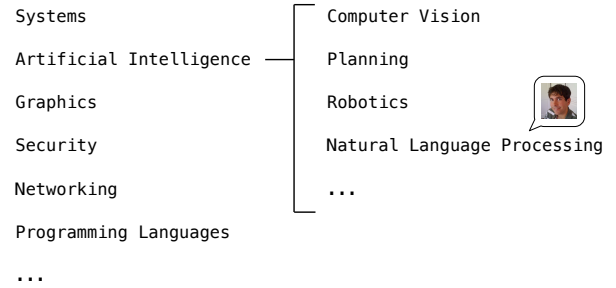


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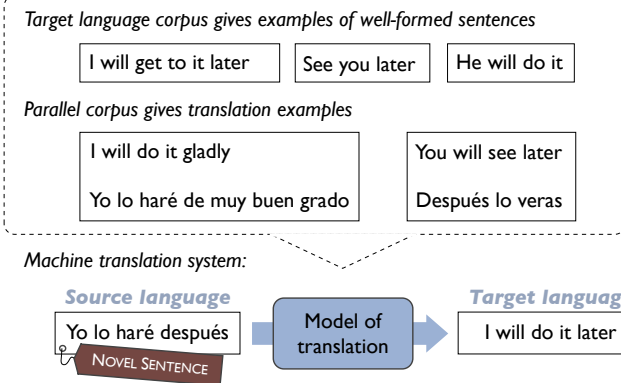
Friday, November 30

What is Computer Science?

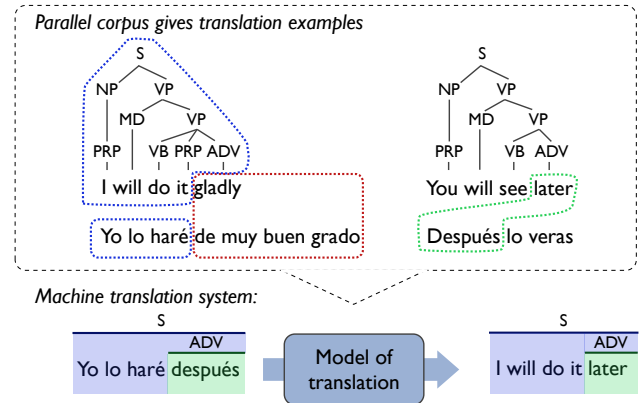


Machine Translation

Bonus Material



The Syntactic Structure of Natural Language

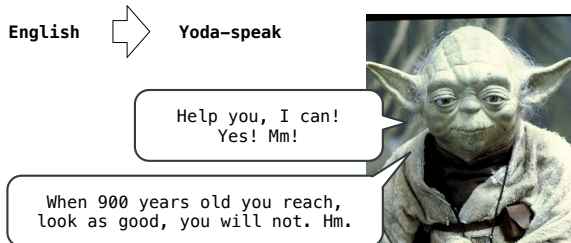


A Translation System in 20 Minutes

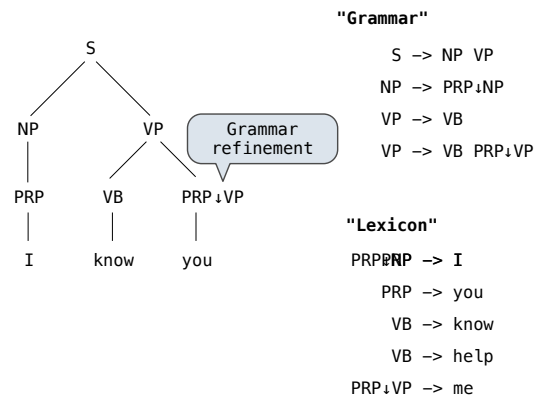
Context-free grammars as a model of language generation

Large-scale linguistic annotations

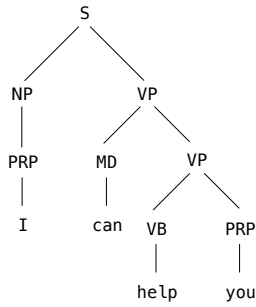
Tree transformations



A Context-Free Grammar Describes Generation



A Context-Free Grammar Describes Generation



"Grammar"

S → NP VP
 NP → PRP
 VP → VB
 VP → VB PRP
 VP → MD VP

"Lexicon"

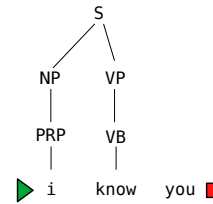
PRP → I
 PRP → you
 VB → know
 VB → help
 MD → can

A grammar can be *learned* from data (demo)

Left-Corner Parsing Builds Trees For Sentences

```

parse_next(S, 1)
complete(S, (PRP i), 1)
complete(S, (NP (PRP i)), 1)
parse_next(VP, 2)
complete(VP, (VB know), 2)
complete(VP, (VP (VB know)), 2)
complete(S, (S ...), 1)
  
```



"Grammar"

S → NP VP
 NP → PRP
 VP → VB
 VP → VB PRP

Left corners

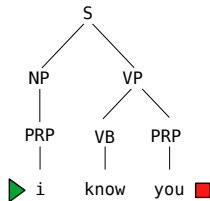
"Lexicon"

PRP → I
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Left-Corner Parsing Builds Trees For Sentences

```

parse_next(S, 1)
complete(S, (PRP i), 1)
complete(S, (NP (PRP i)), 1)
parse_next(VP, 2)
complete(VP, (VB know), 2)
complete(VP, (VP (VB know) (PRP you)), 2)
complete(S, (S ...), 1)
  
```



"Grammar"

S → NP VP
 NP → PRP
 VP → VB
 VP → VB PRP

Left corners

"Lexicon"

PRP → I
 PRP → you
 VB → know
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