

Exploring Sound Change Over Time: A Review of Computational and Human Perception

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Paper in a Nutshell

 **Motivation:** A comparable study of computational and human perception is missing.

 **Aim:** Present a unified view of both perception in terms of approaches and tasks.

 **Main results:** Discuss the intersection of both perception and connection to semantic and syntactic change.

Research Questions

- What are the foci of computational and human perception?
- What are the potential intersections of both perception?
- What are applications in computational linguistics and connections to multifaceted language change?

Approaches

- Computational perception
 - ML methods
 - historical sound change
 - etymological datasets
 - phonetic level
- Human perception
 - listener-driven models
 - ongoing sound change
 - recording corpora
 - acoustic level

Tasks for computational perception

- Sound change detection: [p] → [b]
 - phoneme embedding
- Phonetic alignment between cognate words
 - phoneme-level machine translation
- Markedness of phonemes
 - voiceless vs. voiced plosives (frequency and markedness)
- Sound convergence (from native to non-native)
 - acoustic convergence by Praat

Tasks for human perception

- Perceptual similarity
 - Look at the way to perceive phonetic changes (through listeners-based receiving, processing and interpreting)
- Sound convergence
 - Use a listener-driven approach to check if speech convergence exists.
 - It may misperceive the acoustic and phonetic features of a speaker.

Connection to semantic and syntactic change

- Why - many changes simultaneously affect multiple linguistic levels.
 - changes in sound, meaning and syntax
 - Examples:
 - homograph: present and bow
 - grammaticalization: going to → gonna

Intersections of both perception

- Computer-aided human perception
 - refine the human perception for subtle changes that cannot be observed by listeners.
 - create a feedback loop for both perception.
- Cross-studying etymological datasets and recording corpora.
 - inspect the phonetic similarity of shared words to know the influence of “historical” on “ongoing” changes.

Applications in CL

- Phylogenetic Inference
 - construct a phylogenetic language tree based on phoneme correspondence between languages.
- Quality assessment of etymological datasets.
 - cognitive pairs of some datasets may be incorrect if they are not phonetically aligned.

Futuristic outlook

- Improve human and computational perception based on their feedback loop.
- Investigate the influence of “historical” on “ongoing” changes.
- Detect multifaceted semantic change with phonetic and acoustic features.

Paper link

