Prof. Taehong Cho
Editor-in-Chief, *Journal of Phonetics*

31st August, 2020

Dear Prof. Cho,

We have enclosed our manuscript, "**Systematic co-variation of monophthongs across speakers of New Zealand English**", for your consideration as a research article to the Journal of Phonetics. Our work presents an innovative approach to the study of phonetic co-variation, harnessing the power of a large dataset of speakers of New Zealand English (NZE). Is it the case that speakers co-vary in their vocalic realisations of constellations of vowels? We aim to answer this question through a rigorous and large scale analysis of 10 monophthongs, taken from a corpus of nearly 500 speakers, who were born over a considerable time depth.

Our approach identifies the presence of 'leaders' and 'laggers' in the sound changes that NZE has undergone over the course of the corpus, and crucially, that these speakers exist at all time points irrespective of their gender or year of birth. This demonstrates, for the first time, that irrespective of a speaker's demographic information, there are speakers who are producing innovative (or conservative) variants of specific clusters of vocalic variables together.

We run generalized additive mixed-models for each of our monophongs, predicting normalised F1 and F2 frequencies, this approach enables us to statistically account for variation that exists in the data with respect to the speakers demographic information (e.g. gender and year of birth), which are traditionally the focus for studies on sound change. However, these models also provide random intercept values for each individual speaker, which provide a numeric indication of how advanced each speaker is for each vowel, in comparison to other speakers with similar demographic information. We then apply a principal components analysis on the speaker intercepts to uncover the existence of underlying structure in the dataset, in terms of how some vocalic variables may be systematically co-varying together. We provide comprehensive tools for other researchers to adopt a similar approach for their own investigations, along with an interactive application to allow readers to explore the dataset and results in a transparent and accessible way.

We believe that this approach, and the compelling findings it produces, provides a clear step forward for our theoretical and empirical understanding of how multiple phonetic variables operate together as part of a sound system, thus overcoming the long-standing challenges that studying phonetic co-variation has posed in the past.

This paper will likely have a broad appeal to researchers working on topics such as sociolinguistics, sound change and phonetics more generally. The work highlights not only the need to move beyond individual or small sets of phonetic variables as the focus of phonetic investigations, but also presents a novel methodology that can be used to pave the way forward for future research on the sociophonetics of sound systems.

Thank you for your consideration and please do not hesitate to contact us if you have any questions.

Yours sincerely,

James Brand (corresponding author), Jen Hay, Lynn Clark, Kevin Watson and Martón Sóskuthy