Prediction of Structured Objects in NLP

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Computer scientist view of NLP

Structured data (trees, graphs, etc.)

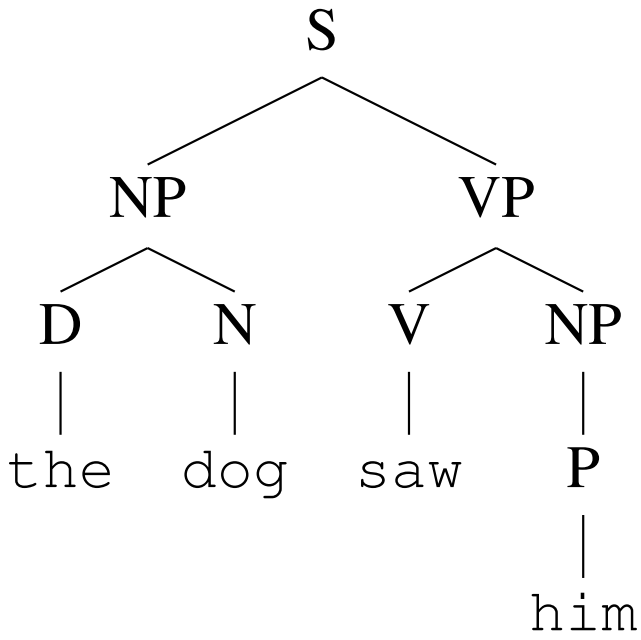
Combinatorial optimization problems (dynamic programming, etc.)

Numerical optimization algorithms (for learning)

Bonus: the language domain is fascinating

Example problem: syntactic parsing

Say we have a tree. The tree has its nodes labeled. For example:



For a given sentence, we can have many trees

Some are right, some are wrong. This is a problem of ambiguity

Example problem: syntactic parsing

We map trees to probabilities. Higher score means “more correct” tree

Questions we need to ask:

- How do we score trees with probabilities in a compositional way?
- How do we choose the tree with the maximal score given a sentence?
- Back to starting point: are such trees the right representation anyway?

Example problem: syntactic parsing

- How do we score trees with probabilities in a compositional way?
  Give a probability to each node. The probability of a whole tree is the product of the probabilities of all nodes.
- How do we choose the tree with the maximal score given a sentence?
  Using dynamic programming.
- Back to starting point: are such trees the right representation anyway?
  Depends on the application or the problem we are trying to solve.

Other questions

We assumed we *know* the probabilities of each node to score the trees

How do we *learn* these weights? – training

- With examples of the trees given? (supervised learning)
- Just from strings (yields of trees)? (unsupervised learning)
- With incomplete data? (latent-variable learning)

Summary

I gave a CS oriented view of NLP

NLP is of course also tied to linguistics

Many of the representations and the models we explore are based on insights from linguistics

Next semester: Topics in NLP (INFR11113)
`http://www.inf.ed.ac.uk/teaching/courses/tnlp/`

Demo: A master's project done by Chiraag Lala:
`http://kinloch.inf.ed.ac.uk/words/`