Hybrid NLP

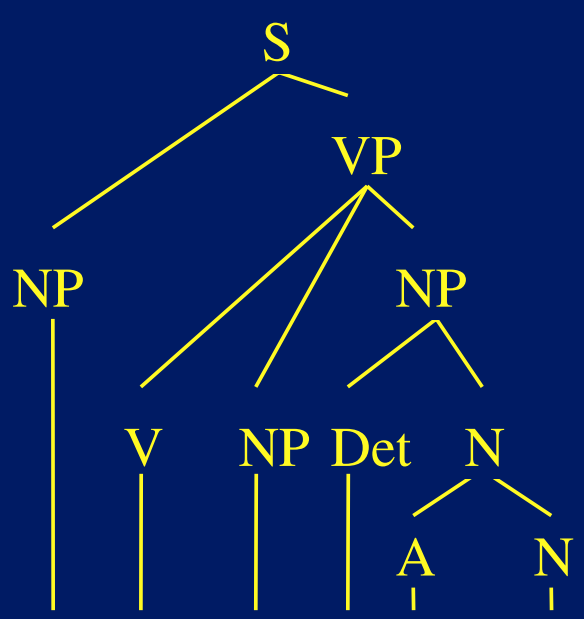
OUTLINE

- Problems of Deep and Shallow Processing
- Hybrid Architectures
- An Advanced Platform for Hybrid NLP: Deep Thought
- Applications for Hybrid Processing
- Conclusion and Outlook

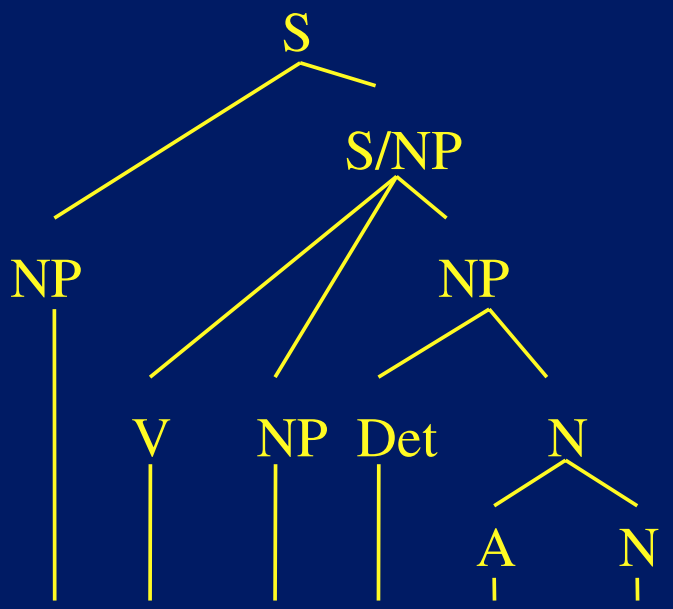
DEEP & SHALLOW PROCESSING

- **deep methods** for morphological - syntactic - semantic processing exploit our knowledge about the structure of human language
- as opposed to **shallow methods** such as pattern matching grammars, n-gram language models
- **deep methods** are needed for getting at the meaning of language input
- **shallow methods** perform a partial or heavily under-specified analysis sufficient for certain applications

$\exists x[(old'(penny'))\ (x) \wedge (Past(give'(sue', paul', x)))]$



Sue gave Paul an old penny.



Sue gab Paul einen alten Pfennig.

APPLICATIONS

- Machine Translation

  e.g. Systran, Logos, METAL-Comprendium, IBM PT

- Access to Databases

  e.g. Core Language Engine

Once Upon a Time

- Broad industrial research in deep parsing
  - Xerox - LFG
  - Siemens - LFG
  - IBM Germany - HPSG
  - Hewlett Packard - GPSG and HPSG
  - IBM USA - PLNLP and Slot Grammar
- Very large projects
  - EUROTRA
  - LILOG
  - LS-GRAM

GRAMMAR FRAMEWORKS

- Head-Driven Phrase Structure Grammar (HPSG)
- Lexical Functional Grammar (LFG)
- Tree-Adjunction Grammar (TAG)
- Categorial Grammar (CG)
- Dependency Grammar (DG)
- GB-Minimalist Program

HPSG

- **Head-Driven Phrase Structure Grammar by Pollard and Sag**
- **Uniform formalism: typed feature structures**
- **High degree of lexicalization: very few PS-rules, rich lexicon structure**
- **Ontological structure: Multiple inheritance type hierarchy**

Problems with Deep Analysis

- **Coverage (Development Time)**
- **Robustness (Coping with Out-of-Grammar Input)**
- **Efficiency (Runtime and Space Efficiency)**
- **Specificity (Selection among Readings)**

Problems with Shallow Analysis

Accuracy

- **Problems with embeddings, grammatical control, anaphora and modal as well a negative contexts.**

  According to SVP Raul Lopez, Slator expected him to be appointed CEO of Crawford Inc. at the upcoming share holders meeting.

  After the retirement of Peter Smith, Mary Hopp was introduced by VP Brown as the new director of the marketing division.

  After every former US based vicepresident except Lisa Ronell served as Chairman of the Board, the shareholders for the first time appointed a non-US Chairperson.