# Exemplar-Modelling Vowel Harmony with Recurrent Neural Networks: Literature Review

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# Outline

- Exemplar approach to vowel harmony
- Connectionist Models
    - Where does this experiment fit in?

# Exemplar Approach to Vowel Harmony

# VH as an evolutionary process

- vowel harmony is the result of a diachronic process of sound change motivated by perturbatory effects of coarticulation on listener perception (Ohala, 1994; Blevins, 2004)
- evidence suggests it is possible to extract phonological patterns corresponding to VH from coarticulatory patterns (Przezdziecki, 2005)
    - counter-claim: phonetic basis for VH irrelevant from a synchronic point of view (Anderson, 1980; Nevins, 2010)
- motivates search for models that integrate phonetic features and phonological structures

# Motivating the exemplar approach

- mental lexicon integrates detailed representations of acoustic/auditory, articulatory, visual, spatial, and even social inputs
- phonological patterns are implicitly learnt through repeated exposure to sequences of such inputs and 'words' are a natural organisational unit for this process (lexically driven learning)
- exemplar models have been argued to be particularly suited to modelling language change as an evolutionary process
- Wedel (2006); Port (2007); Johnson (2007); Coleman (2002); Johnson (2006)

# Connectionist models (aka Neural Networks)

# Connectionist accounts in linguistics

- linked to psycholinguistically motivated accounts of production/perception, and processing (Dell et al., 1999; Hawkins and Smith, 2001; Port, 1990)
- proposed and/or shown to be compatible with emergent/exemplar accounts of phonological acquisition (Bybee and McClelland, 2005; Lathroum, 1989; Hare, 1990; Rodd, 1997; Cole, 2009; Alderete and Tupper, 2018; Cole, 2009)
- but, actual early implementations were often limited in scope by constraints on computational processing and storage

# Where does this experiment come in?

- it is now possible to train such models to learn semantic representations directly from raw phonetic or text inputs with no annotation at the phonological or syntactic level
- resurgence of interest in testing if and how the representations learnt by such ”end-to-end” models maps to traditional linguistic structures (Alishahi et al., 2017; Doucette, 2017; Gulordava et al., 2018; Ravfogel et al., 2018; van Schijndel and Linzen, 2018; Enguehard et al., 2017; Linzen et al., 2016)

# Where does this experiment come in?

proposed aim: replicate methodology from Alishahi et al. (2017) to test the representation of VH structures in an RNN model trained in an exemplar-compatible way [1]

[1] project repo: https://github.com/irfus/ExemplarNNetHarmony

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