# How consistent is the Voicing Effect across dialects of English?

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## Background

- Voicing effect (VE): vowels preceding voiced obstruents longer than before their voiceless counterparts (House 1961)
  - e.g., *bead* vs *beat*
- Little studied in spontaneous speech, where vowel duration is also affected by speech rate, frequency, etc; not clear how robust the VE is across contexts
- Focused mainly on North American English; little is known about variability across English dialects (Tauberer & Evanini 2009, Rathcke & Stuart-Smith 2016)

## Research Questions

- 1. How robust is the Voicing Effect across phonetic and phonological contexts?
- 2. How variable is the Voicing Effect across dialects?

## Methods

- Extraction of monosyllabic phrase-final vowels from 8 corpora (Buckeye, CORAAL, ICE-Canada, Modern RP, Raleigh, Santa Barbara, SCOTS, Sounds of the City) corresponding to 15 dialects across British and North American English using ISCAN
- Removed tokens < 49ms (Dodsworth 2013)
- In total **58,571** tokens (1,233) types analysed from **498** speakers (247 female)

## Model

- Bayesian linear mixed-effects regression fit using *brms* (Bückner 2018): an R interface for the Stan programming language (Stan Development Team 2018)

- Bayesian models provide a **distribution** of model parameters; possible to examine the *range* of values for a parameter
- Dependent variable: **vowel duration**
- Independent variables:
  - Following consonant **voicing** (the VE), **manner**, vowel **height**, **mean** and **local** speech rate, word **frequency**
  - Interactions between **voicing** and all other terms
  - Maximal random effects structure for speakers, intercepts for words & vowel labels
  - Random effects correlation between intercept, voicing, manner, and voicing : manner included for speakers
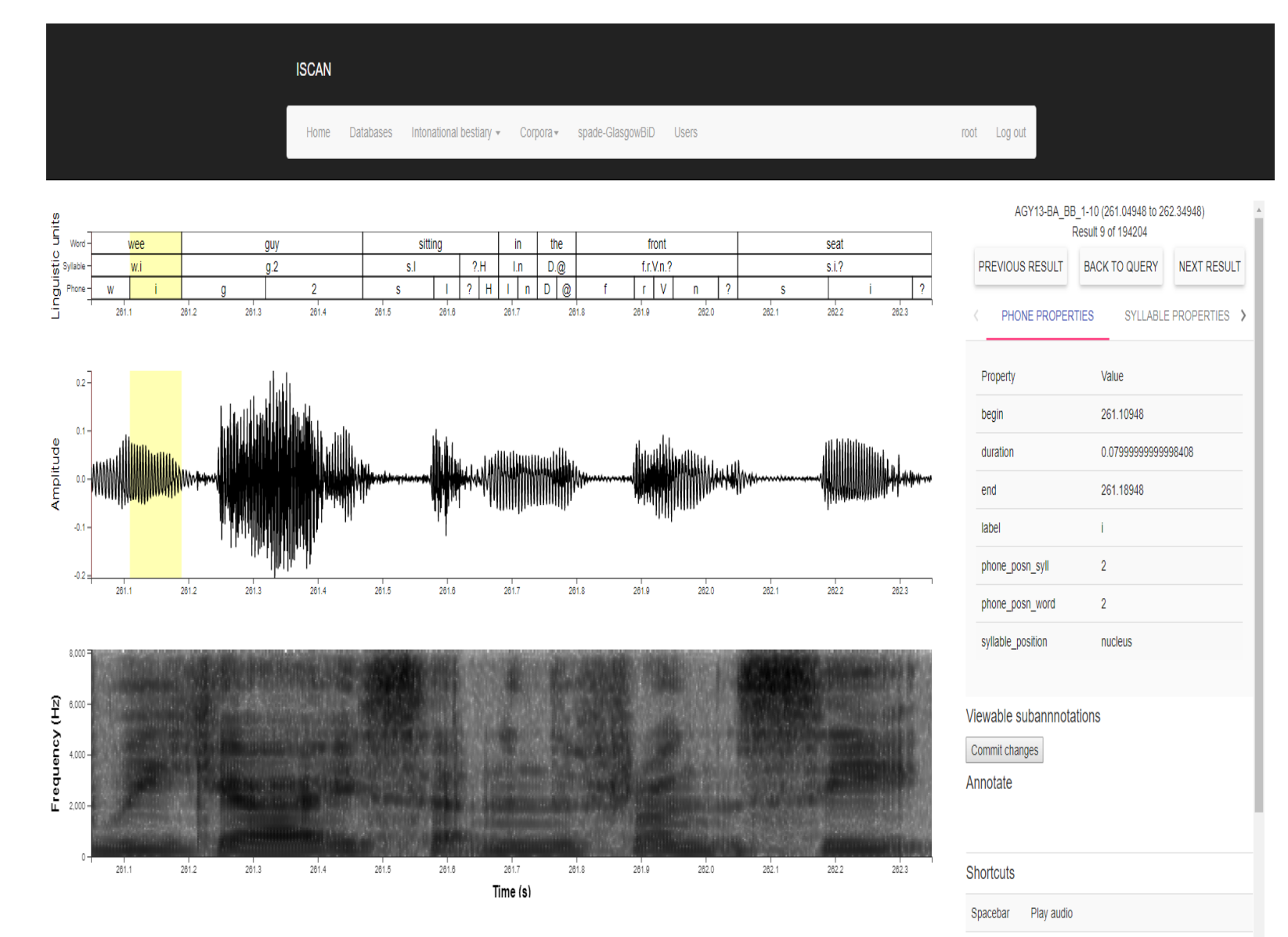


## Polyglot/ISCAN

Python command line library/ Graphical User Interface

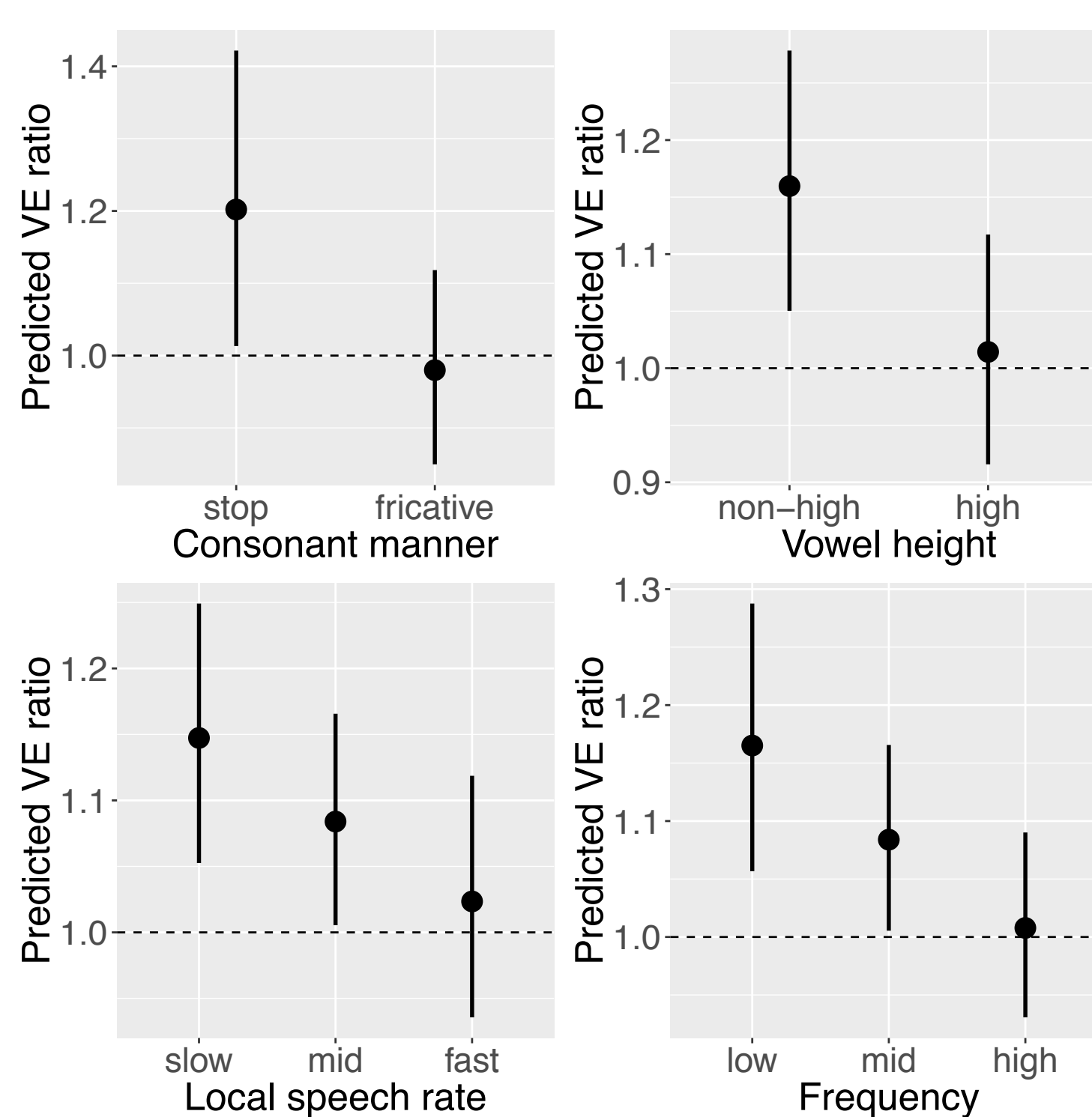Tool for user friendly, large-scale, ethically non-invasive automated acoustic analysis of speech datasets

McAuliffe et al. (2019)
*Proc 19th ICPhS*
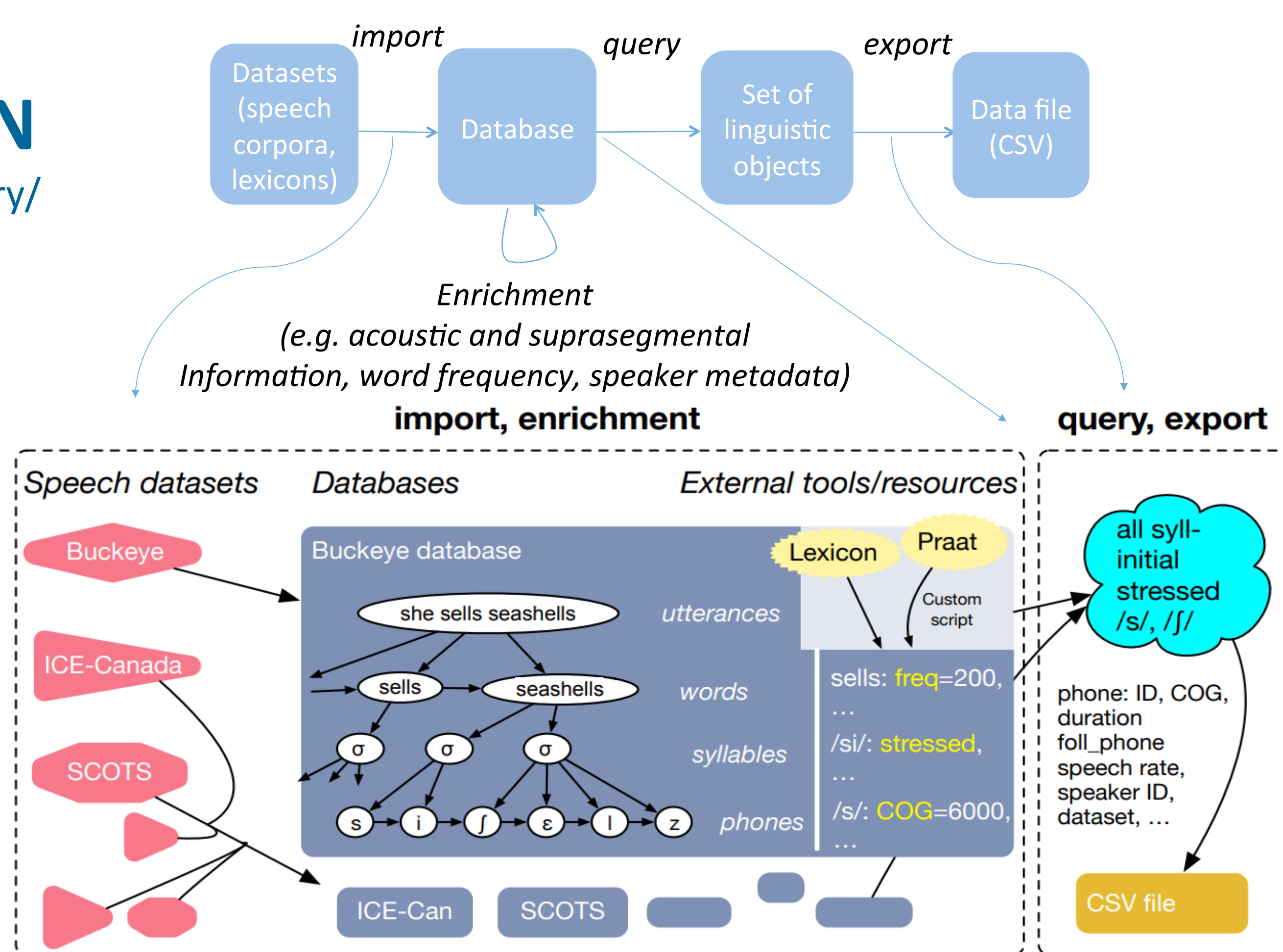
## ISCAN inspection interface



## RQ1: Voicing Effect is robust across phonetic and phonological contexts



- The Voicing Effect is observed, but the effect size is smaller than previously reported (median = 1.08; between 1 and 1.16)
- Vowel duration longer before stops than fricatives, but little evidence of a manner effect on VE size
- Vowel height modulates vowel duration with high vowels shorter than non-high; vowel height also affects VE size, with larger VE for non-high vowels
- More reduced and more predictable words have smaller VE values (Klatt 1973, Cuartero 2002)

## RQ2: Voicing Effect is variable across dialects
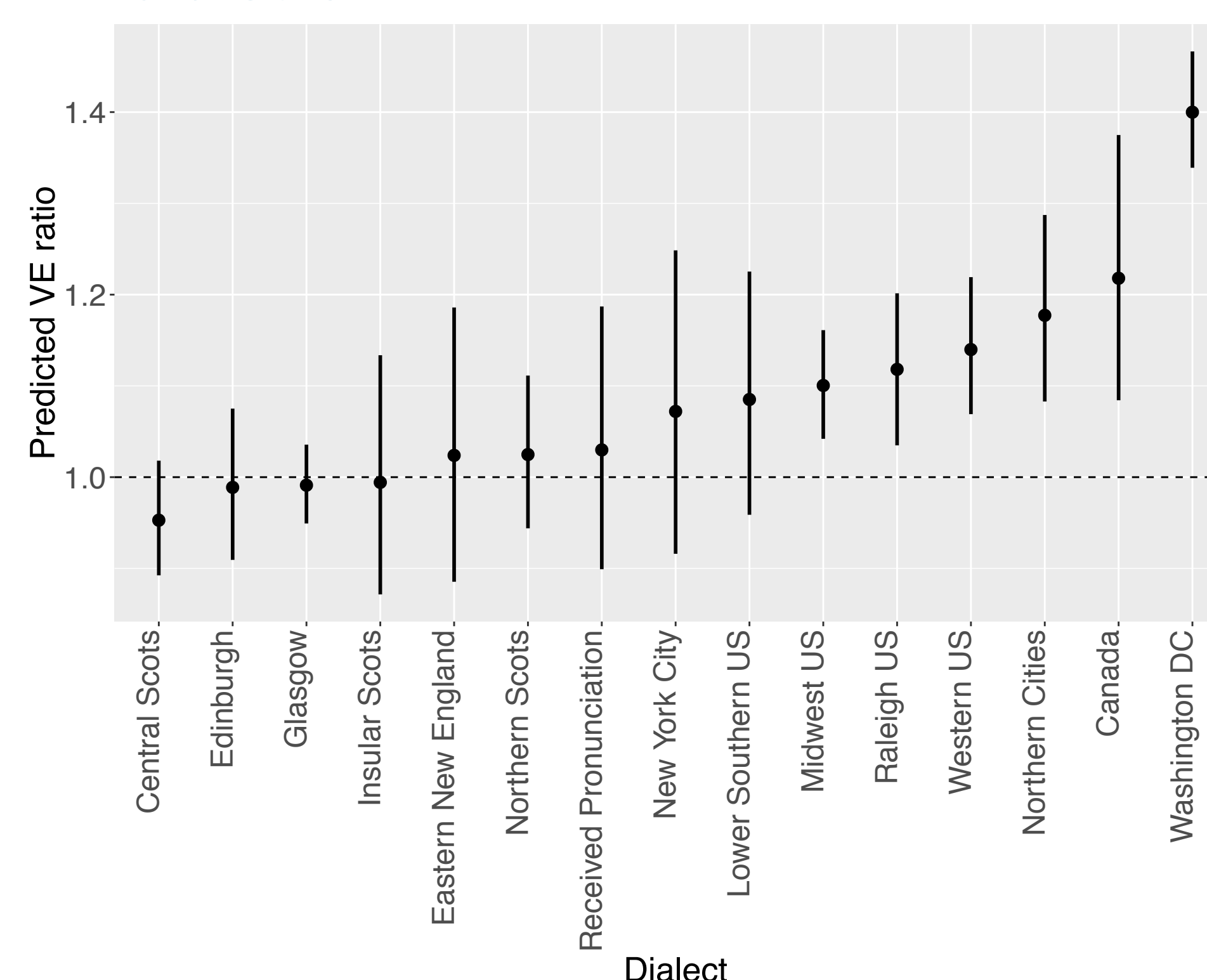


- Dialect-level variability in VE size, roughly as large as population level VE size (median = 0.09, between 0.08 and 0.19)
- Dialects appear to differ *gradiently* from each other, ranging from effectively-null to approximately 1.4
- Dialects with small/null VE are all Scottish varieties, whilst others (ENE, RP, NYC) have broadly positive (but possibly null) VE
- African American English (AAE) speakers in Washington DC have largest VE in sample (approximately 1.4), similar to previous observations in AAE read speech (Holt *et al.* 2016)

## Conclusions

- **Voicing Effect in spontaneous speech is smaller than previously reported for lab speech, and in line with other spontaneous speech studies** (Tauberer & Evanini 2009)
- **VE size is modulated by manner, vowel height, speech rate, and word frequency**
- **English dialects demonstrate a continuum of potential VE sizes**
- ➜ **This suggests that Voicing Effect size is dialect-specific, as opposed to a single 'English' feature**

## Paper available:

Tanner, J., Sonderegger, M., Stuart-Smith, J., The SPADE Data Consortium. (2019). 'Vowel duration and the voicing effect across dialects of English'. *Toronto Working Papers in Linguistics*, 41(1).