Clause Head	92.42	99.40

	LAS	LA	L
Baseline	73.62	91.00	76.04



Why and How?

- As said earlier, clause boundary info. reduces the search space of the parser
- But, clausal information spans across many words
- Hard to encode as a boolean feature
- Modified the code of MSTParser to handle the following features
 - Whether two words (Stack[0] and Input[0]) are in the same clause or not (boolean)
 - The head/non-head info. of each word in a clause (H or NH)

F

Figure showing the feature clearly



Results

	LAS	UAS	LS
Baseline	73.62	91.00	76.04
F1	72.66	91.00	74.74
F2	72.66	91.00	74.74
F3	74.39	91.87	76.21

F1: Only Boundary

F2: Only Head Info.

F3: Both Boundary and Head info.

- Improvement in LAs: 0.87 UAS: 0.87

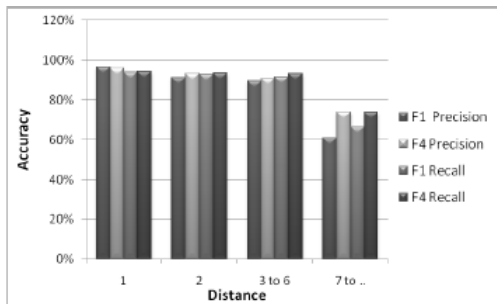


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Dependency Accuracy Vs Distance



- Once can see that
 - The accuracy improvement increases as the distance increases
 - Shows that the clausal features, help distinguishing and identifying long distance dependencies

Dependency Accuracy for Non-projective Dependencies

- Most of the non-projectivities exist in-between the clauses (Mannem et al., 2009)
- So, The head features should guide the parser to identify non-projectivities
- The following table shows this clearly.

	F1(%)	F4(%)
Precision	41.1	50
Recall	30.5	39.2



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Conclusion

Clausal features help dependency parsing, especially, when there is dependency and label bias toward the clause.



Future Work

References

