

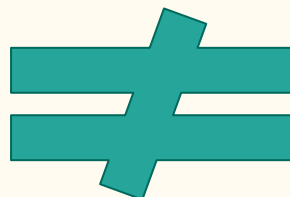
Supertagging with CCG primitives

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Motivation I: supertags are not POS

N
N/N
NP_{nb}/N
(NP\NP)/NP
((S\NP)\(S\NP))/NP
Conj
NP
PP/NP
(S\NP)\(S\NP)
((S\NP)\(S\NP))/((S\NP)\(S\NP))
(((S\NP)\(S\NP))\((S\NP)\(S\NP)))/NP
...



CC	PRP\$
CD	RB
DT	RBR
EX	RBS
FW	RP
IN	SYM
JJ	TO
JJR	UH
JJS	VB
LS	VBD
MD	VBG
NN	VCN
NNS	VBP
NNP	VBZ
NNPS	WDT
PDT	WP
POS	WP\$
PRP	WRB

Motivation II: novel categories follow same rules

$((((S_{\text{dcl}} \backslash NP) / (S_{\text{to}} \backslash NP)) / NP) / NP_{\text{expl}}$

$S_{\text{poss}} / (S_{\text{adj}} \backslash NP)$

$(S / S) / S$

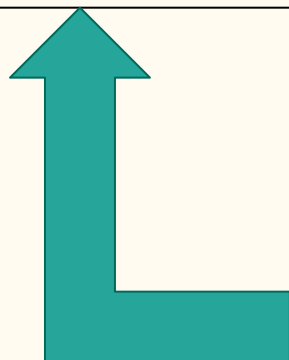
$((S_{\text{dcl}} \backslash NP_{\text{expl}}) / S) / NP$

$((NP / NP) / (NP / NP)) / (S_{\text{adj}} \backslash NP)$

$NP / (S_{\text{b}} \backslash NP)$

$(NP / NP) / NP$

$((S_{\text{dcl}} \backslash NP_{\text{expl}}) / S) / PP$



Which are novel?



Motivation III: category internals are useful

...	...
law	N
that	$(\text{NP} \backslash \text{NP}) / (\text{S}_{\text{dcl}} \backslash \text{NP})$
makes	$((\text{S}_{\text{dcl}} \backslash \text{NP}) / (\text{S}_{\text{to}} \backslash \text{NP})) / \text{NP} / \text{NP}_{\text{expl}}$
it	NP_{expl}
a	$\text{NP}_{\text{nb}} / \text{N}$
crime	N
...	...

Motivation III: category internals are useful

...	...
law	N
that	$(NP \backslash NP) / (S_{\text{dcl}} \backslash NP)$
makes	$((S_{\text{dcl}} \backslash NP) / (S_{\text{to}} \backslash NP)) / NP / NP_{\text{expl}}$
it	NP_{expl}
a	NP_{nb} / N
crime	N
...	...

Motivation III: category internals are useful

...	...
law	N
that	$(NP \backslash NP) / (S_{\text{dcl}} \backslash NP)$
makes	$((((S_{\text{dcl}} \backslash NP) / (S_{\text{to}} \backslash NP)) / NP) / NP_{\text{expl}})$
it	NP_{expl}
a	NP_{nb} / N
crime	N
...	...

Category \rightarrow primitive linearization

$(S_{\text{dcl}} \backslash \text{NP}) / \text{NP}$



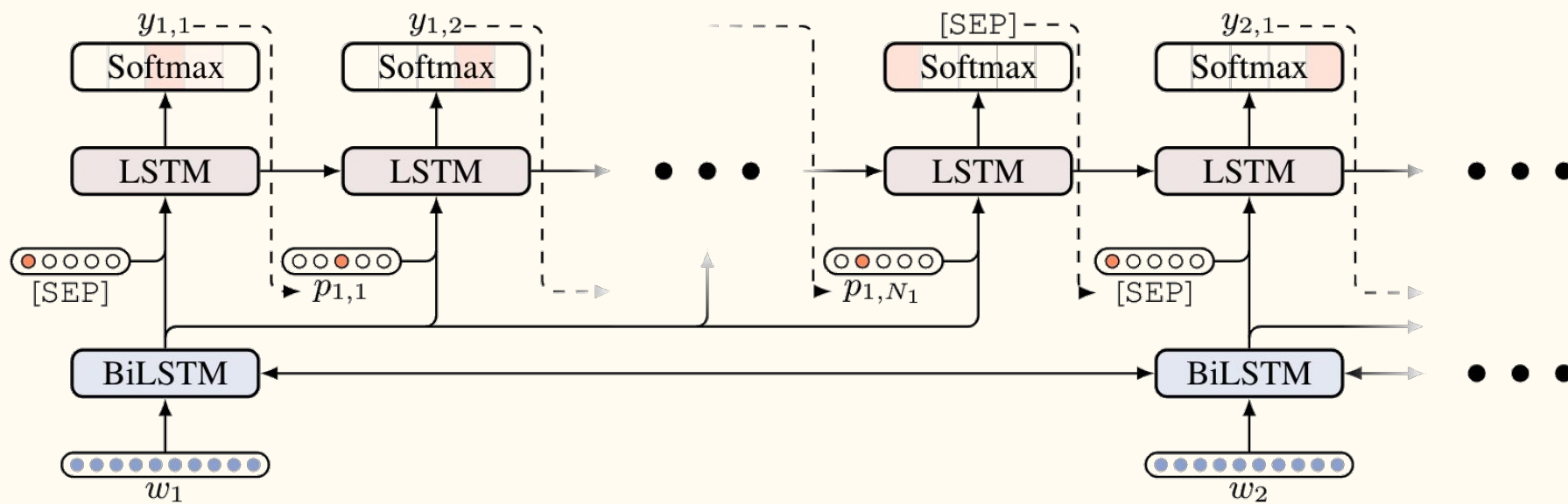
(S_{dcl}	\	NP)	/	NP
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$((S \backslash \text{NP}) \backslash (S \backslash \text{NP})) / \text{NP}$



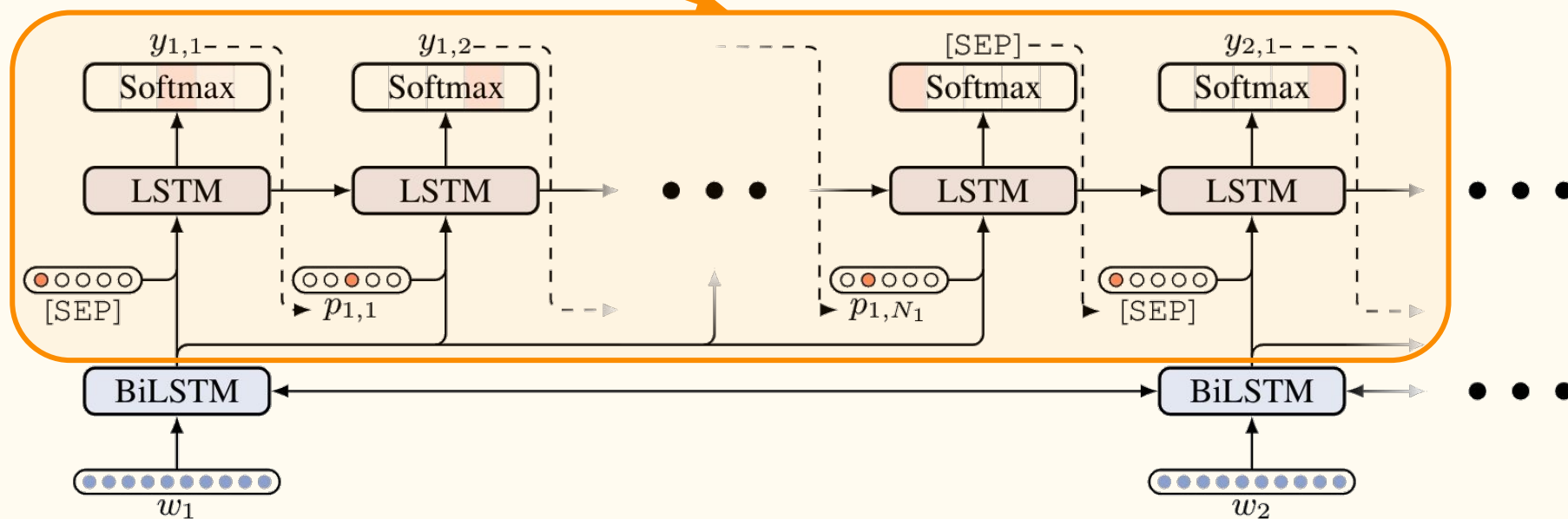
((S	\	NP)	\	(S	\	NP))	/	NP
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CCG primitive decoder model



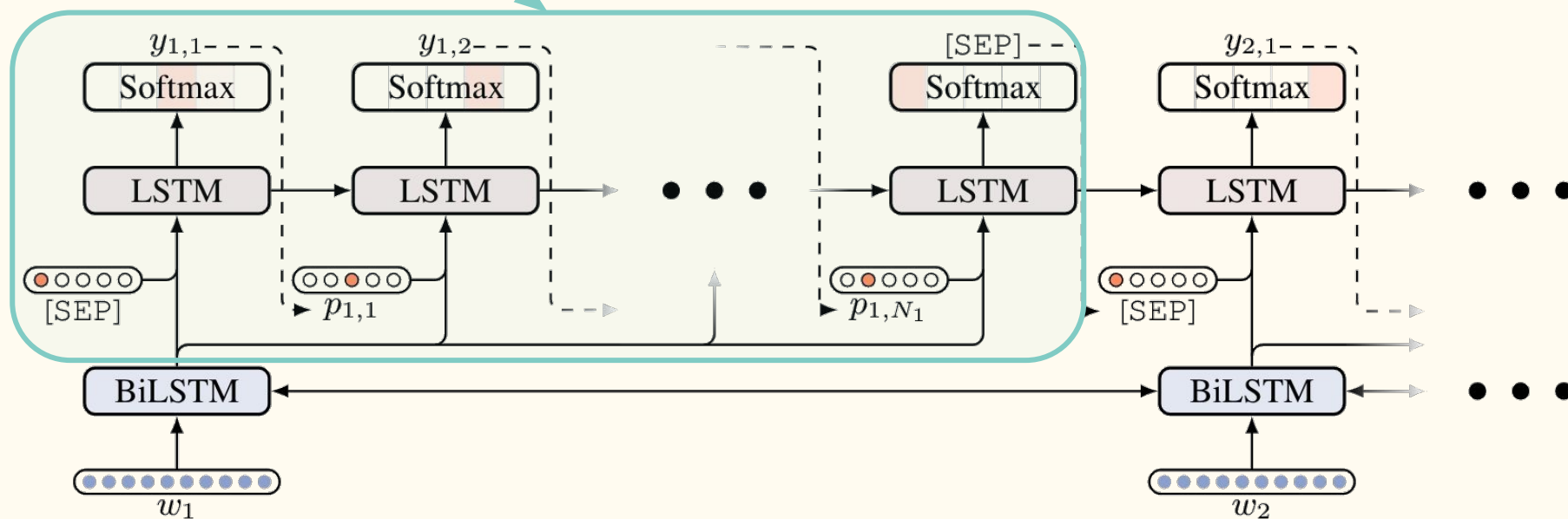
CCG primitive decoder model

Replaces n softmax layers



CCG primitive decoder model

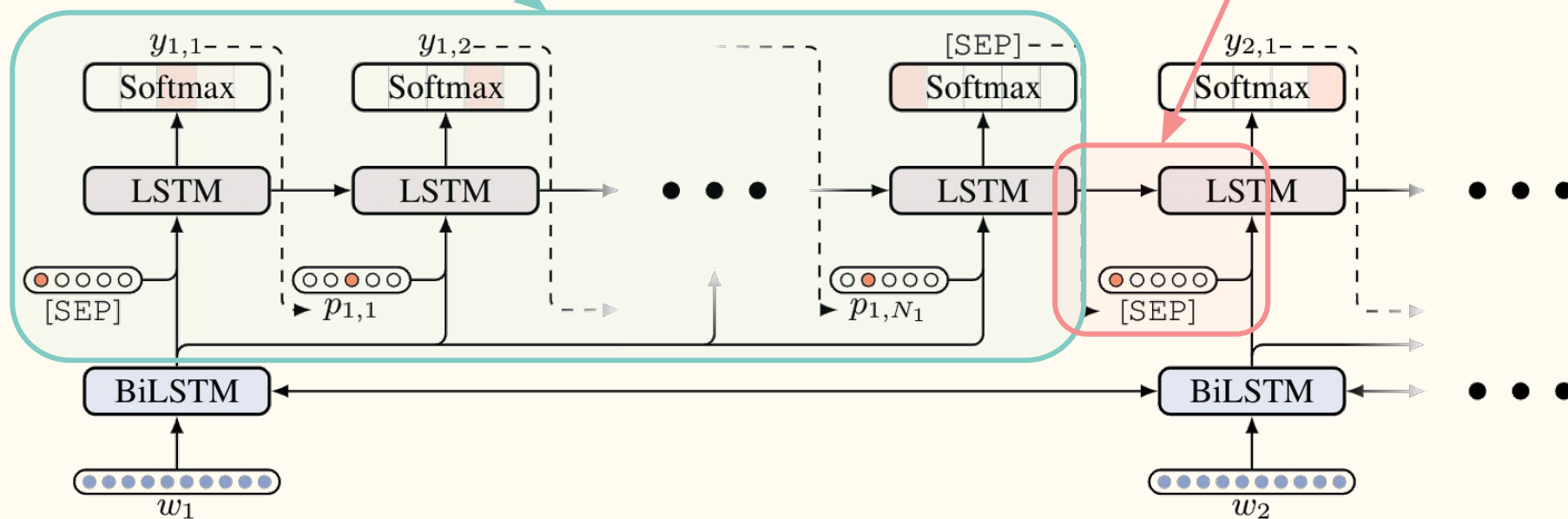
Primitive generation (+Prim)



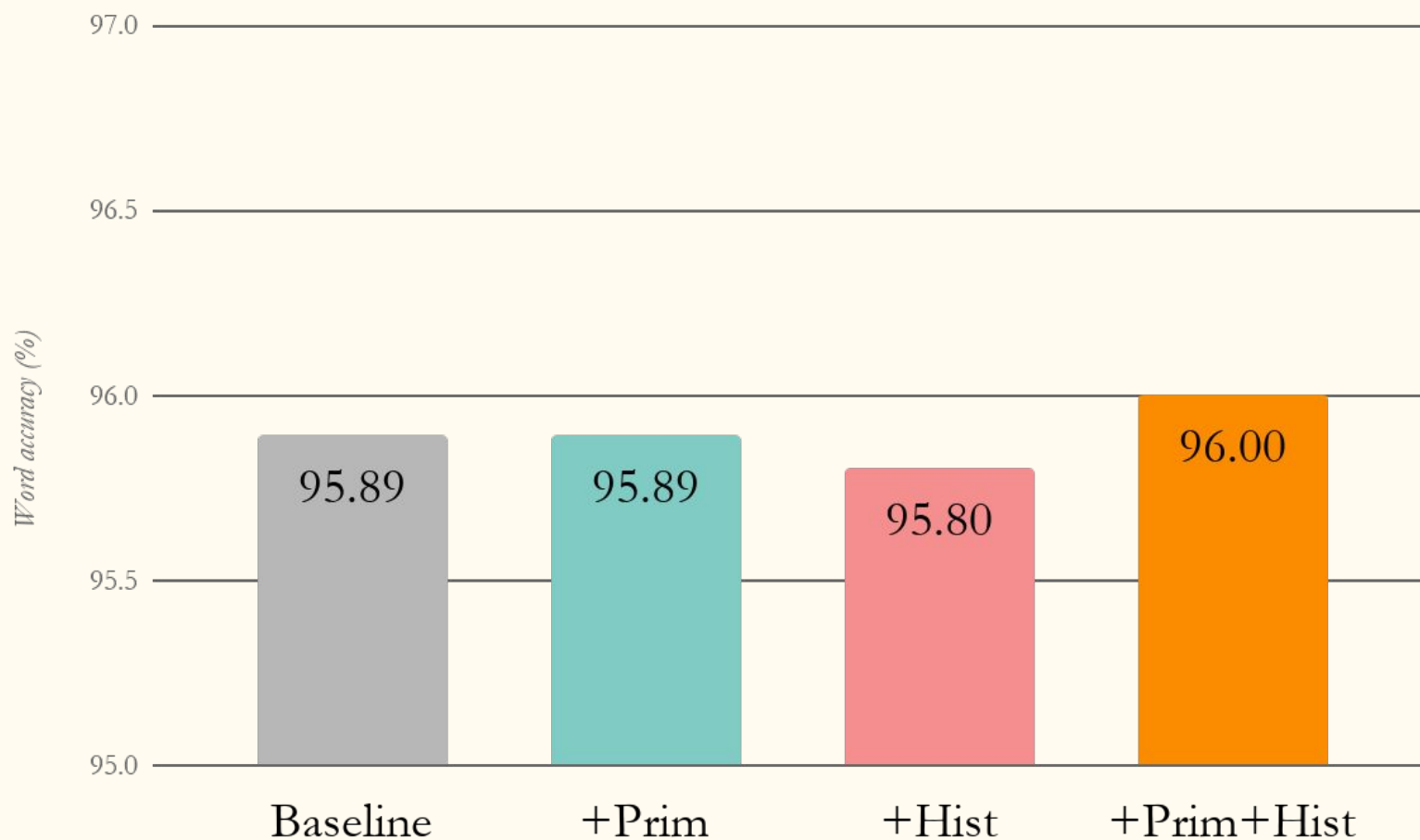
CCG primitive decoder model

Primitive generation (+Prim)

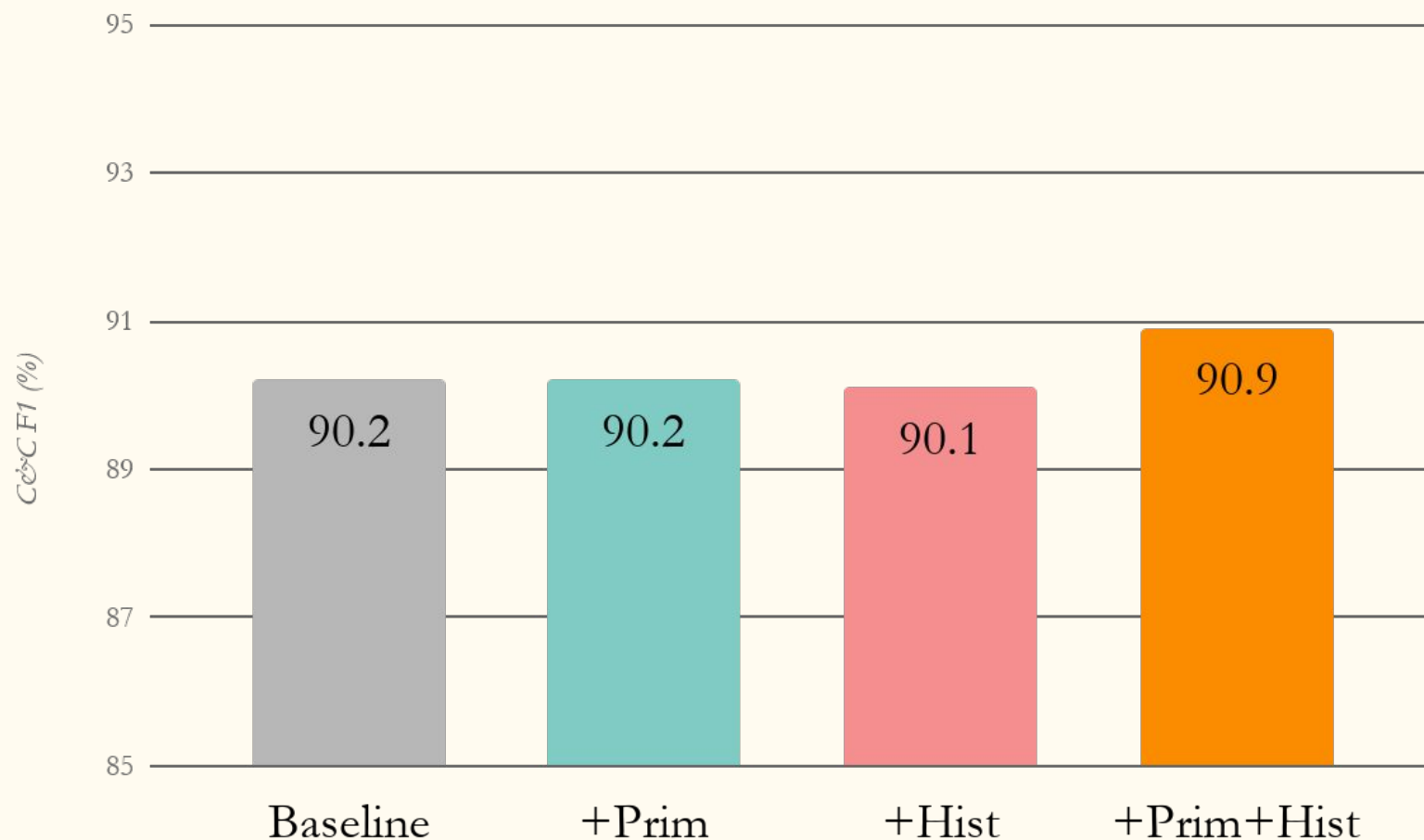
Prediction history between words (+Hist)



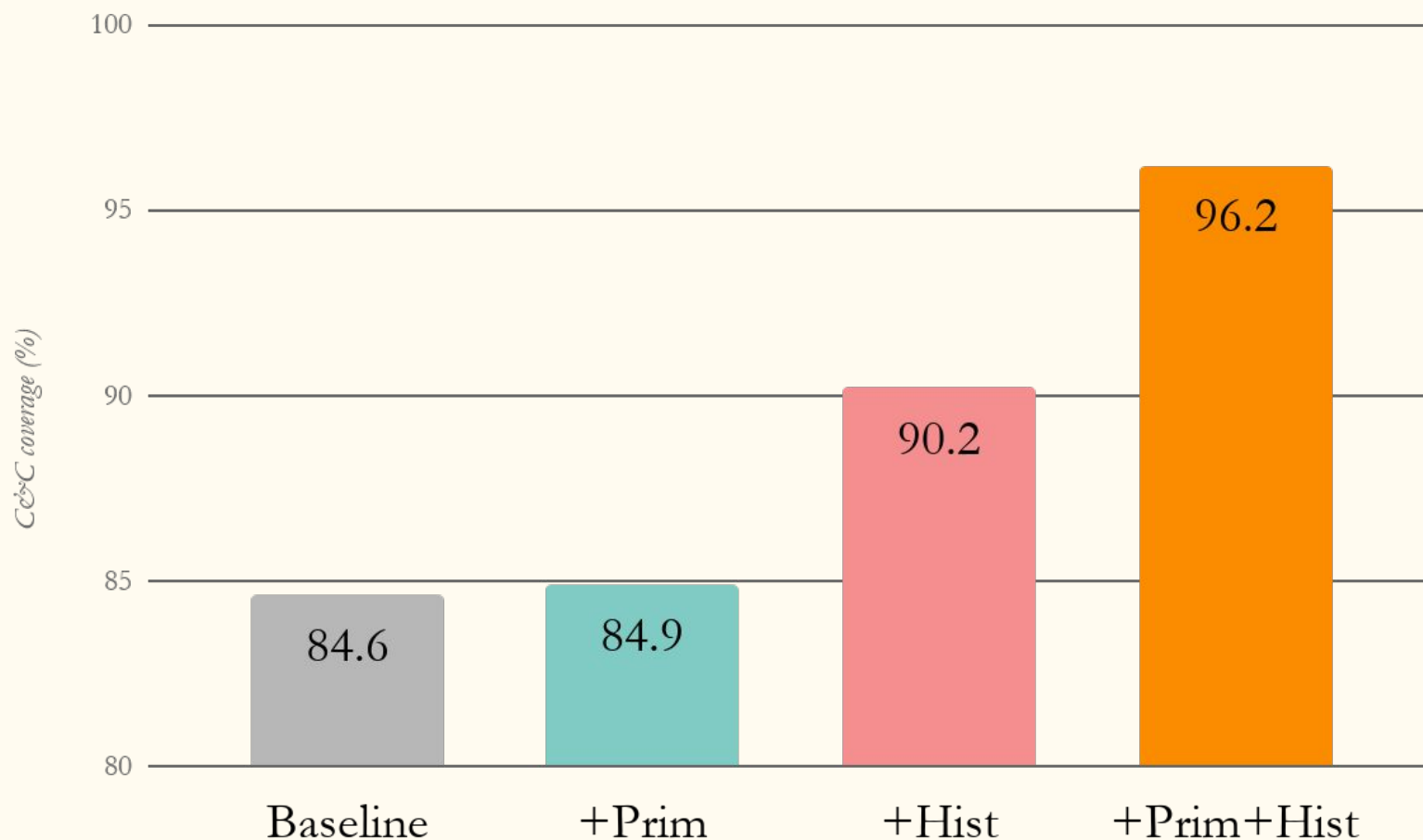
Results: word accuracy



Results: C&C dependency F_1



Results: C&C coverage



Results: novel category accuracy

- 5% of words with novel (OOV) categories had correct category
- **First CCG supertagger to be able to do this**

Summary

- Worthwhile to view CCG supertags as complex units
- Our model outperforms baseline, especially on parser coverage
- Possible to generate novel categories

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