Lecture 16: Semantic Processing for Code-Mixed Languages

L98: Introduction to Computational Semantics

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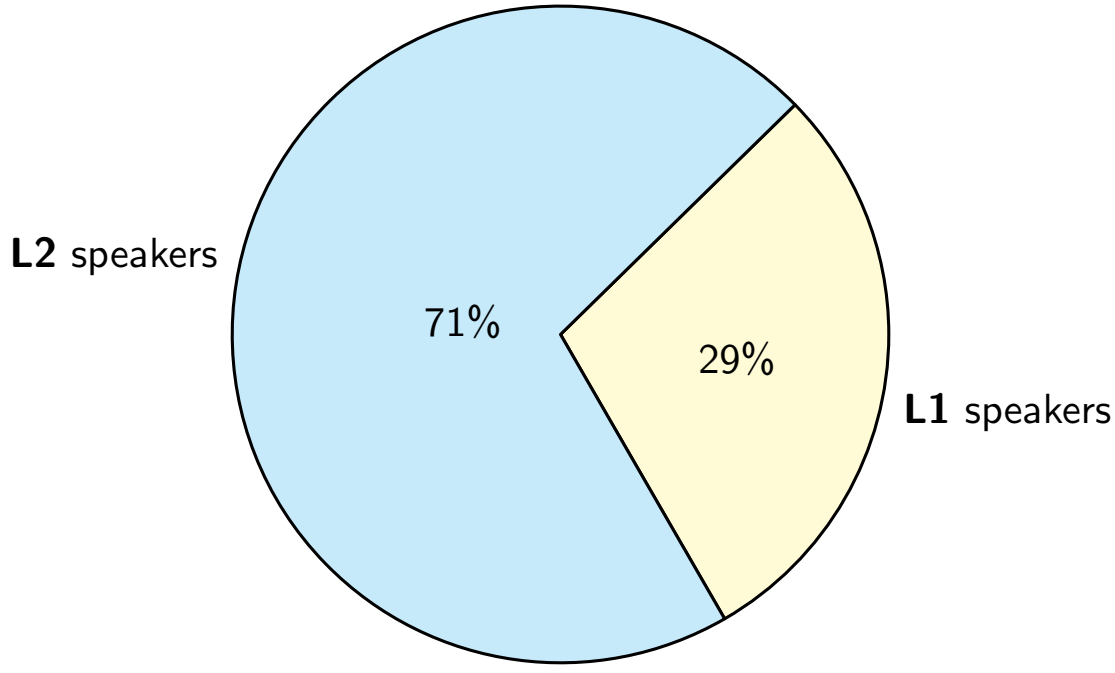


from Ethnologue (2019, 23rd edition);

898.4 million ESL speakers!

Lecture 16: Semantic Processing for Code-Mixed Languages

1. Code-mixing

Code Mixing

Code mixing/switching

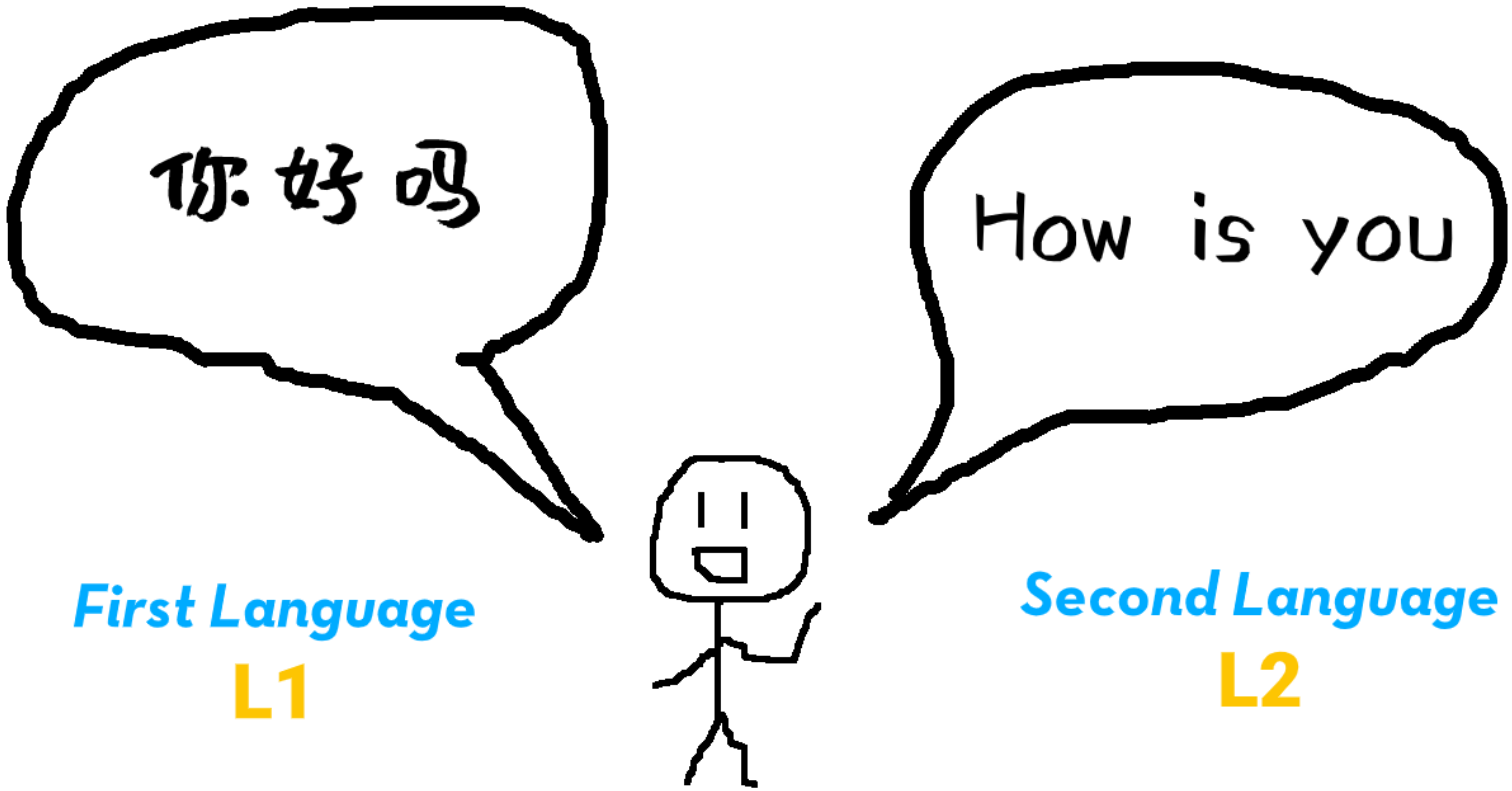
Code-mixing/switching: a speaker alternates between two or more languages in the context of a single conversation or situation.

Code-switching in Hong Kong

The English word "sure" / "cute" is mixed into an otherwise Cantonese sentence.

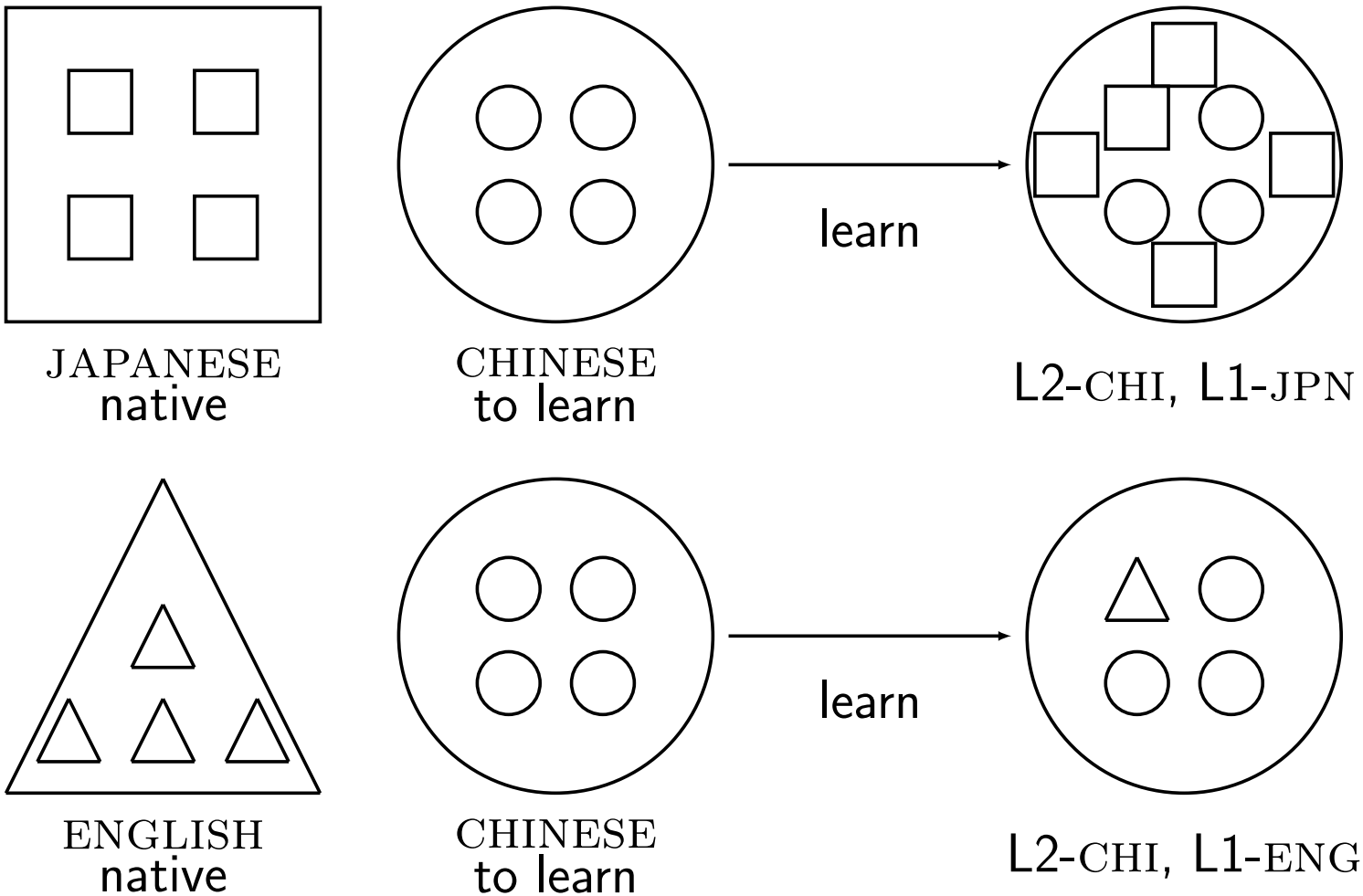
- 我唔sure
- cu唔cute啊

First languages, second languages, cross-lingual transfer



L1 has an influence on L2

Something like



Language acquisition

- Frist language acquisition
- Second language acquisition
- Monolingual FLA
- Bilingual FLA
- Syntactic acquisition
- Semantic acquisition

Universals

Noun Phrase Accessibility Hierarchy

Subject $\succ$ direct object $\succ$ indirect object $\succ$ oblique $\succ$ genitive $\succ$ object of comparison

If a language can relativize on a position on the hierarchy, then any other higher position can also be relativized on.

(1) a. the man who I am taller than $\triangleright$ object of comparison

b. the man whose father I know $\triangleright$ genitive

For example, if a language allows (1a), then it allows (1b).

A universal of SLA

L2 learners find relative clauses higher on the hierarchy easier to acquire.

Annotating English as a Second Language

Annotating second language data

There is naturally a need to automatically annotate second language data with rich lexical, syntactic, semantic and even pragmatic information.

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High-performance automatic annotation,

- from an engineering perspective, enables deriving high-quality information by structuring this specific type of data, and
- from a scientific perspective, enables quantitative studies for Second Language Acquisition, which is complementary to hands-on experiences in interpreting second language phenomena.

Data: Reddit (https://www.reddit.com)

Large-scale L2 texts are available!

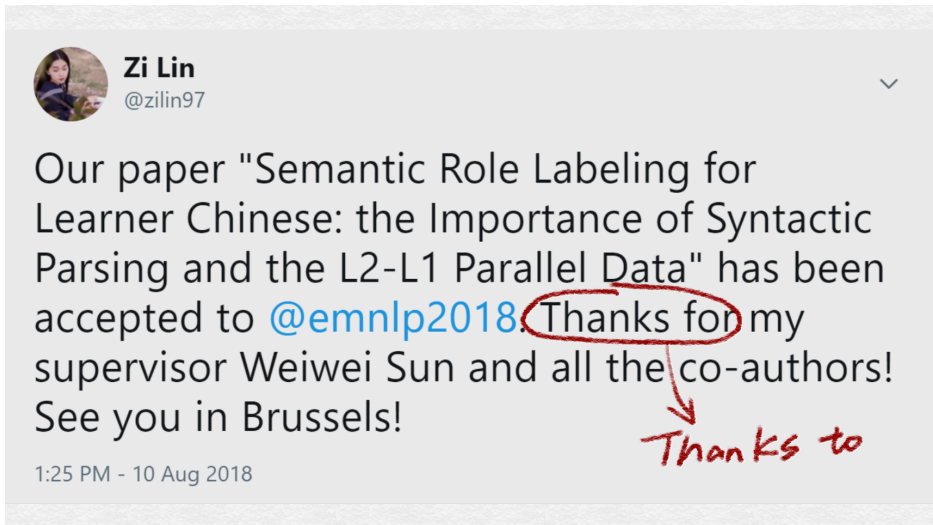
250M native and non-native English sentences (3.8B tokens), covering over 45K authors from 50 countries [**?**]

L1	Sentence
French	*I have to go to the Dr. to do a* **rapid** *check on my heart stability.*
French	*Maybe put every name through a manual* **approbation** *pipeline so it ensures quality.*
French	*Polls have shown public* **approbation** *for this law is somewhere between 58% and 65%, and it has been a strong promise during the presidential campaign.*
Italian	*The event was even more shocking because the* **precedent** *evening he wasn't sick at all.*

Learner texts are everywhere . . .

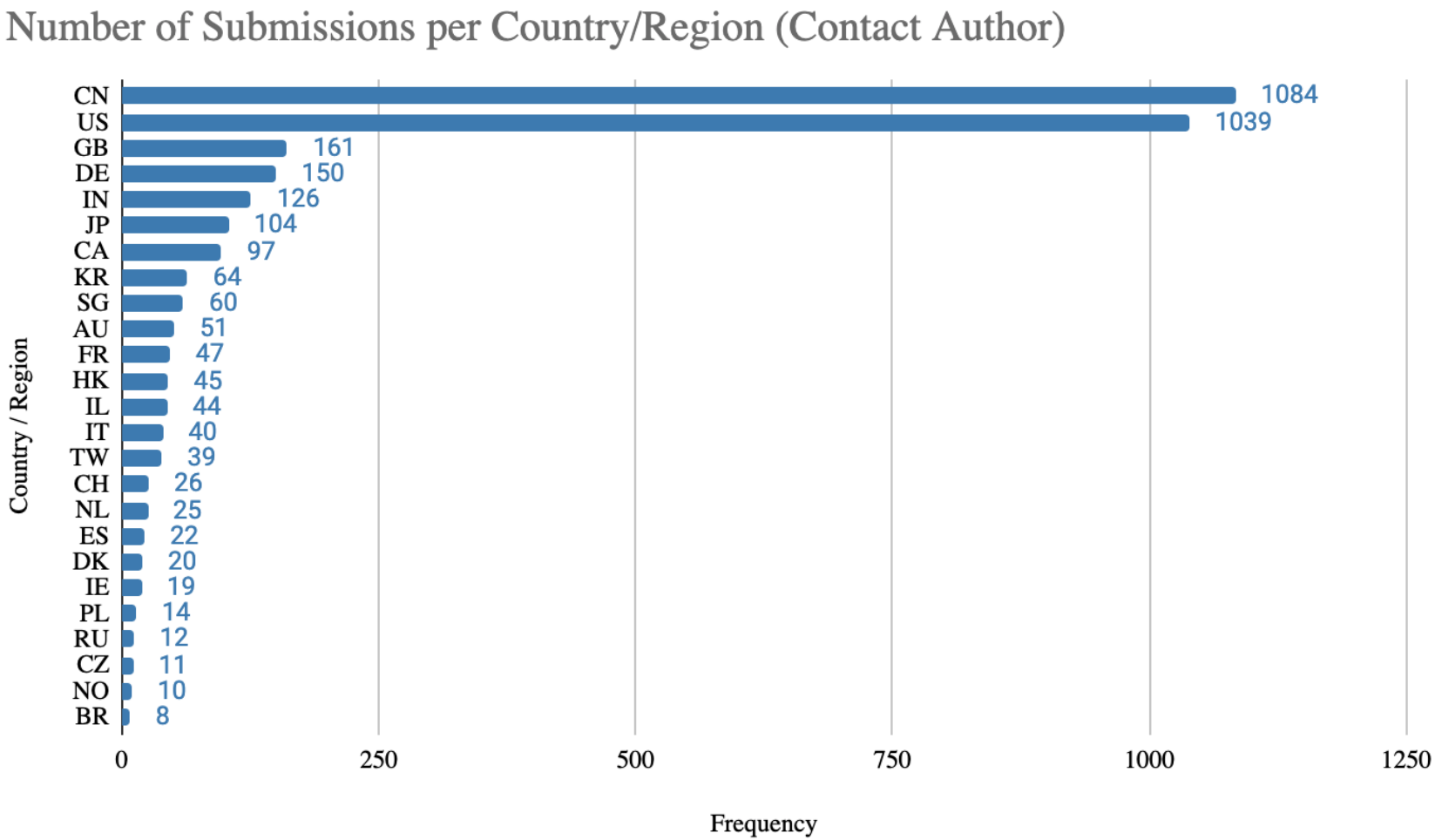
Language Tests

Learner texts are everywhere . . .



Social Network

Learner texts are everywhere . . .



https://acl2020.org/blog/general-conference-statistics/

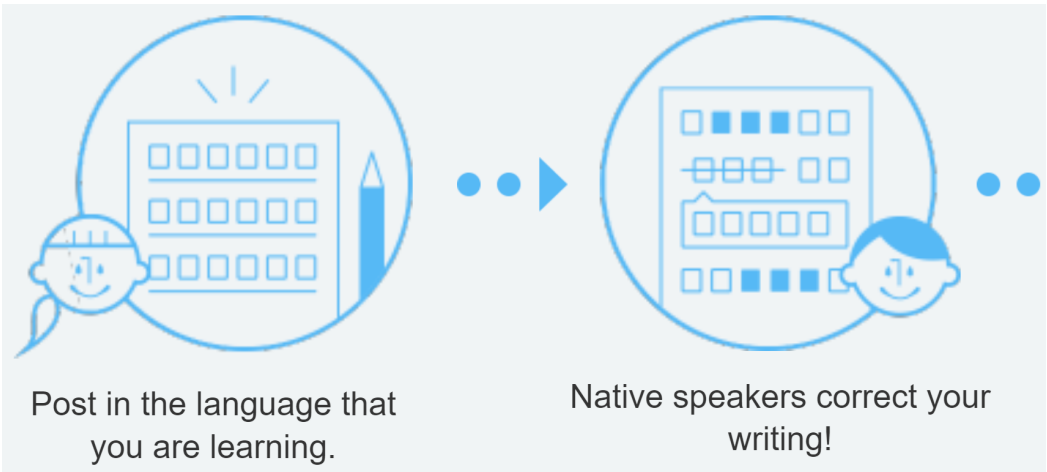
and perhaps your papers

Data: LANG-8 (http://lang-8.com)

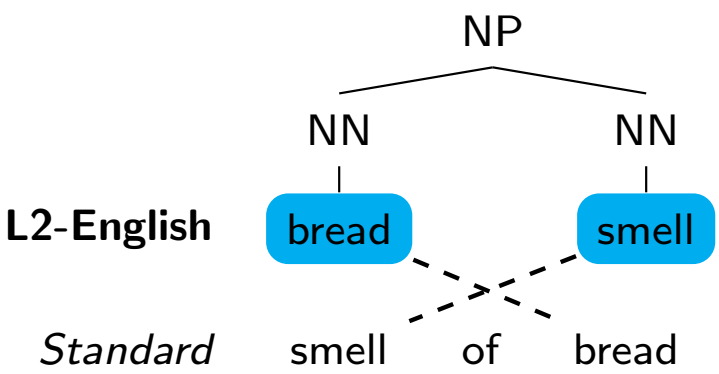
Large-scale L2-L1 parallel texts are available!

6.8M English sentence pairs and 720K Chinese sentence pairs.

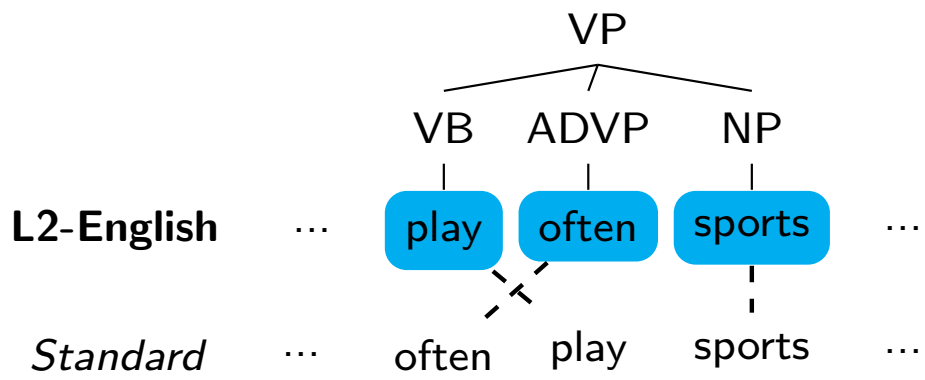
L2 speaker	城市里的人能度过多方面的生活。
corrected	城市里的人能过丰富多彩的生活。
L2 speaker	You know what should I done.
corrected	You know what I should have done.



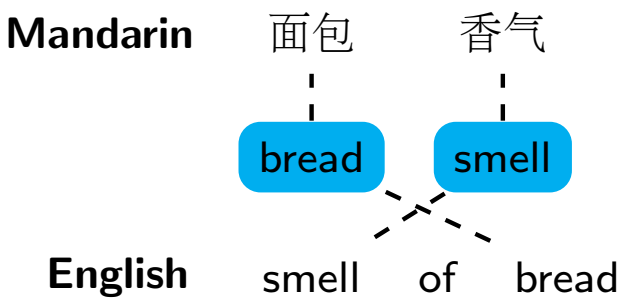
Patterns of cross-lingual transfer

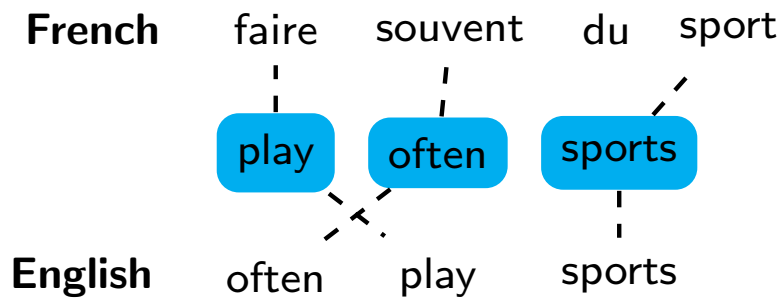


NP(x0:NN x1:NN) → x1 x0

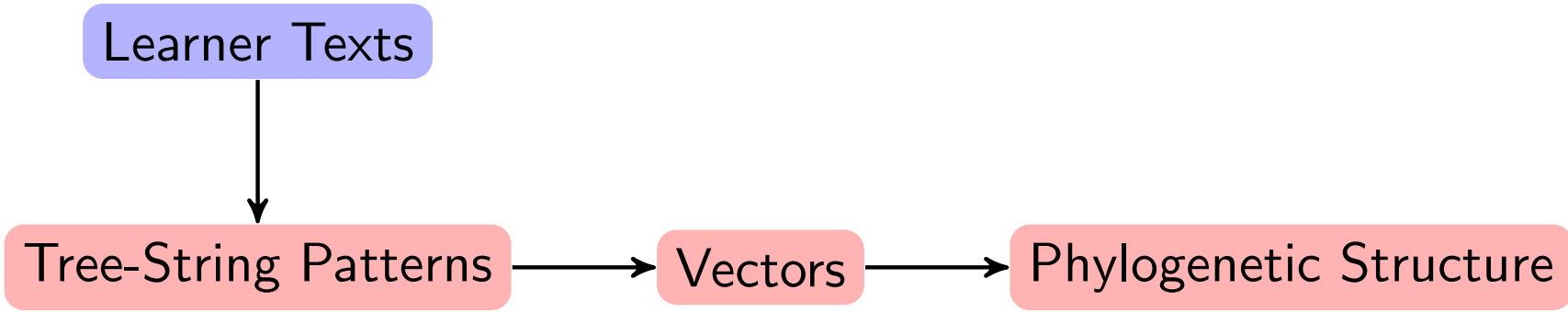


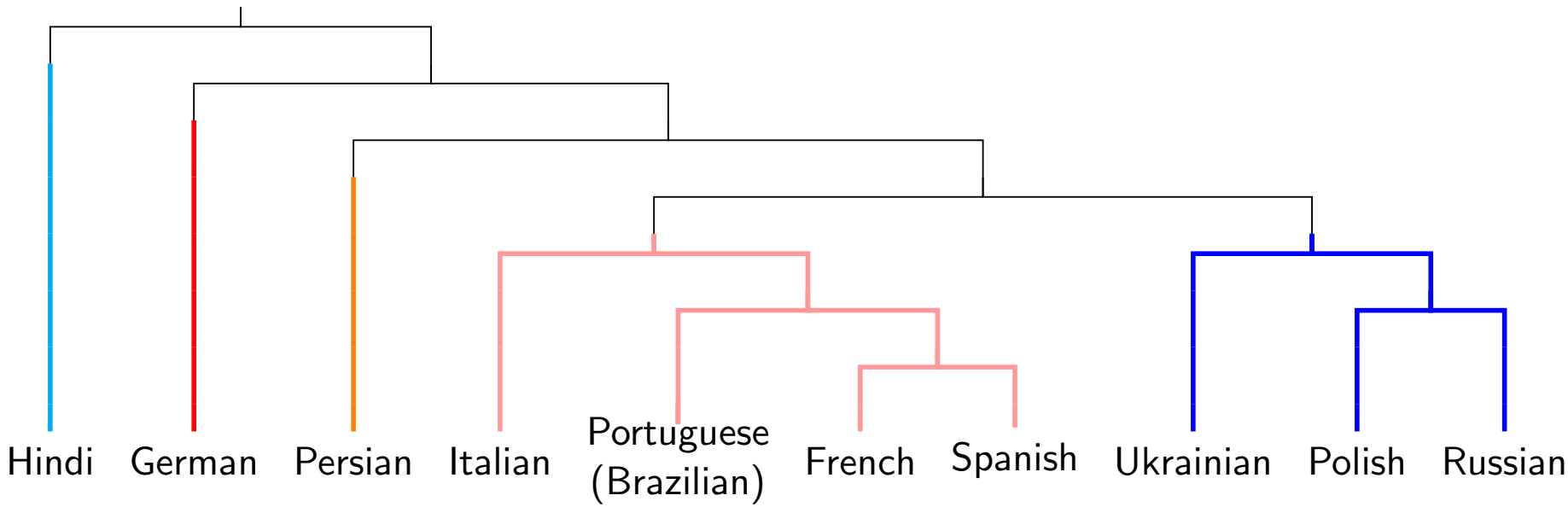
VP(x0:VB x1:ADVP x2:NP) → x1 x0 x2





Using patterns

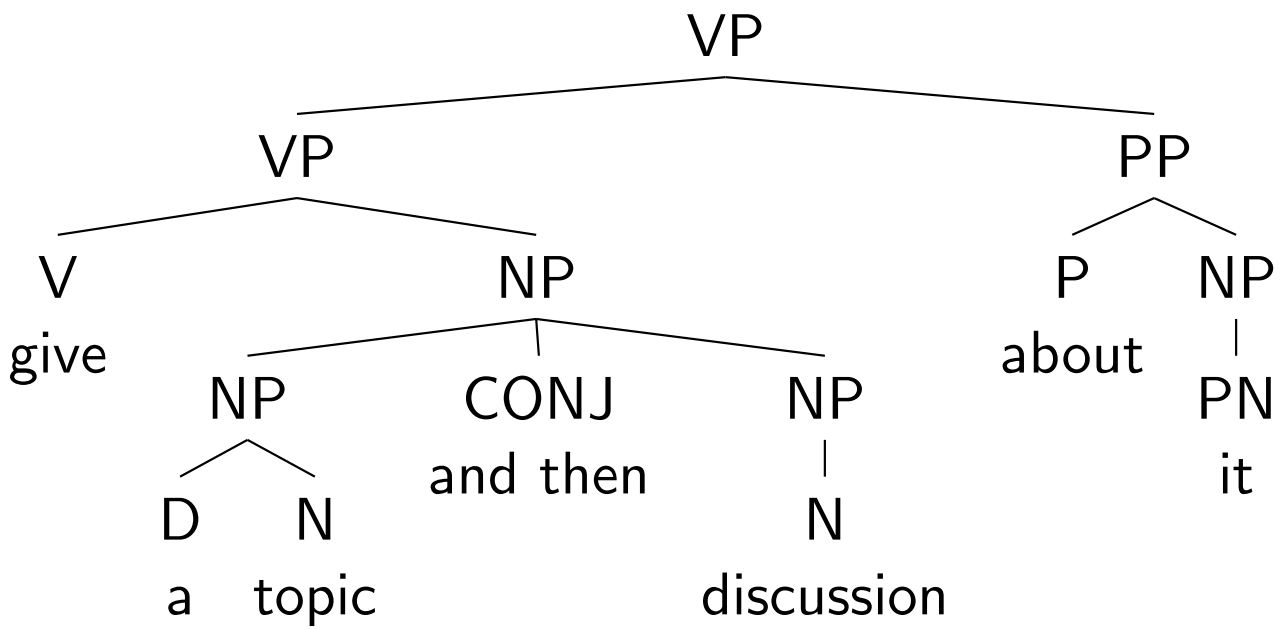




Zhao et al. (2020); arXiv:2007.09076

Interface Hypothesis

Language structures involving an interface between different language modules, like **syntax–semantics interface** and **semantics–pragmatics interface**, are less likely to be acquired completely than structures that do not involve this interface; see e.g. Sorace 2011



Literal meaning versus intended meaning

Literal Meaning

conventional meaning
sentence meaning

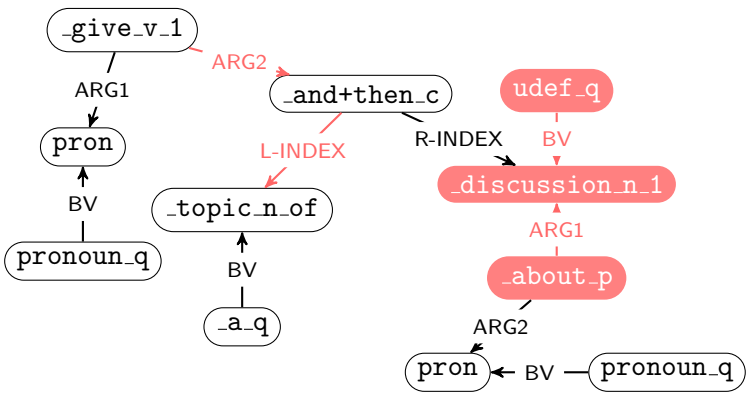
linguistic code features

often
≠

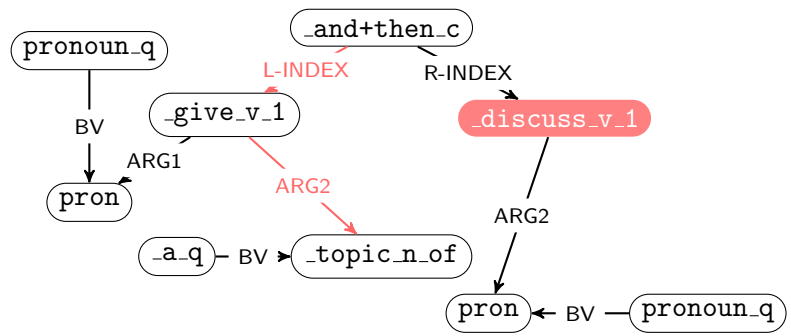
Intended Meaning

speaker meaning
interpretation

author's intention



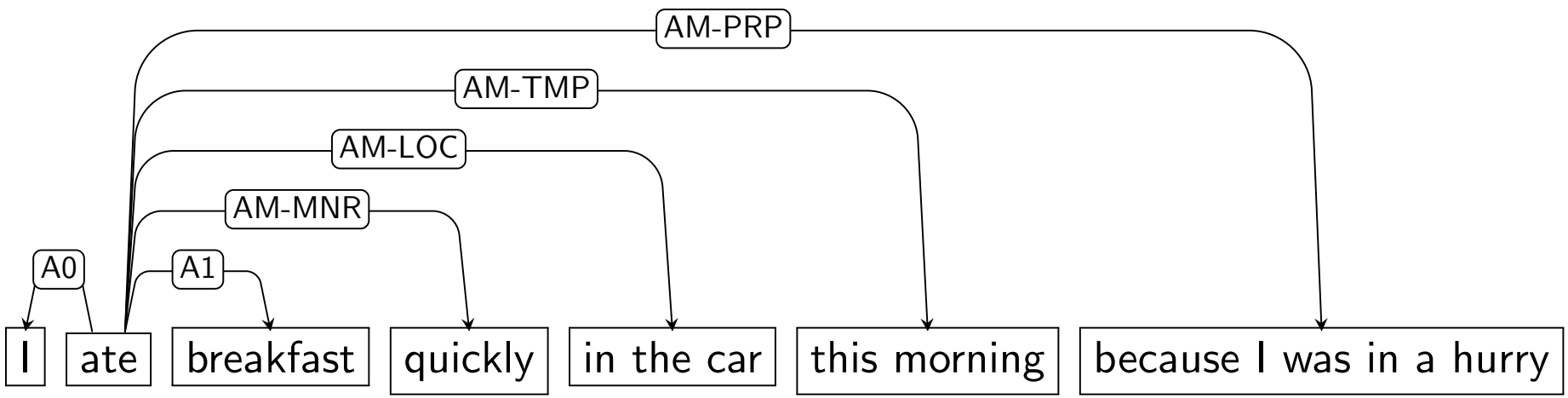
give a topic and then discussion about it.



Give a topic and then discuss it.

Semantic Role Labeling

- **Argument (AN):** Who did what to whom?
- **Adjunct (AM):** When, where, why and how?



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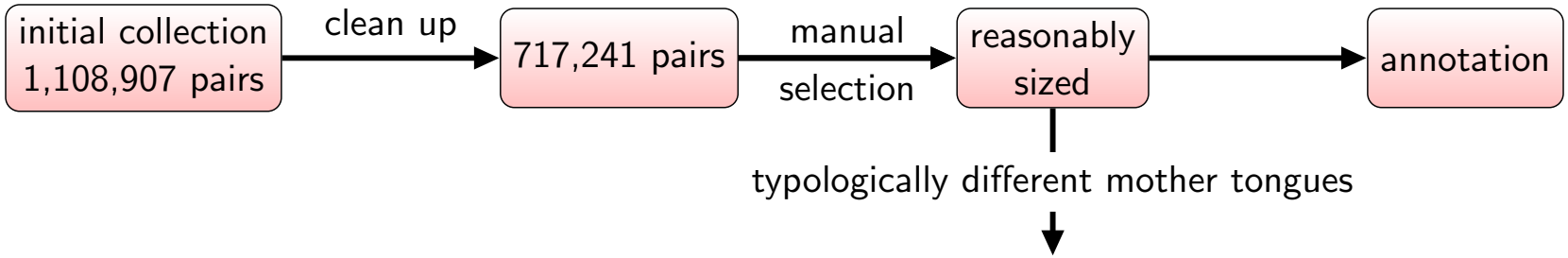
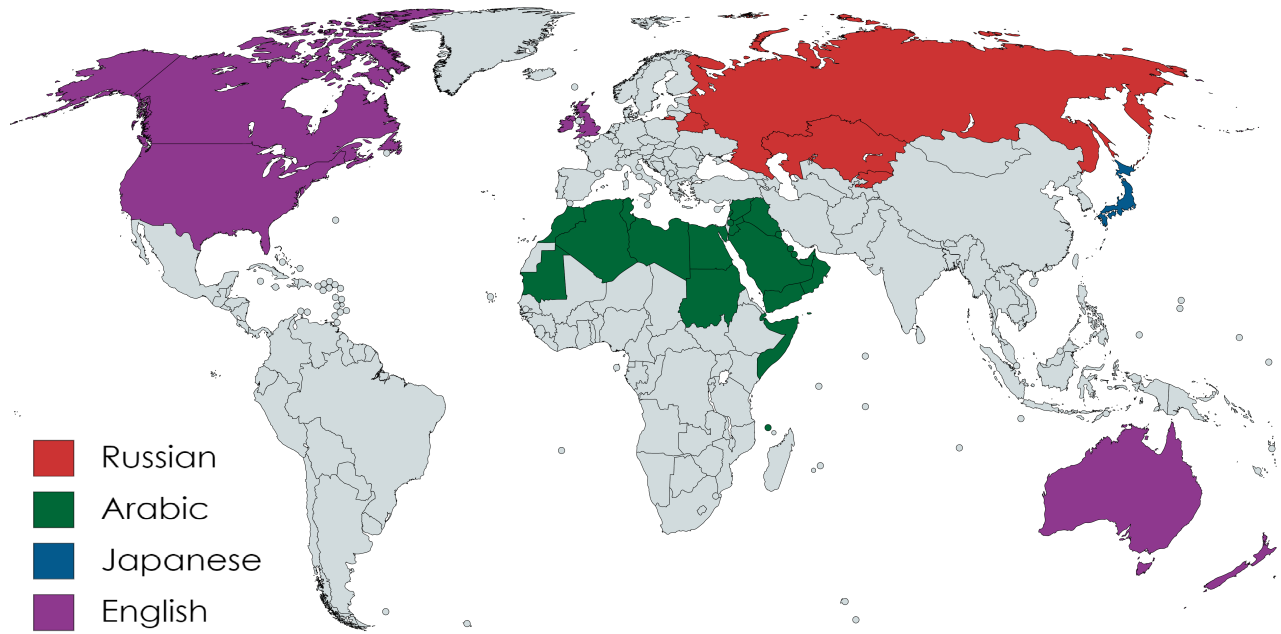
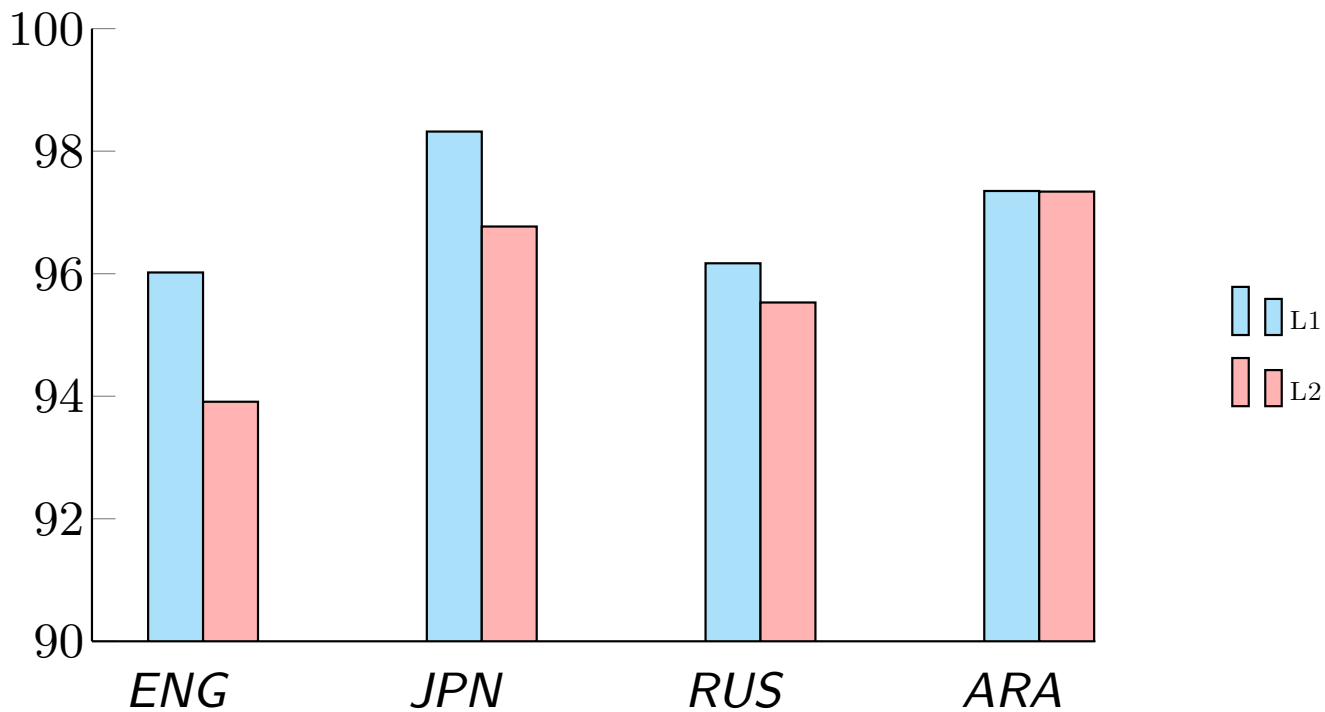


Chinese	Sino-Tibetan
Russian	Slavic
Arabic	Semitic
Japanese	?
English	Germanic

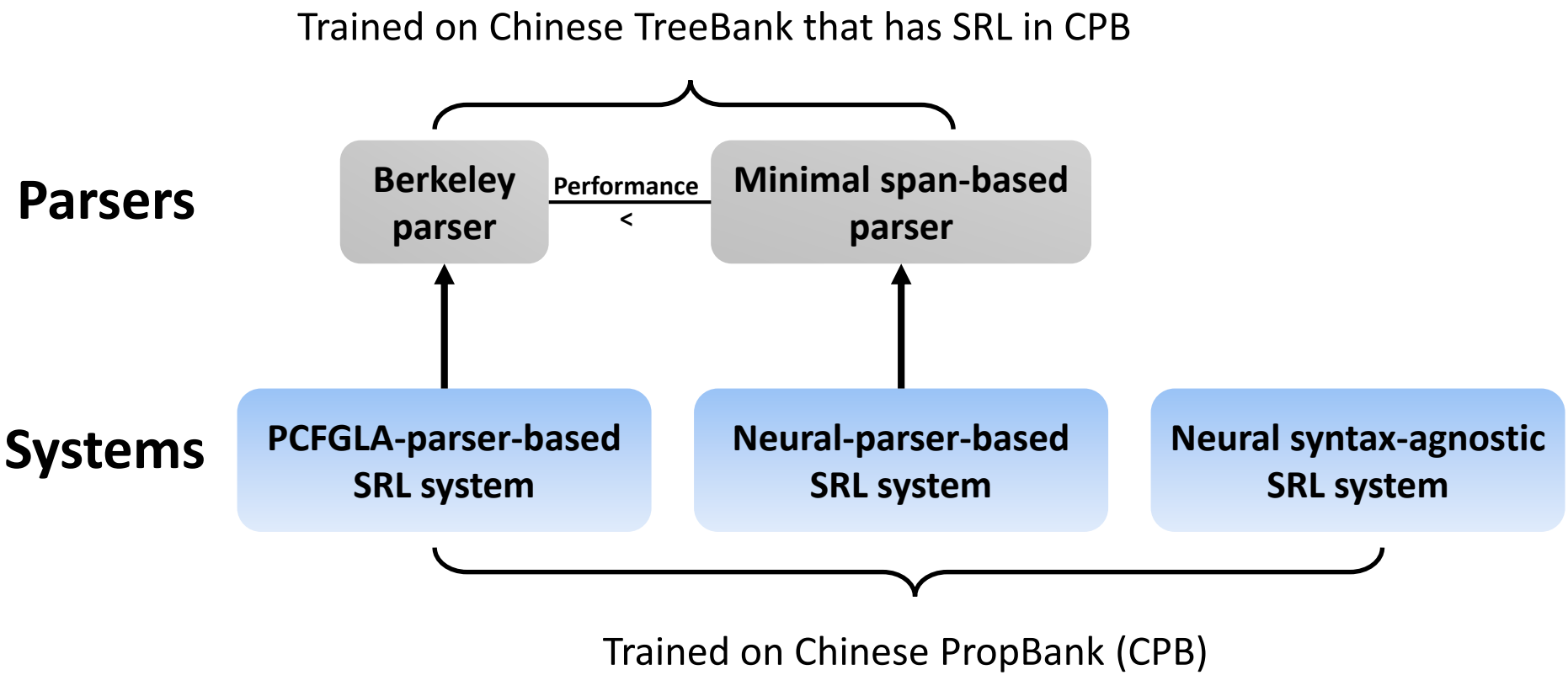


Inter-annotator agreement

- **Annotator:** two students majoring in linguistics
- **The first 50-sentence trial set:** adapting and refining the Chinese PropBank secification
- **The rest 100-sentence set:** reporting the inter-annotator agreement



Three SRL systems



Syntax-agnostic SRL

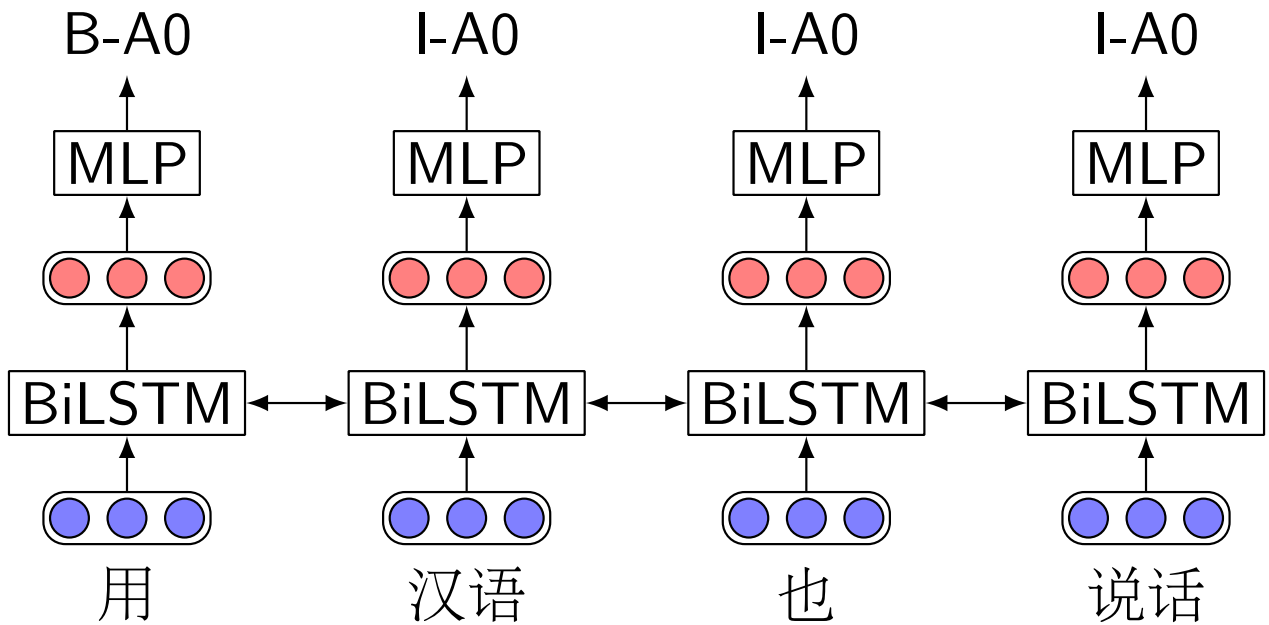
B-A0	I-A0	I-A0	I-A0	I-A0	B-AM	I-AM	I-AM	I-AM	B-AM	REL
用	汉语	也	说话	快	对	我	来	说	很	难

Syntax-agnostic SRL

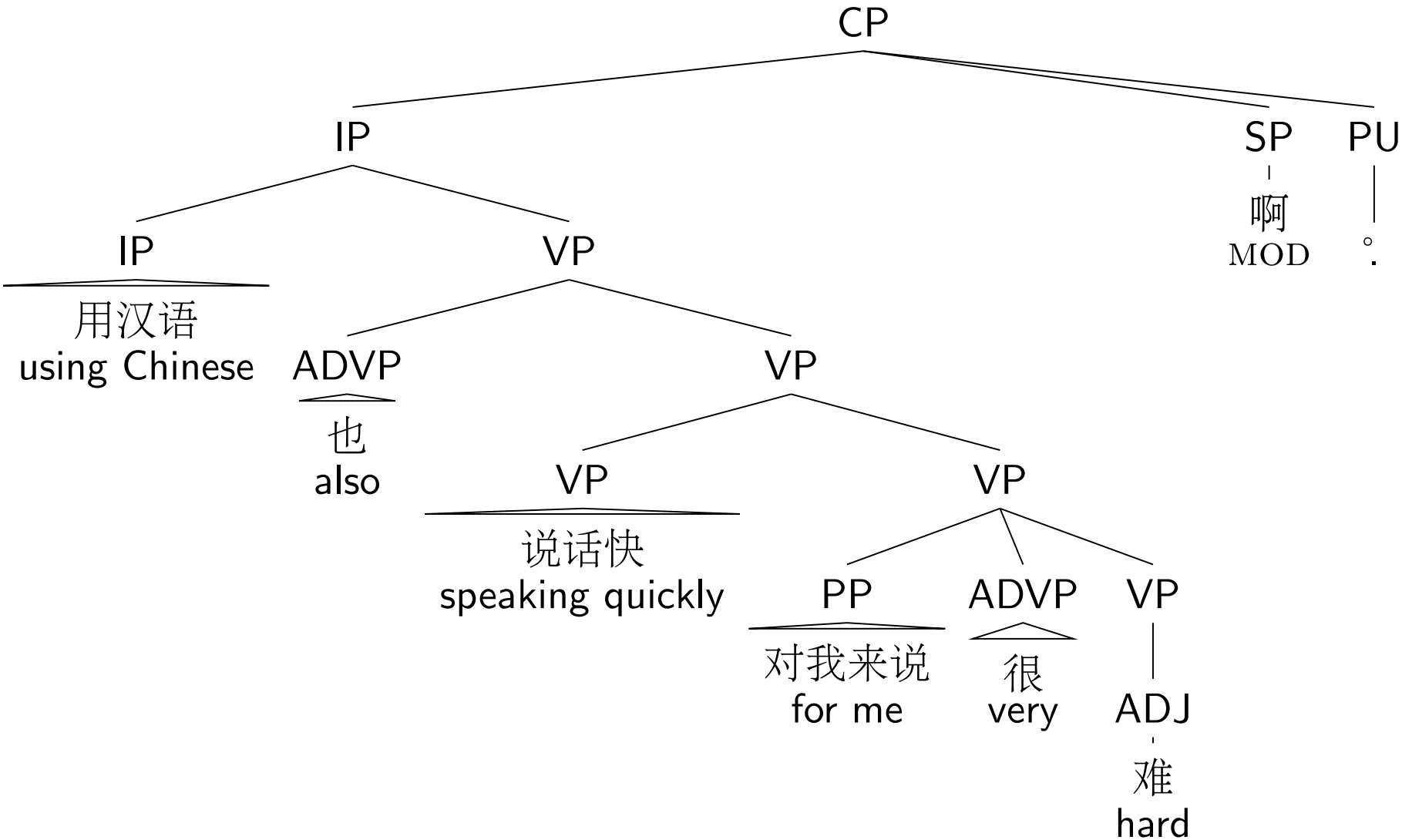
B-A0	I-A0	I-A0	I-A0	I-A0	B-AM	I-AM	I-AM	I-AM	B-AM	REL
用	汉语	也	说话	快	对	我	来	说	很	难

Syntax-agnostic SRL

B-A0	I-A0	I-A0	I-A0	I-A0	B-AM	I-AM	I-AM	I-AM	B-AM	REL
用	汉语	也	说话	快	对	我	来	说	很	难



Syntax-based SRL



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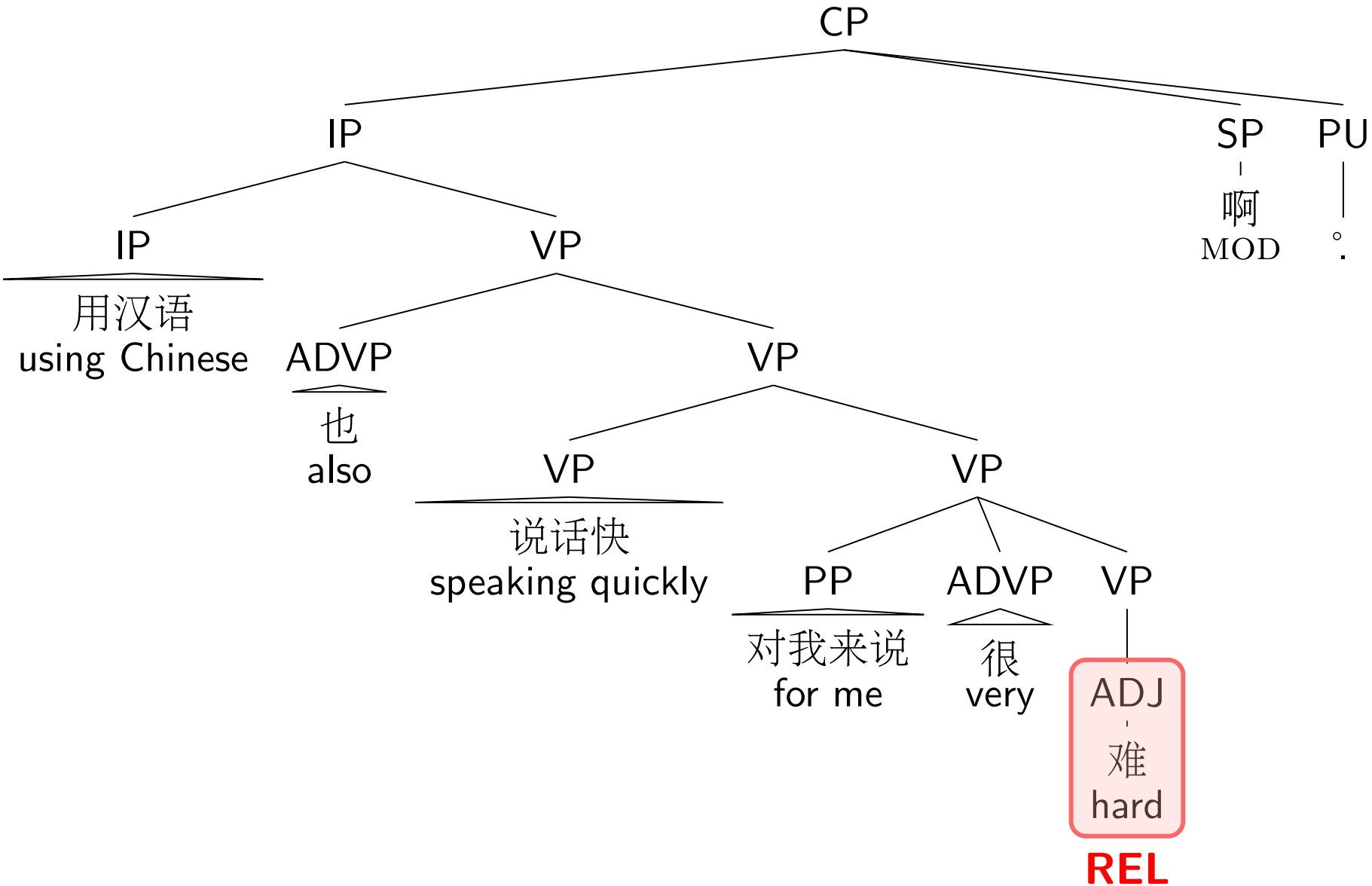
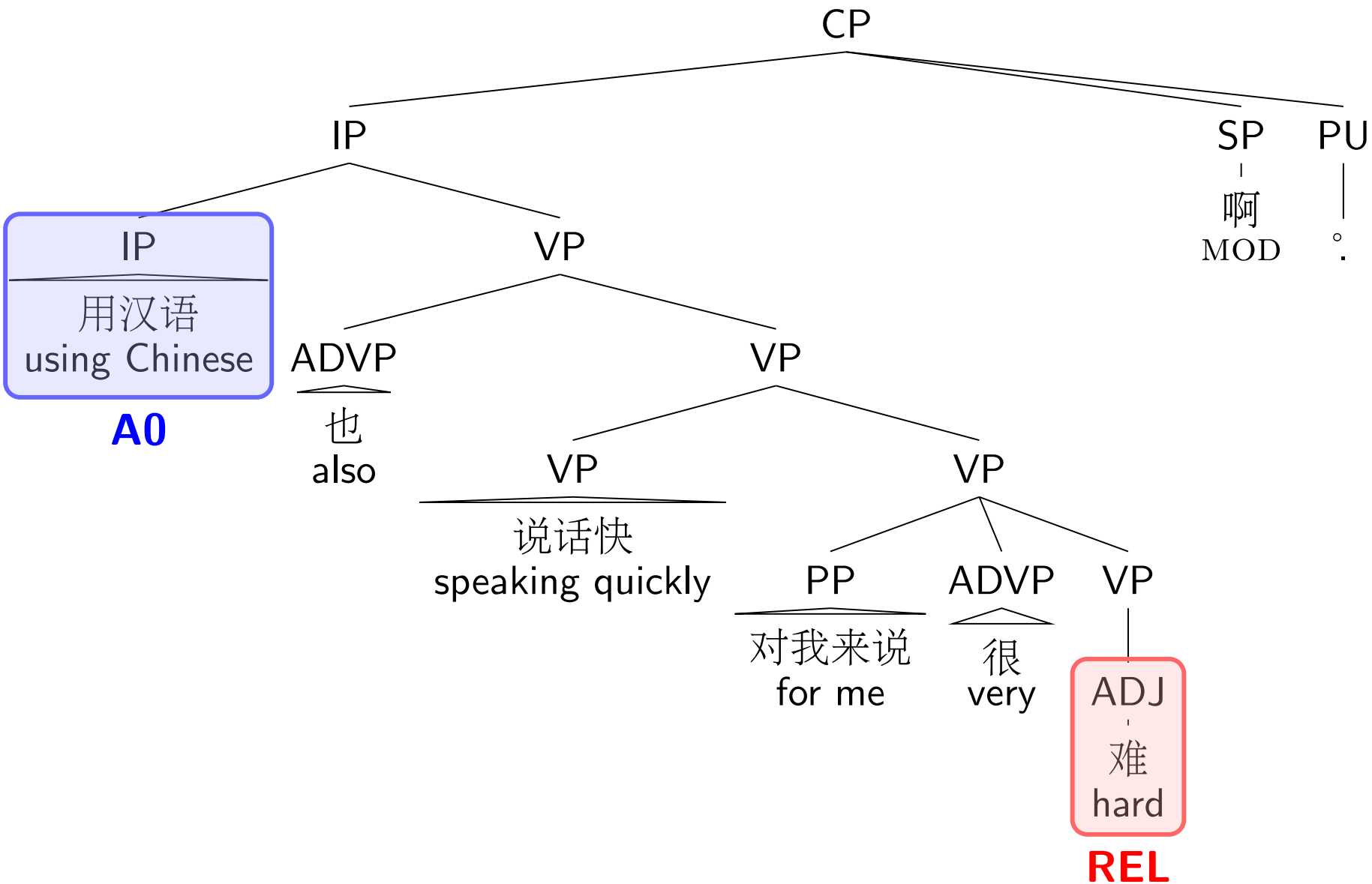


Syntax-based SRL



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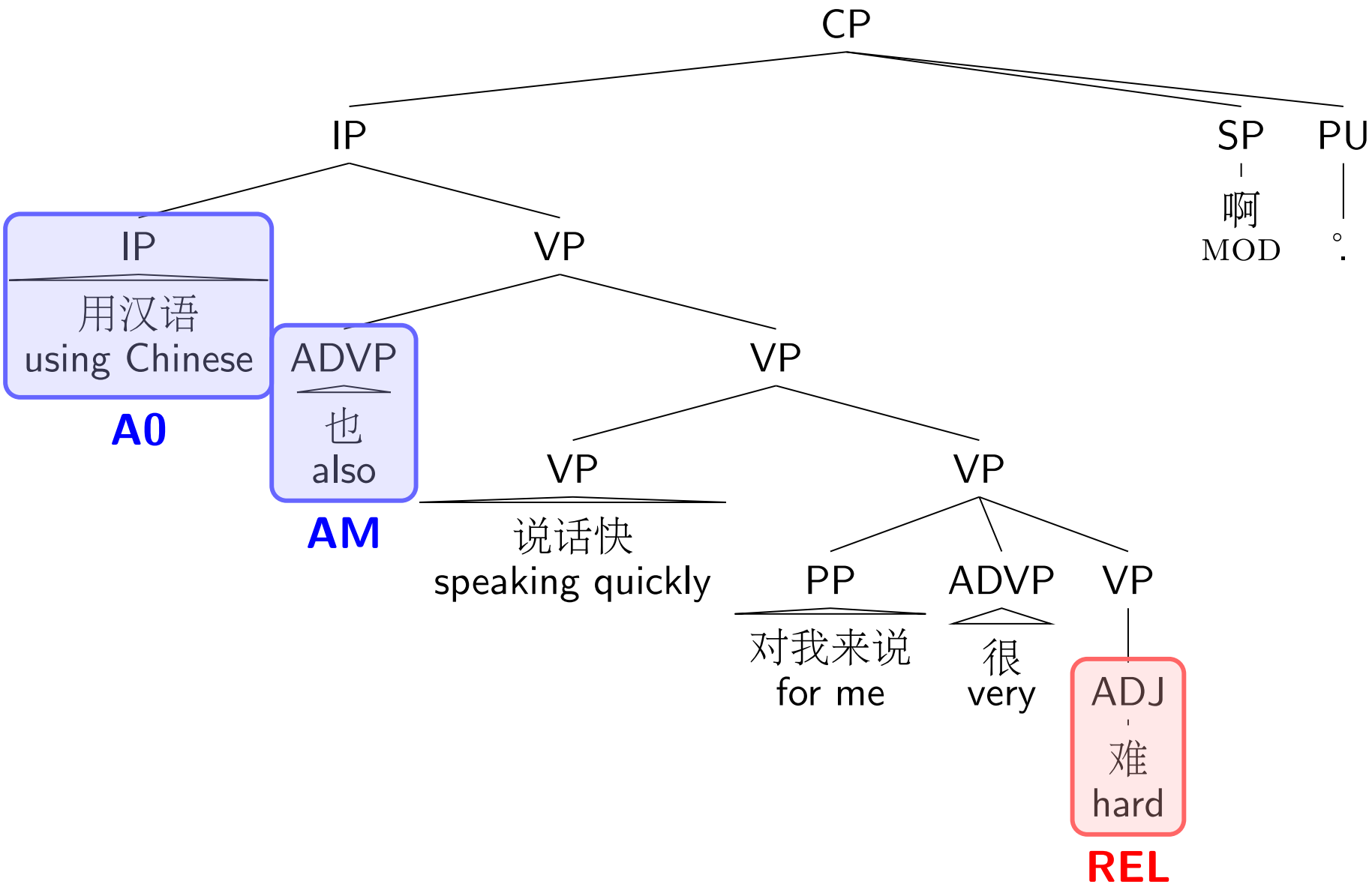

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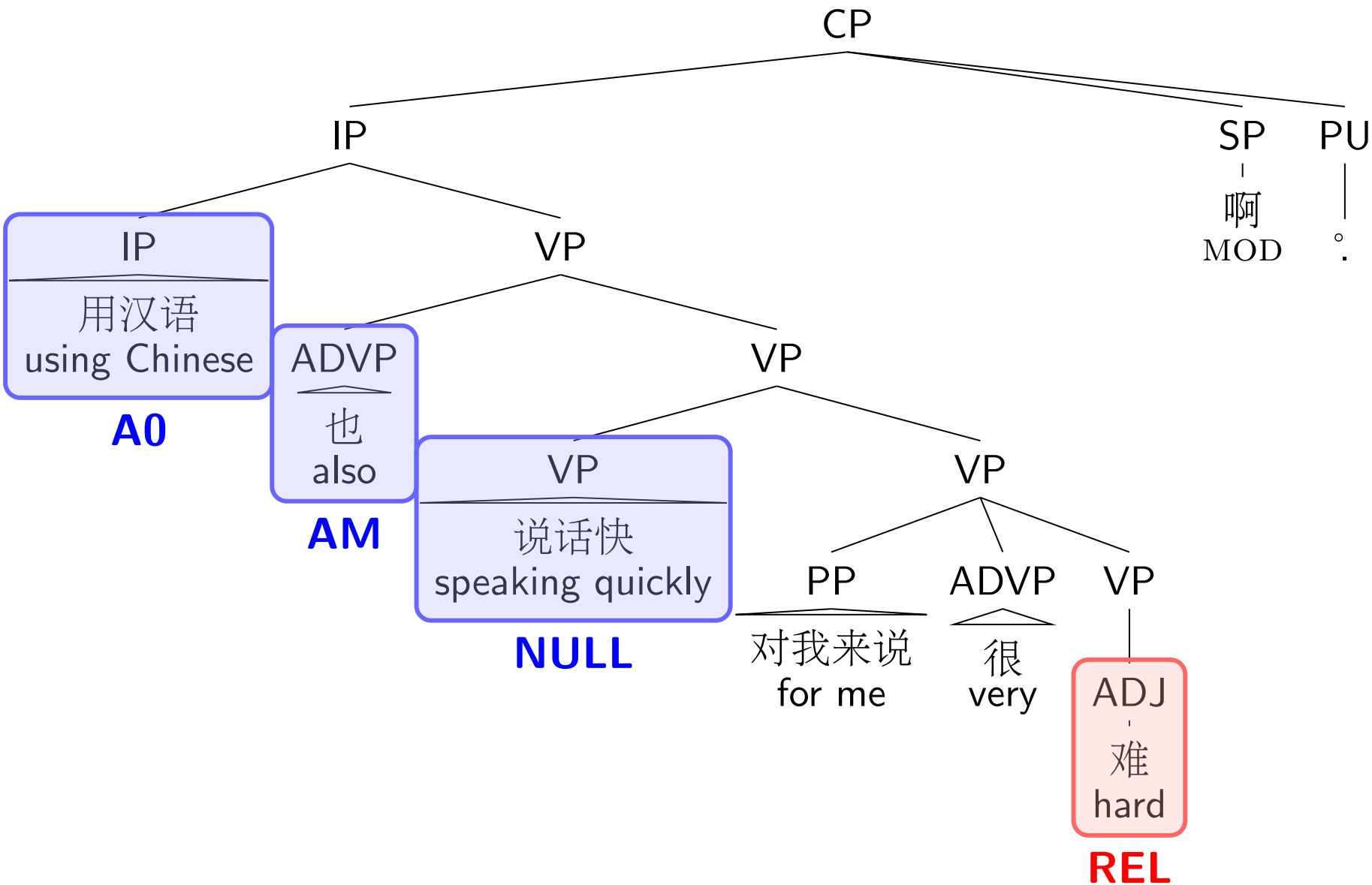

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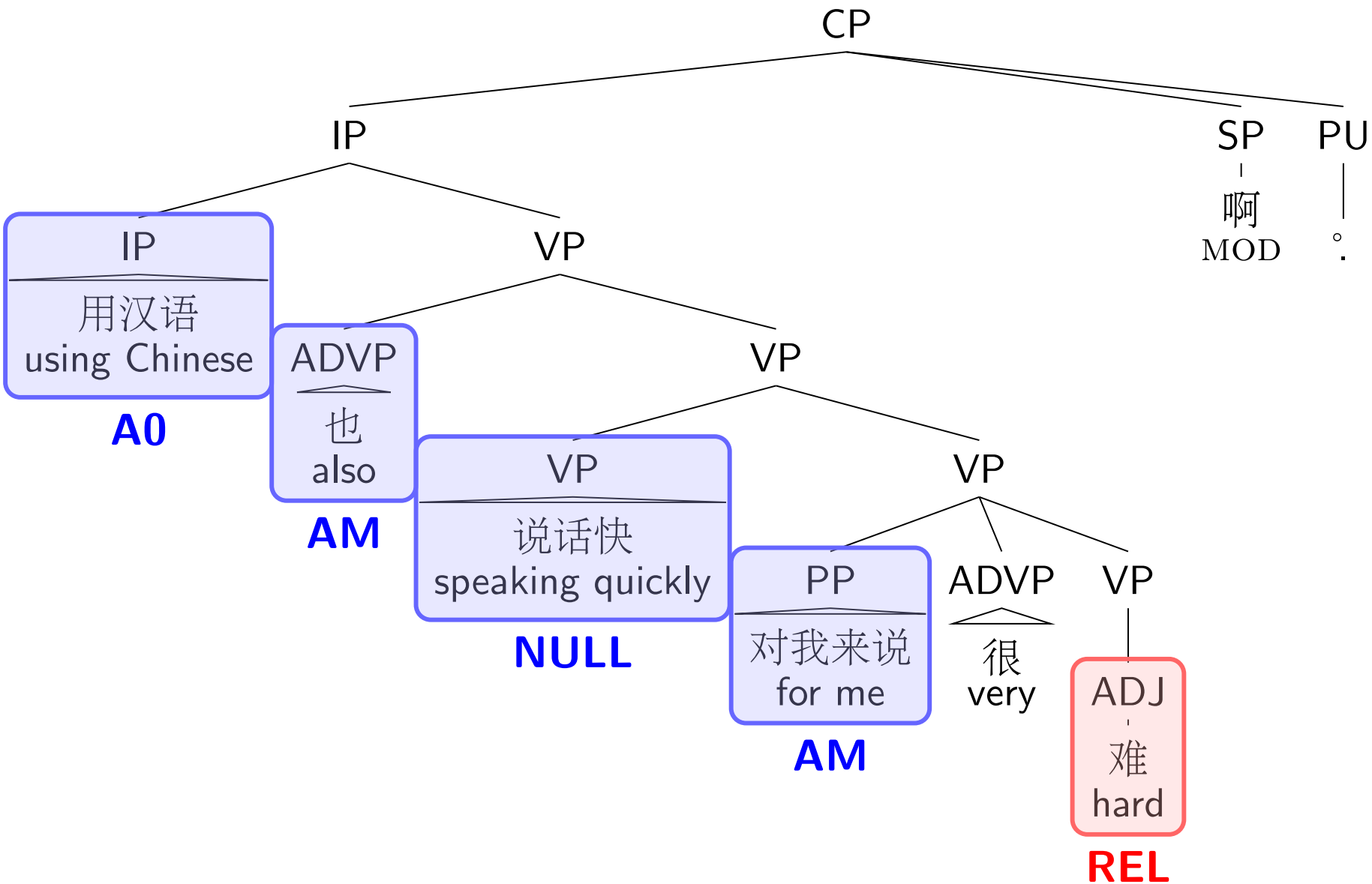

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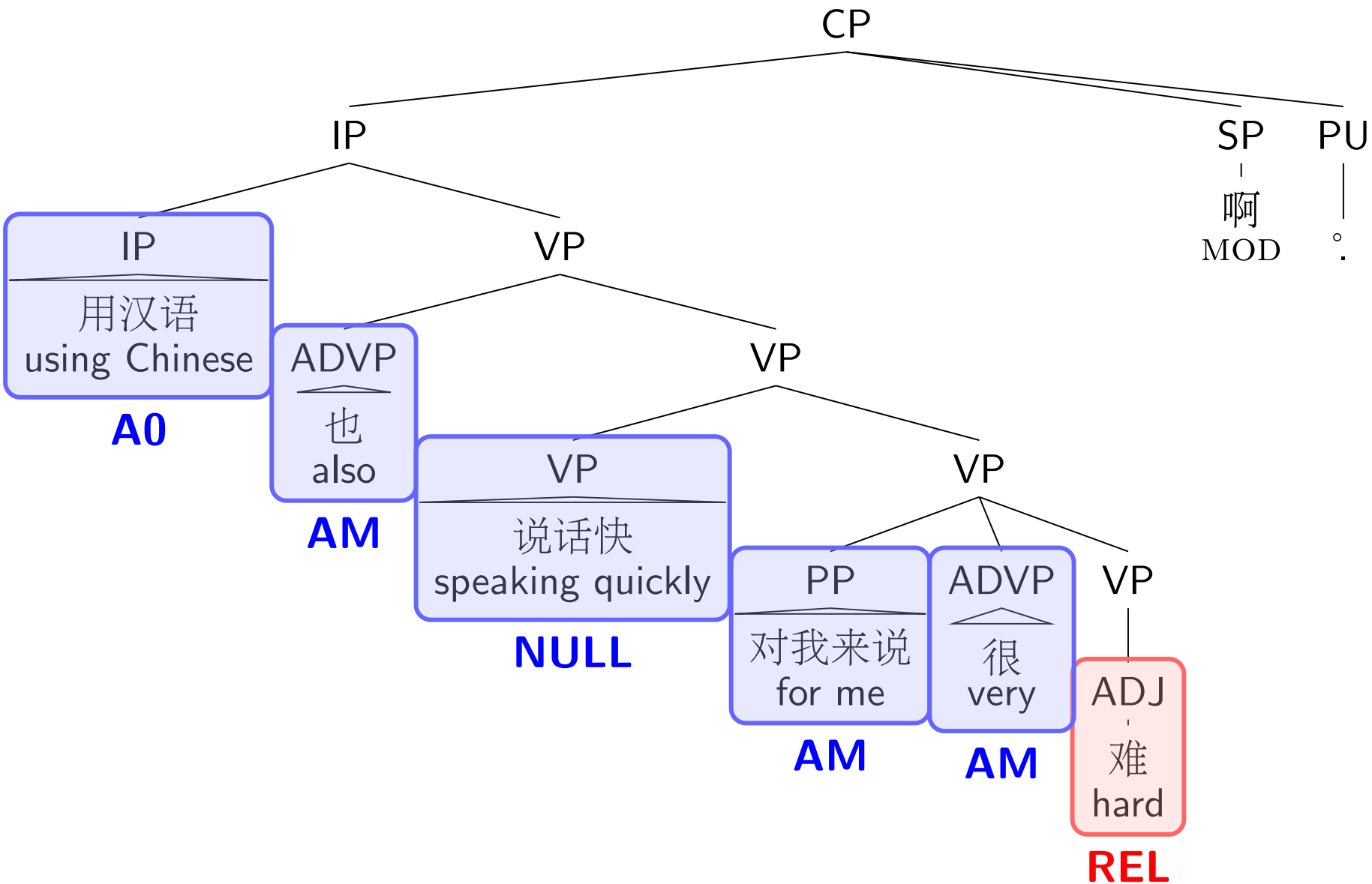
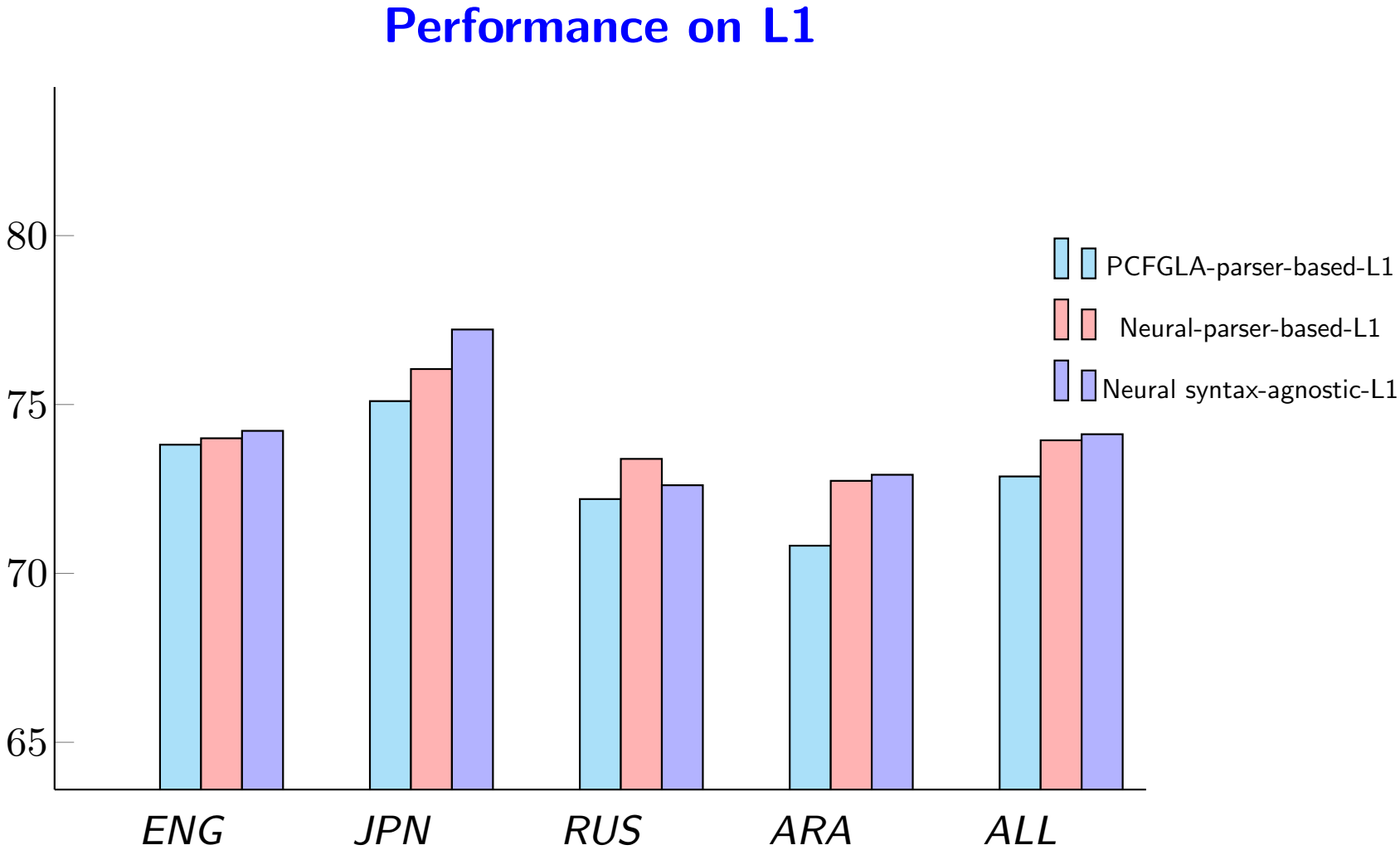
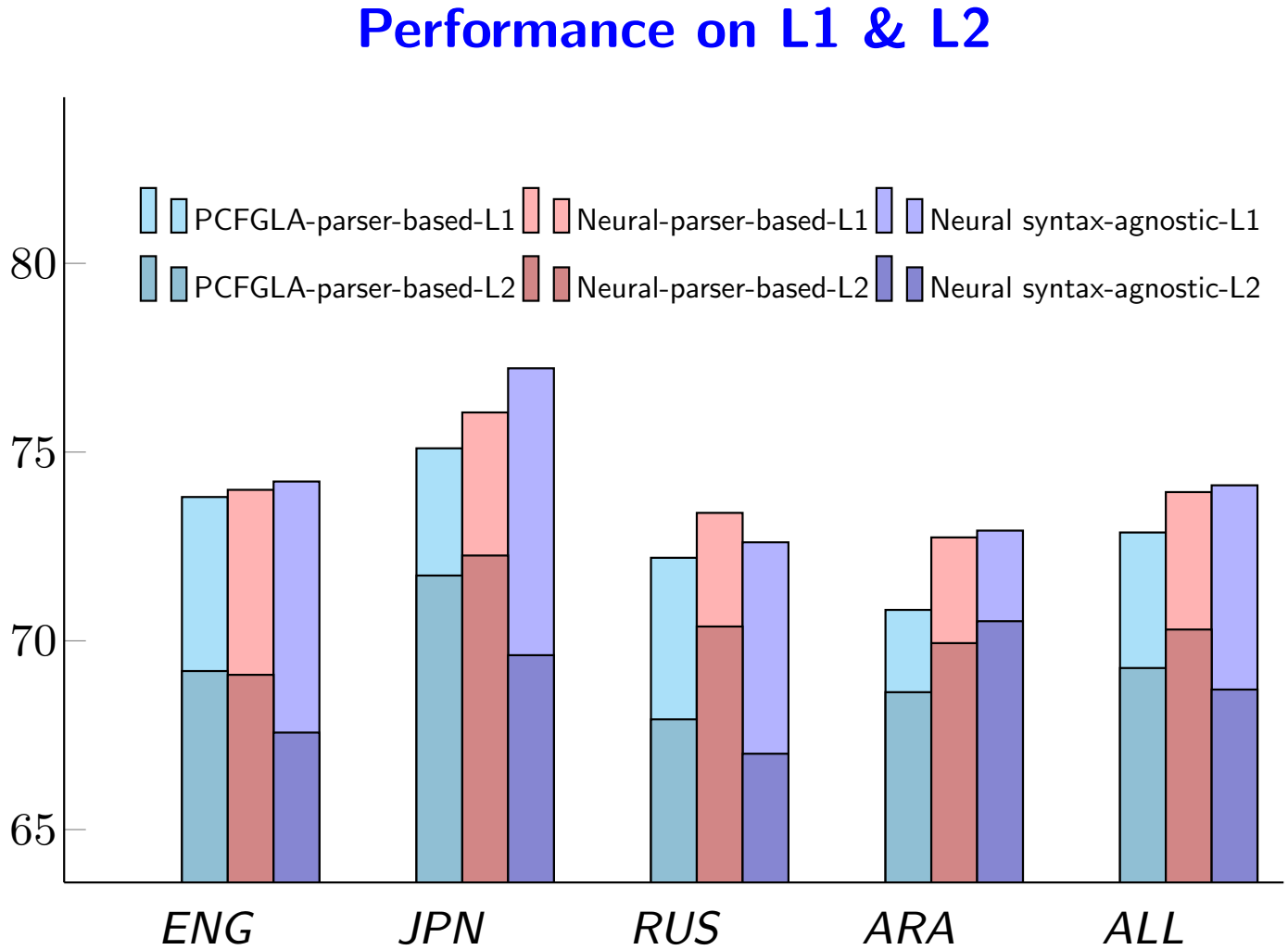


Evaluation and findings

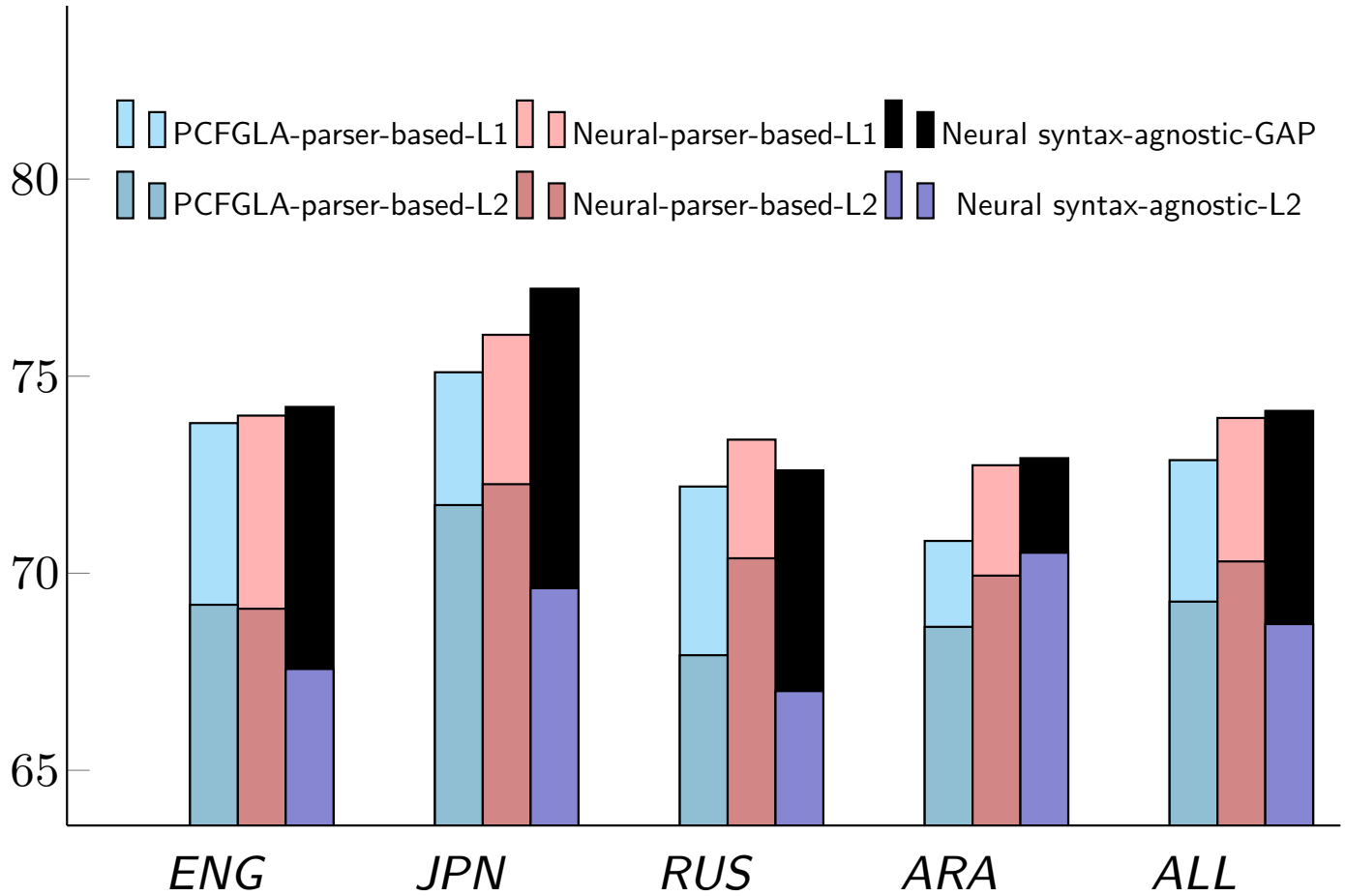


Evaluation and findings



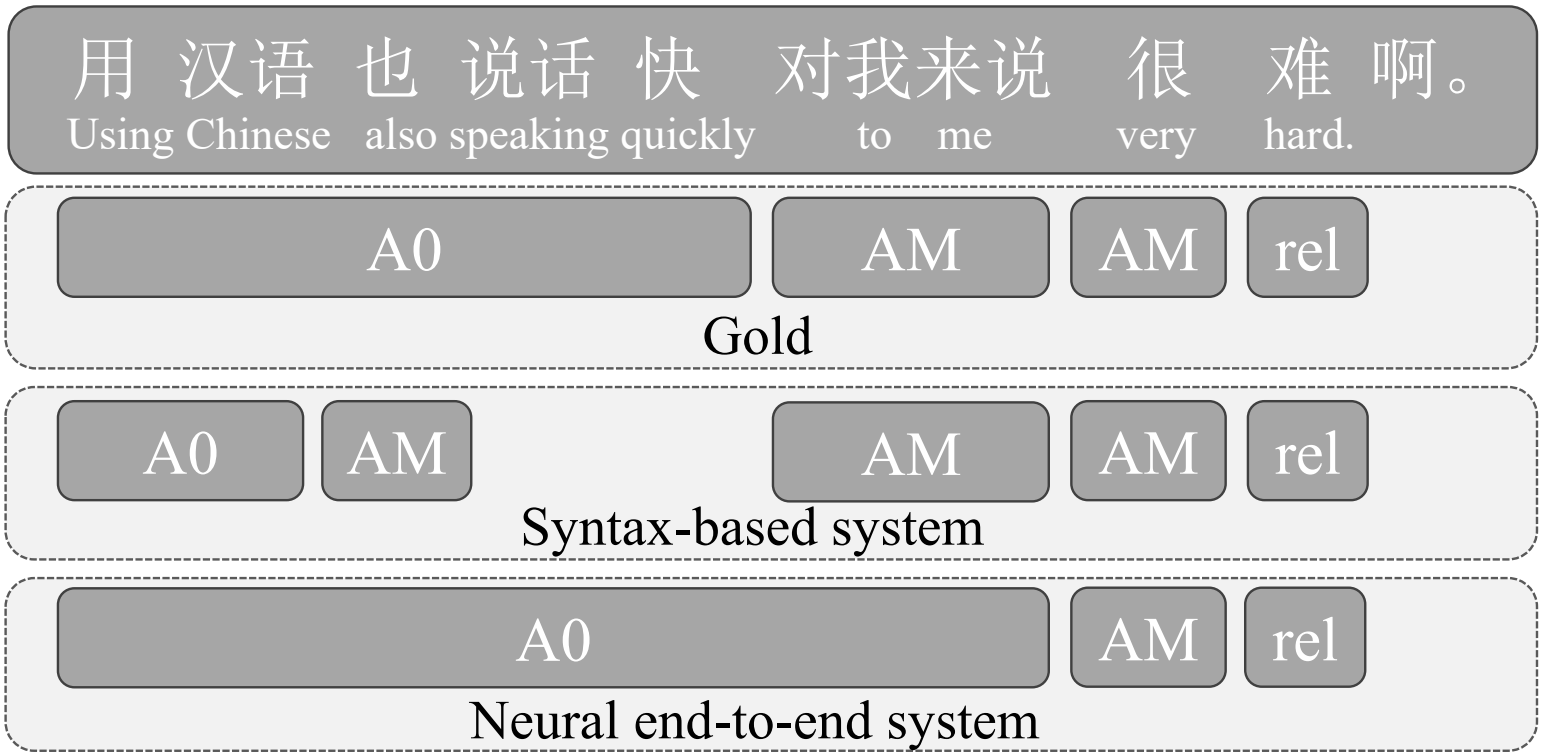
Evaluation and findings

Performance on L1 & L2



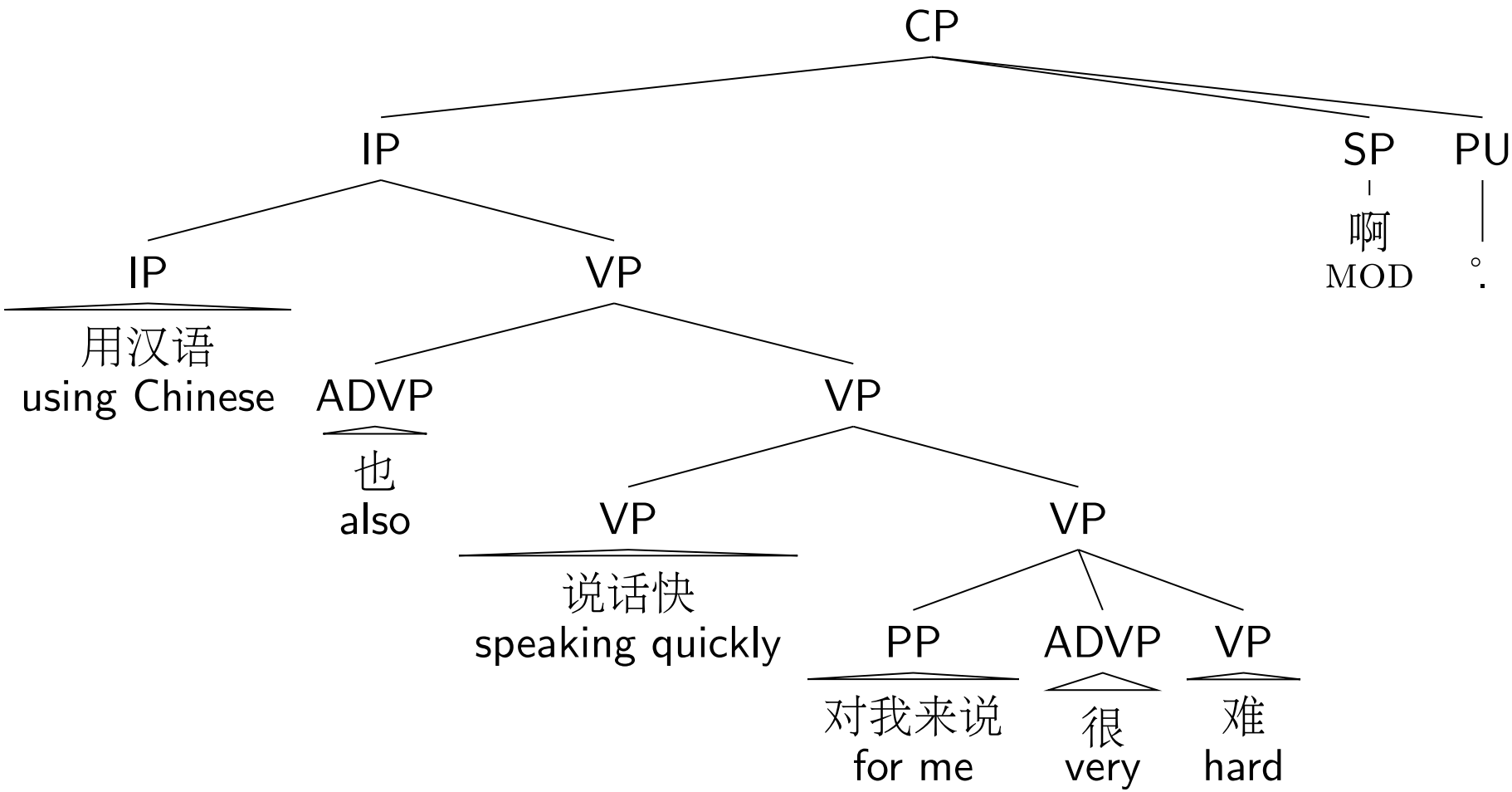
The syntax-based systems are more robust when handling learner texts.

Why syntactic analysis is important?



It is very hard for me to speak Chinese quickly.

Why syntactic analysis is important?



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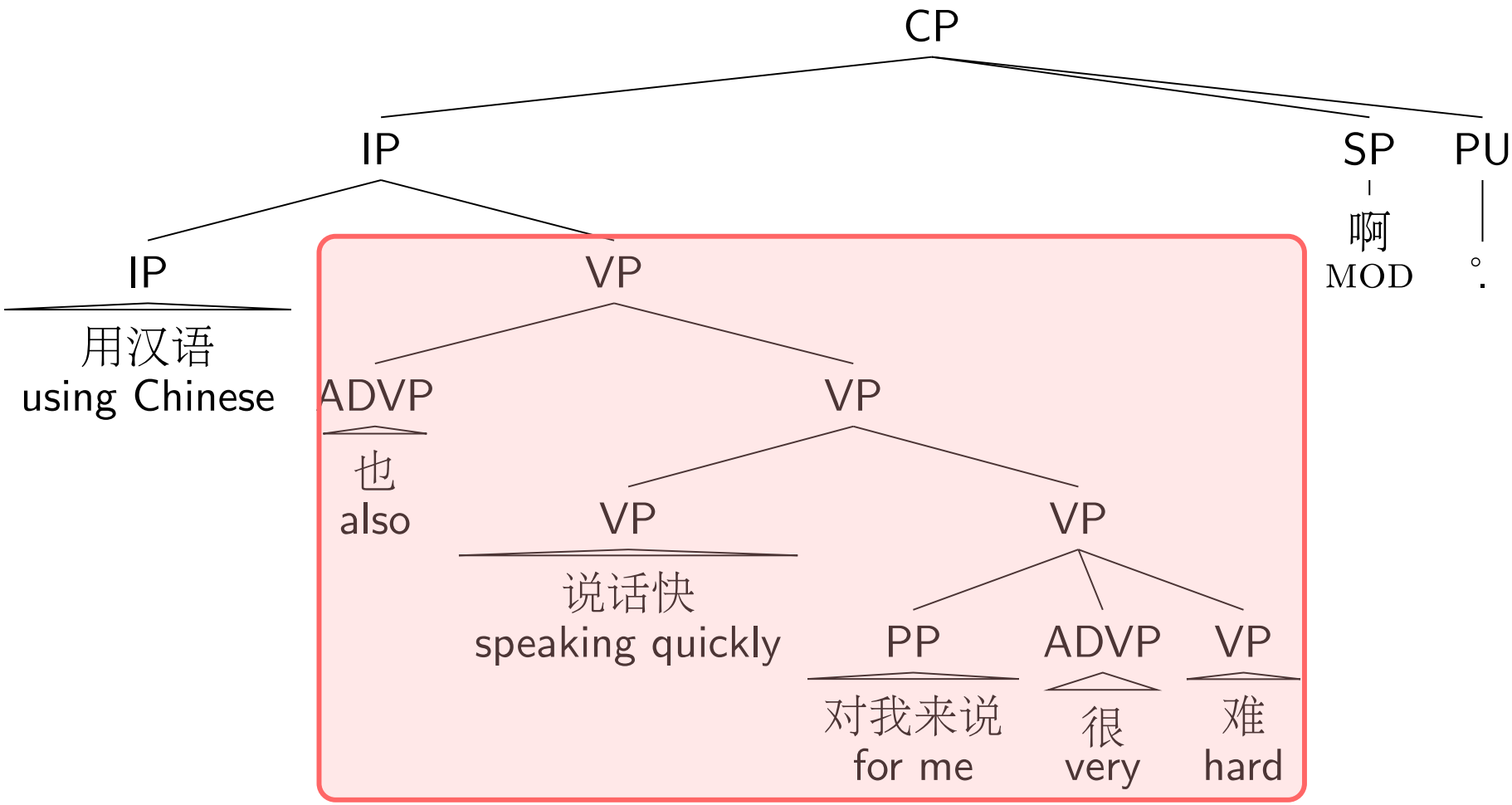
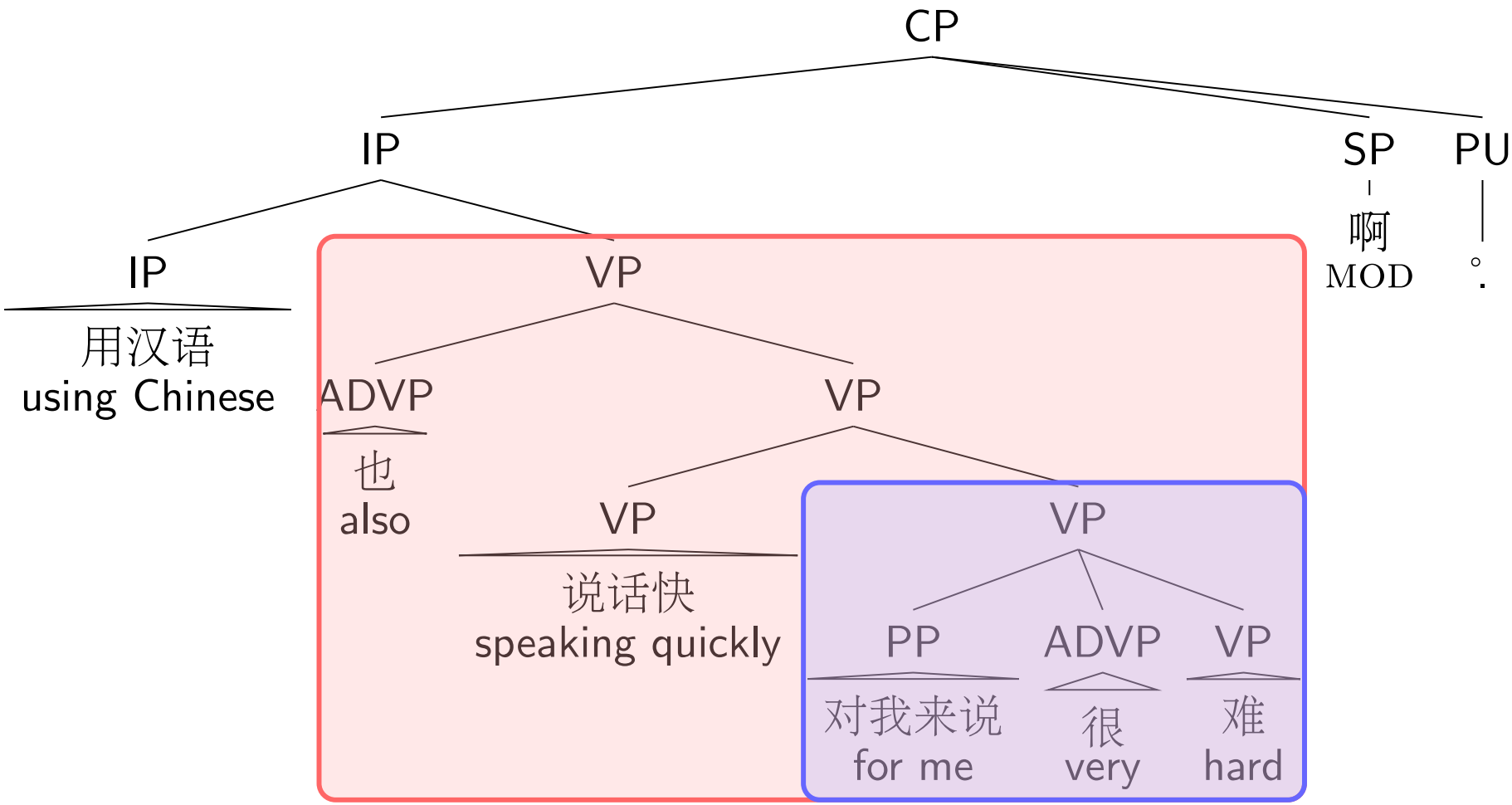


Though the whole structure is *bad*,

Why syntactic analysis is important?



Though the whole structure is *bad*, some parts may be *good*.