

How to study sound change in Norwegian with the help of forced alignment

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Bruk av *forced alignment* i nordisk språkforskning
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The merger of /ɧ/ and /ç/

- The most well-known sound change in today's Norwegian is the merger between /ɧ/ and /ç/ in urban dialects.
- Acoustic studies have been made of the merger (Dommelen 2003, 2019; Scholtz 2009), but none based on Oslo speech.

Acoustics of voiceless fricatives

- Voiceless fricatives like /f/ and /ç/ are acoustically well differentiated by the mean and peaks of the amplitude in their frequency spectrum (Gordon, Barthmaier, and Sands 2002).
- In Norwegian, the center of gravity (= the mean) is higher for /ç/ than for /f/ (Dommelen 2019).

Using forced alignment to check /f/ and /ç/

- With forced alignment in speech corpora like TAUS (Hanssen et al. 1978) and NoTa (Johannessen and Hagen 2008), all examples of /f/ and /ç/ will be automatically tagged.
- With the help of scripting in Praat (Boersma 2001), one can automatically extract all these sounds and their acoustic properties.
- As an example, one could compare the center of gravity values for /f/ and /ç/ and see if there are overlaps correlating with age, gender, location, time of recording, etc.

The merger of ‘light’ /l/ and ‘dark’ /l/

- A more recent change that seems to be more or less complete among young speakers of Urban East Norwegian, is the merger between a ‘light’ and ‘dark’ /l/.
- There is considerable variation among speakers in how these laterals are articulated (Moen, Simonsen, et al. 2003; Moen and Simonsen 2012).
- Their articulation is most often described as the ‘dark’ /l/ being velarized ([ɫ]) while the ‘light’ /l/ is not (Papazian 1977; Vanvik 1979; Jahr 1981; Slethei 1996; Kristoffersen 2000).

The merger of ‘light’ /l/ and ‘dark’ /l/

- The contrast between /l/ and /ɫ/ is extremely marginal, if at all existing.
- They are best seen as allophones, with [ɫ] appearing after /ɑ/ and /ɔ/, and [l] elsewhere.
- They have ‘merged’ in that the allophone [ɫ] has been lost, and [l] now appears in all positions, also after /ɑ/ and /ɔ/.

Acoustics of laterals

- The ‘darkness’ of a lateral is best analyzed by its second formant (F2) value (Recasens 2012).
- A ‘dark’, or velarized, [ɫ] will have a lower F2 than a ‘light’ [l].

Using forced alignment to check [l] and [ɫ]

- With forced alignment in speech corpora like TAUS and NoTa, all examples of /l/ following /ɑ/ and /ɔ/ can be automatically tagged.
- With the help of scripting in Praat, one can automatically extract all these sounds and their acoustic properties.
- By looking at the F2 value of /l/ in these words, one could see if it changes over time to overlap with the F2 value of 'light' [l], and see if this overlap correlates with age, gender, location, time of recording, etc.

Why use forced alignment and acoustic analyses?

- With the help of forced alignment, we can amass a large set of data.
- It is a lot faster than doing everything manually, which allows us to use more data.
- Both the merger of /f/ and /ç/ and the loss of [t] have been investigated in Oslo speech before (Papazian 1994; Svendsen 2012).
- In both cases, however, it was determined impressionistically what category the produced sounds belonged to.

Why use forced alignment and acoustic analyses?

- This approach invites an “either-or” analysis, but sound change often occurs as one sound gradually shifts towards another.
- Acoustic analyses does not categorize the sounds in advance, and they might reveal gradual shifting and partial overlap between categories.
- Automatic acoustic analyses are also a lot faster than listening to each word separately and determining what was being said.

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