



Experimental explorations of a discrimination learning approach to language processing

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Discrimination learning

- Discrimination learning approach to language processing
- Based on the Rescorla-Wagner equations (Rescorla & Wagner, 1972)



Experimental explorations

- Three applications:
 - Reaction times in reading aloud
 - Eye fixation patterns in compound reading
 - ERP signal in primed picture naming

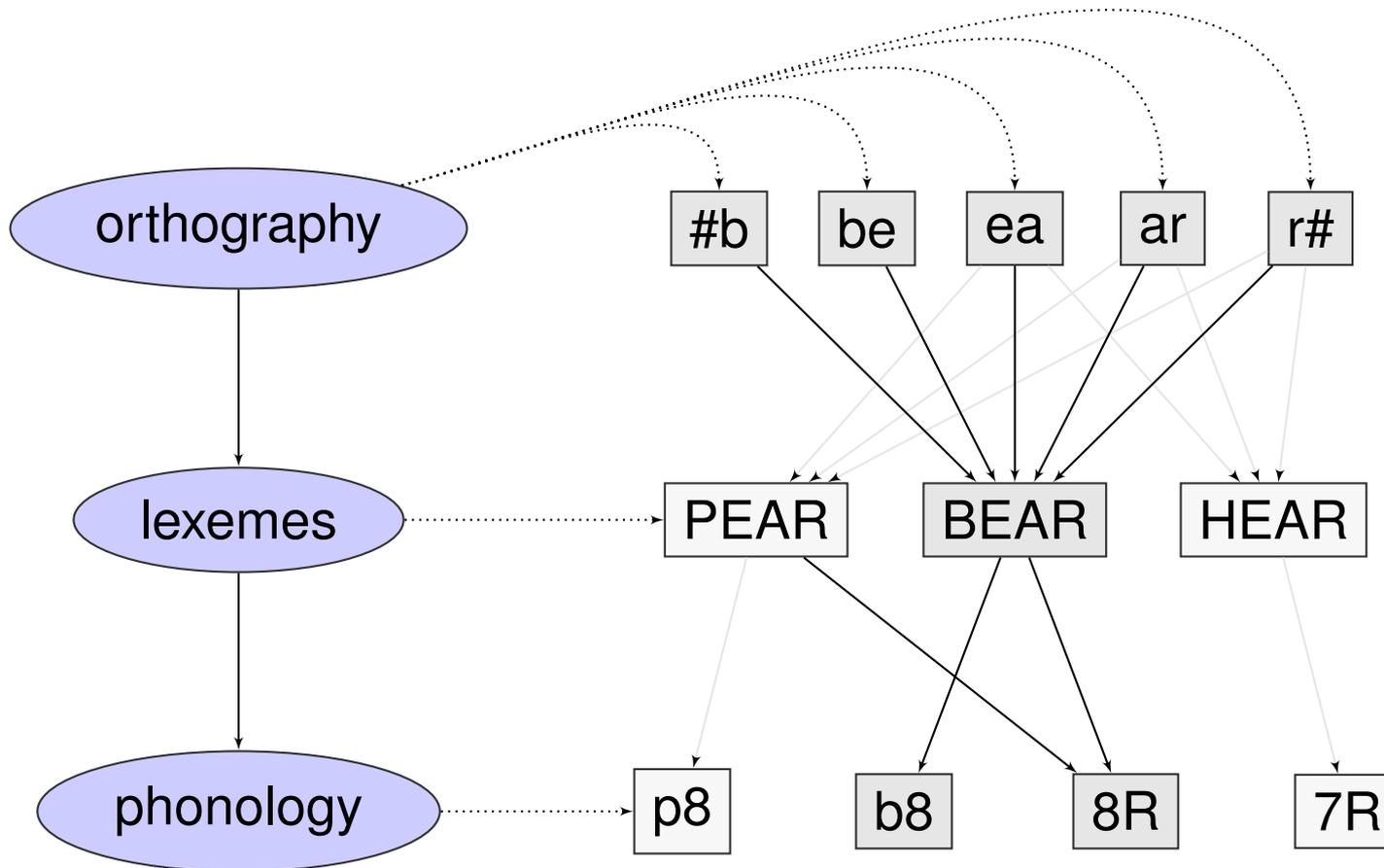


Reaction times in reading aloud

- Existing models of reading aloud are dual-route models
- Do we really need two routes?
- Propose a discrimination learning model with a single lexical route

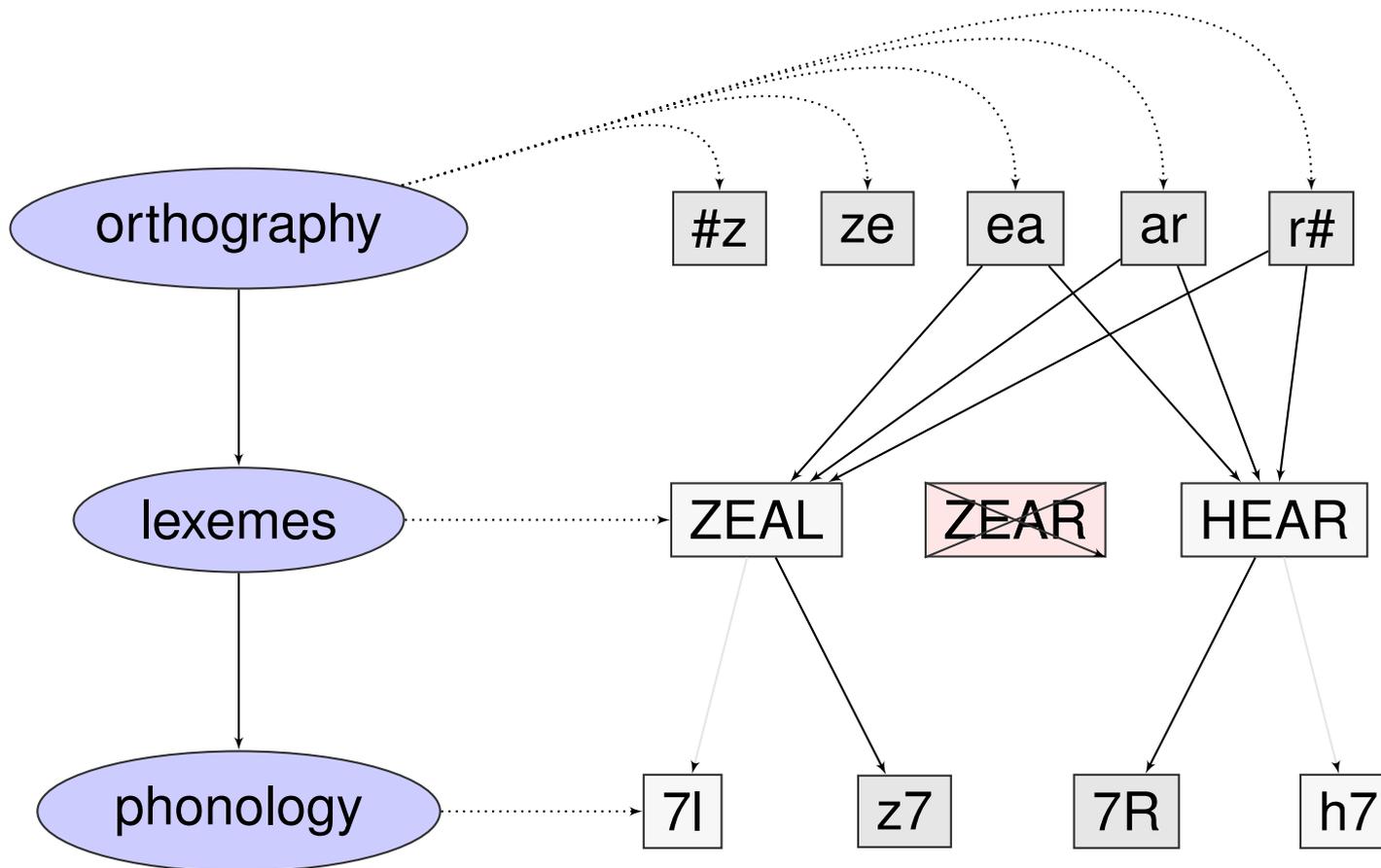


Reaction times in reading aloud





Reaction times in reading aloud





Reaction times in reading aloud

- Overall performance slightly better than performance of a state-of-the-art dual-route model
- Captures a wide range effects for both words and non-words
- Adding a sub-lexical route does not improve the performance of the model



Eye fixation patterns in compound reading

Edmonton-Tübingen eye-tracking corpus
(ET corpus)



Eye fixation patterns in compound reading

- Fixations on noun-noun compounds
- Two analyses:
 - lexical predictors
 - discrimination learning measures



Eye fixation patterns in compound reading

- Single fixation duration: bottom-up support for all lexico-semantic information associated with a compound given all orthographic features of that compound
- First-and-only fixation duration: bottom-up support for modifier lexeme given first orthographic trigram of compound
- Additional fixations are a consequence of insufficient information during first fixation



Eye fixation patterns in compound reading

- Lexical predictors: compound frequency effect for both single and second fixations
- Discrimination learning:
 - single fixations: bottom-up support
 - second fixations: top-down knowledge about out-of-context probability



ERP signal in primed picture naming

- Primed picture naming experiment
- Primes: preposition + definite article (e.g. “on the”, “into the”)
- Targets: photographs of nouns (e.g.; “strawberry”, “onion”)



ERP signal in primed picture naming

- Analyze data using generalized additive mixed effect models (GAMMS)
- Two analyses:
 - lexical predictors
 - discrimination learning measures



ERP signal in primed picture naming

- Predictive power of discrimination learning measures is at least as good as that of lexical predictors
- Discrimination learning measures capture non-linear effects of preposition frequency and target noun frequency
- Discrimination learning does not (fully) capture effect of phrase frequency



Conclusions

- Discrimination learning measures provide excellent explanatory power
- Discrimination learning approach leads to new insights into language processing



Conclusions

- What's next?
 - Moving beyond the lexical level
 - Auditory perception
 - Second language learning
 - ...