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k-best Parsing, Directed Hypergraphs & Dynamic Programming

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Joint work with David Chiang (University of Maryland)

In this talk, we first formalize various parsing algorithms under a general framework of monotonic directed hypergraphs and discuss its relevance with the optimal subproblem principle in dynamic programming. The problem of k-best parsing, then, can be viewed as an instance of k-best derivations problem in those hypergraphs. This is different from but closely related to the k-shortest hyperpaths problem in the algorithm community. We develop a series of four algorithms for k-best derivations problem that substantially improve on previously-used algorithms with respect to efficiency, scalability, and accuracy. Experimental results based on state-of-the-art systems will presented in the context of treebank parsing and machine translation. We show in particular how the improved output of our algorithms has the potential to improve results from parse reranking systems and other applications.

For those who have heard of this talk before, this version is adapted to a general CS audience but contains many important updates on the theoretical side.

The conference version of this paper can be downloaded here:
http://www.cis.upenn.edu/~lhuang3/huang-iwpt.pdf
