Andreas Weilinghoff

The Past, Present and Possible Future of Phonetic Research

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Slides

Example

Vowel duration, the VE and the SVLR

Vowel duration

tempo

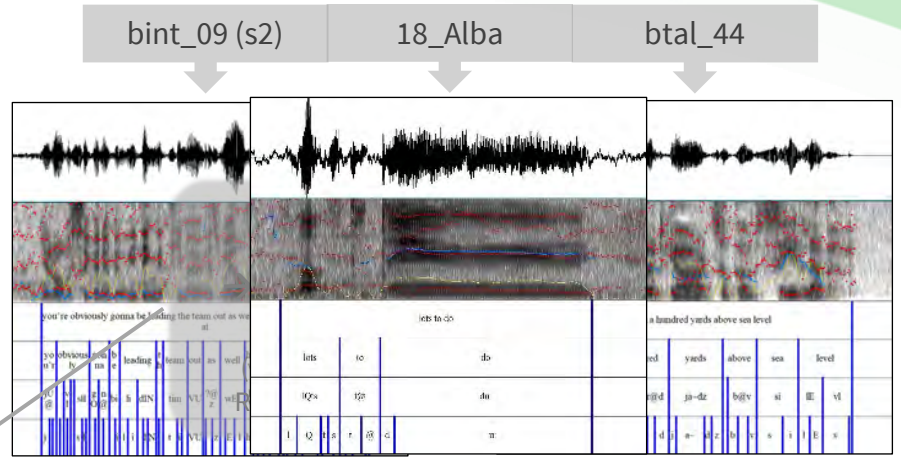
→ the faster the speech, the shorter the vowels

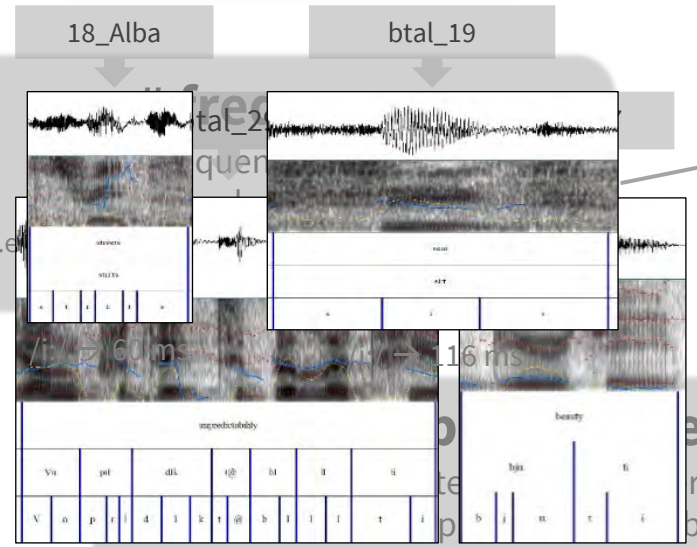
(i.e Crystal & House 1988, 1990; Schötz 2007)

phrasal position

→ final syllables tend to be longer than non-final syllables

(i.e Oller 1973, Umeda 1974, Rathcke & Stuart-Smith 2016)



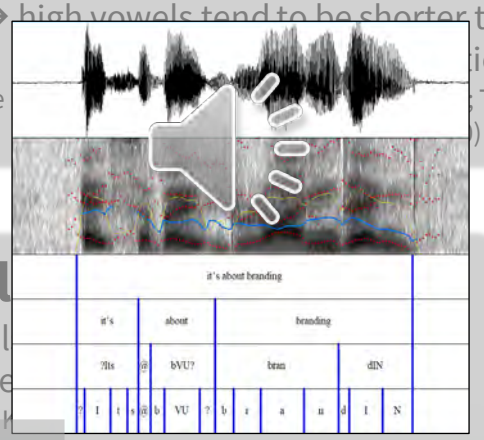


(i.e Maddieson 1985; Munhall et al. 1992; Katz 2012)

vowel height

→ high vowels tend to be shorter than low

(i.e Tauberer &

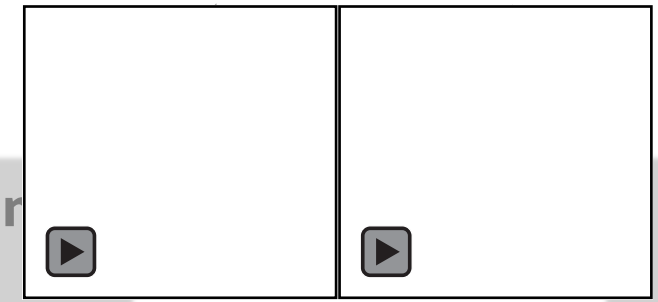


polysyll

→ vowel

the more

(i.e Barnwell 1971;

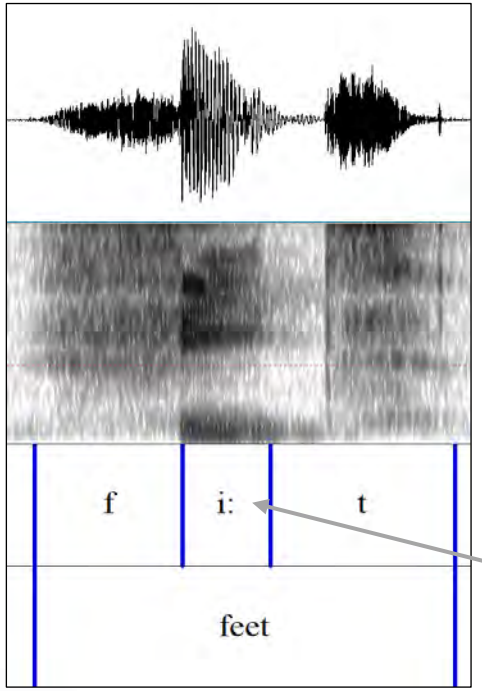


MRIs by Janet Beck for /i/ and /a/. Seeing Speech Project of the University of Glasgow.

The Voicing Effect

→ vowels tend to be longer before voiced consonants than before voiceless consonants

(i.e Sweet 1877; Heffner 1937; House and Fairbanks 1953; Peterson & Lehiste 1960; Chen 1970; Tauberer & Evanini 2009; Tanner et al. 2020)

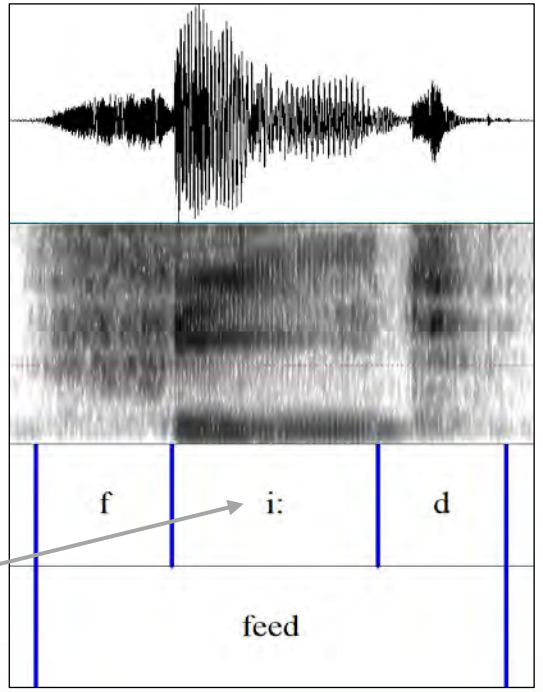


feet

vowel duration:
~ 130 ms

feed

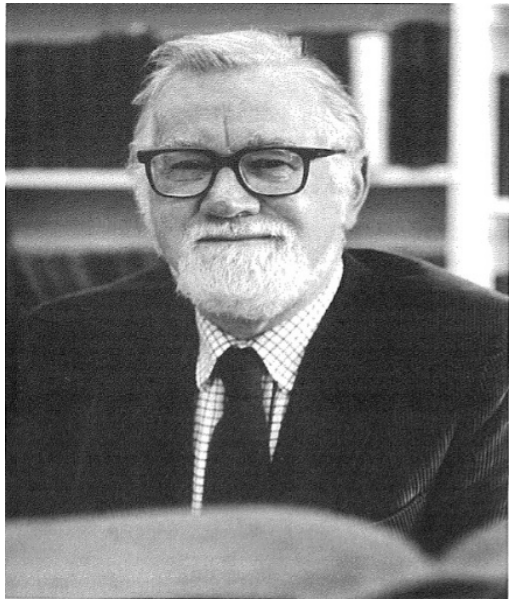
vowel duration:
~ 300 ms



Vowel duration in Scottish English

The Scottish Vowel Length Rule / Aitken‘s Law:

“All vowels and diphthongs are **long in stressed open syllables**, before **voiced fricatives** and **/r/**, and before **morpheme boundaries** and **short elsewhere**; with the two exceptions of **/ɪ/** and **/ʌ/** which are **invariably short**.“ (McClure 1977)



Adam Jack Aitken (1921-1998)

- Scottish lexicographer
- scholar of the Scots language
- formulator of the SVLR

Vowel duration in Scottish English

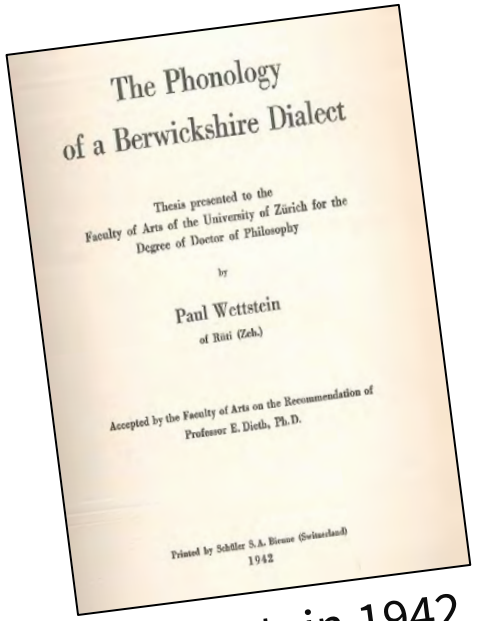
Table 1. Environments constraining durational allophony in varieties of British English.

Constraint	Examples	Scottish English	Anglo-English
Voiceless consonants	*beat, greet* *brute, cute*	short allophones	short allophones
Voiced (oral and nasal) stops and /l/	*bead, bean, beal* *brood, broom, gruel*	short allophones	long allophones
Voiced fricatives and /r/	*tease, beer* *bruise, smooth, cure*	long allophones	long allophones
Morpheme boundaries	*bee, bees, bee's* *agree, agreed* *brew, brews, brewed*	long allophones	long allophones

(Retrieved from: Rathcke and Stuart-Smith 2016: 406)

The Past

The Past: Impressionistic accounts


The Phonology
of a Berwickshire Dialect

Thesis presented to the
Faculty of Arts of the University of Zürich for the
Degree of Doctor of Philosophy

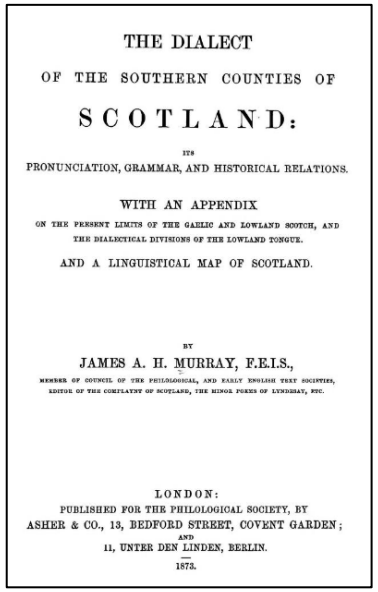
by

Paul Wettstein
of Rüti (Zch.)

Accepted by the Faculty of Arts on the Recommendation of
Professor E. Dieth, Ph.D.

Printed by Schiller S.A. Bienne (Switzerland)
1942

Wettstein 1942


THE DIALECT

OF THE SOUTHERN COUNTIES OF

SCOTLAND:

ITS

PRONUNCIATION, GRAMMAR, AND HISTORICAL RELATIONS.

WITH AN APPENDIX

ON THE PRESENT LIMITS OF THE GAELIC AND LOWLAND SCOTCH, AND THE DIALECTICAL DIVISIONS OF THE LOWLAND TONGUE.

AND A LINGUISTICAL MAP OF SCOTLAND.

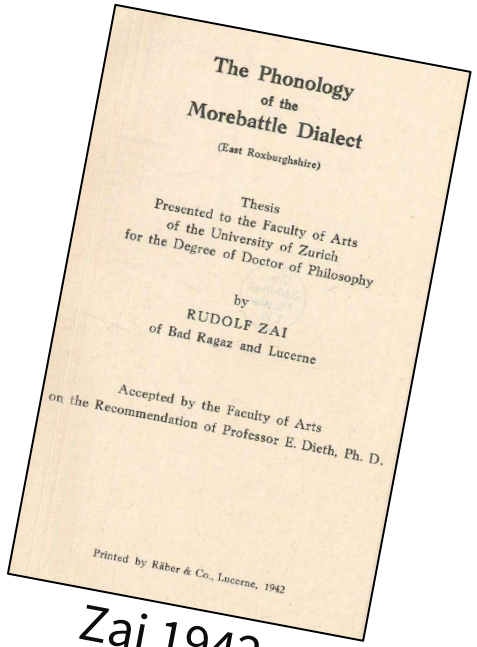
BY

JAMES A. H. MURRAY, F.E.I.S.,

MEMBER OF COUNCIL OF THE PHILOLOGICAL, AND EARLY ENGLISH TEXT SOCIETIES, EDITOR OF THE COMPLAYNT OF SCOTLAND, THE MINOR POEMS OF LYNDESAY, ETC.

LONDON:
PUBLISHED FOR THE PHILOLOGICAL SOCIETY, BY
ASHER & CO., 13, BEDFORD STREET, COVENT GARDEN;
AND
11, UNTER DEN LINDEN, BERLIN.
1873.

Murray 1873


The Phonology
of the
Morebattle Dialect
(East Roxburghshire)

Thesis
Presented to the Faculty of Arts
of the University of Zurich
for the Degree of Doctor of Philosophy

by
RUDOLF ZAI
of Bad Ragaz and Lucerne

Accepted by the Faculty of Arts
on the Recommendation of Professor E. Dieth, Ph. D.

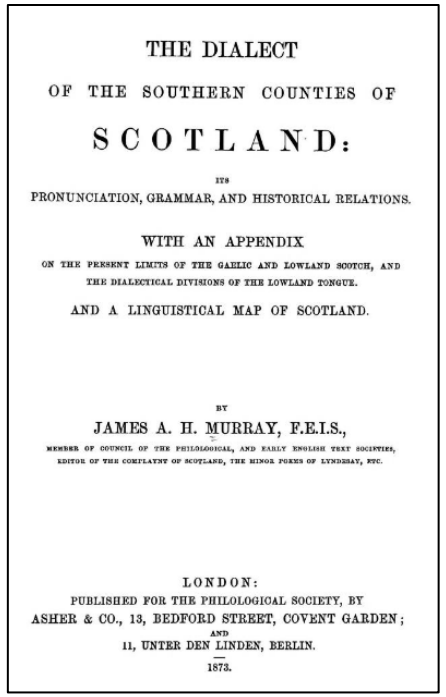
Printed by Räber & Co., Lucerne, 1942

Zai 1942

Grant & Dixon 1921 | Watson 1923 | Grant 1931 | Dieth 1932 | Wölck 1965 | Lodge 1984

Aitken 1962, 1977, 1981

The Past: Impressionistic accounts



THE DIALECT

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1873.

The dialect of the Southern Counties of Scotland
(Murray 1873)

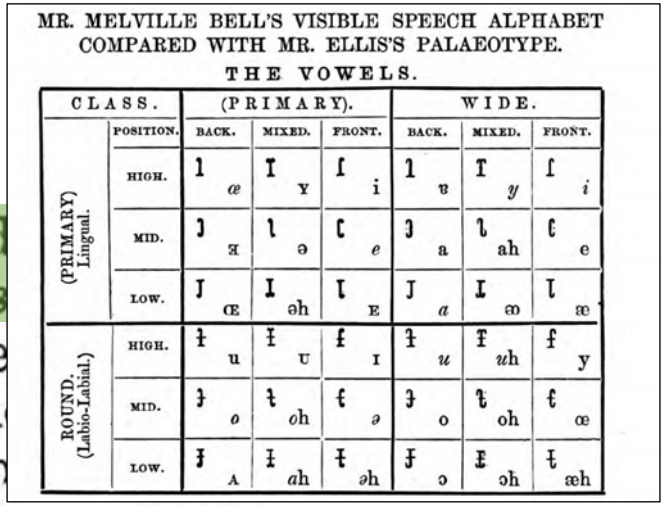
Murray (1873)

1. A vowel at the end of a monosyllable, or accented lable, is long; as *wee*, tiny, *day*; *faa*, fall; *gæ*, gave; *s*

The words *a*, *the*, can scarcely be looked upon as e for, so far as pronunciation is concerned, they are not in words, but mere prefixes, or initial syllables to the wo they define, and are consequently brief (*i.e.* short in an open syllable). The same may be said of possessives and prepositions like *maa*, my; *tui*, to; *wui*, with; *fræ*, from; *î*, in; which have a long sound only when emphatic, but otherwise are brief, *mă*, *tă*, *wă*, *fră*, *ă*, like *a-* in *ă-bove*, *ă-mong*.

The above rule also holds good, where such a monosyllable is followed by *s* or *d*, in the process of noun- or verb-inflection, as *faa*, *faa's*, *day*, *days*, *preae*, *preaed*, *preaes*.

(Murray 1873: 97)



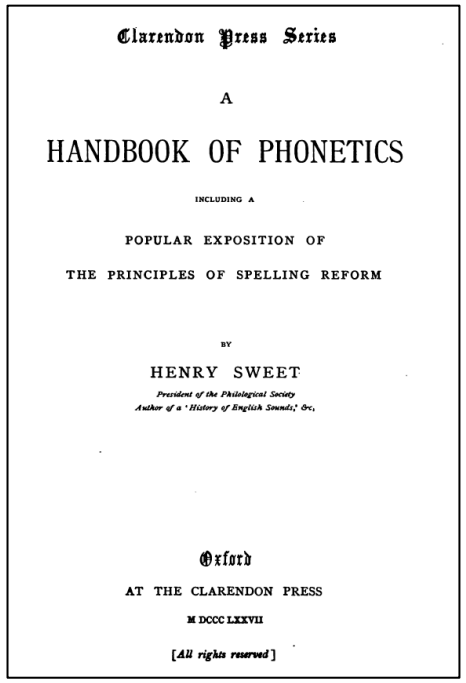
MR. MELVILLE BELL'S VISIBLE SPEECH ALPHABET COMPARED WITH MR. ELLIS'S PALAEOTYPE.

THE VOWELS.

CLASS.		(PRIMARY).			WIDE.		
	POSITION.	BACK.	MIXED.	FRONT.	BACK.	MIXED.	FRONT.
(PRIMARY) Lingual.	HIGH.	ɭ œ	ɪ ʏ	ɾ i	ɭ ʊ	ɪ y	ɾ i
	MID.	ɟ ɤ	l ə	ɾ e	ɟ a	l ah	ɾ e
	LOW.	J Œ	I əh	ɪ E	J a	I œ	ɭ æ
ROUND. (Labio-Labial.)	HIGH.	ɬ u	ɪ ʊ	ɾ ɪ	ɬ u	ɪ uh	ɾ y
	MID.	ɟ o	l oh	ɾ ə	ɟ o	l oh	ɾ œ
	LOW.	J ʌ	I ah	ɪ əh	J ɔ	I ɔh	ɭ æh

(Murray 1873: 99)

The Past: Impressionistic accounts



Clarendon Press Series

A

HANDBOOK OF PHONETICS

INCLUDING A

POPULAR EXPOSITION OF

THE PRINCIPLES OF SPELLING REFORM

BY

HENRY SWEET

President of the Philological Society
Author of a 'History of English Sounds,' &c.

Oxford

AT THE CLARENDON PRESS

M DCCC LXXVII

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A Handbook of Phonetics
(Sweet 1877)

Sweet (1877)

186. The quantity of any one sound is apt to vary according to its circumstances. Thus in E. final long vowels, as in 'see,' and before voice consonants, as in 'seize,' are really long, while before breath consonants they are shortened to half-longs, as in 'cease.' But in German full length is preserved before voiceless consonants as well as voice ones, so that the (o) in 'noth' is as long as the E. 'node,' not half-long as in 'note.'

In many Scotch dialects there are no full long vowels at all, all long vowels being shortened to half-longs.

(Sweet 1877: 59)

Henry Sweet
(1845 - 1912)

The Past: Impressionistic accounts

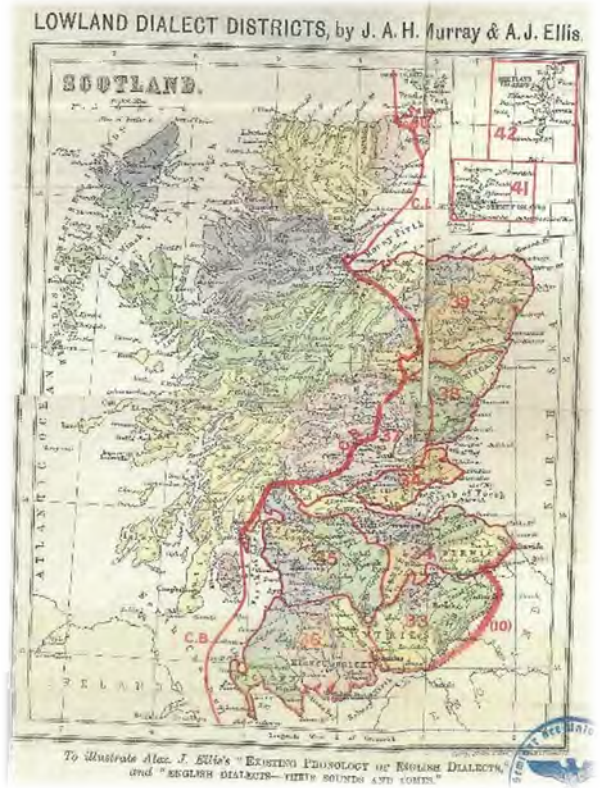
Sir James Murray (1837-1915)

- impressionistic reports of regional pronunciation in Scotland

- no empirical basis
(e.g. phonograph only invented in 1877)

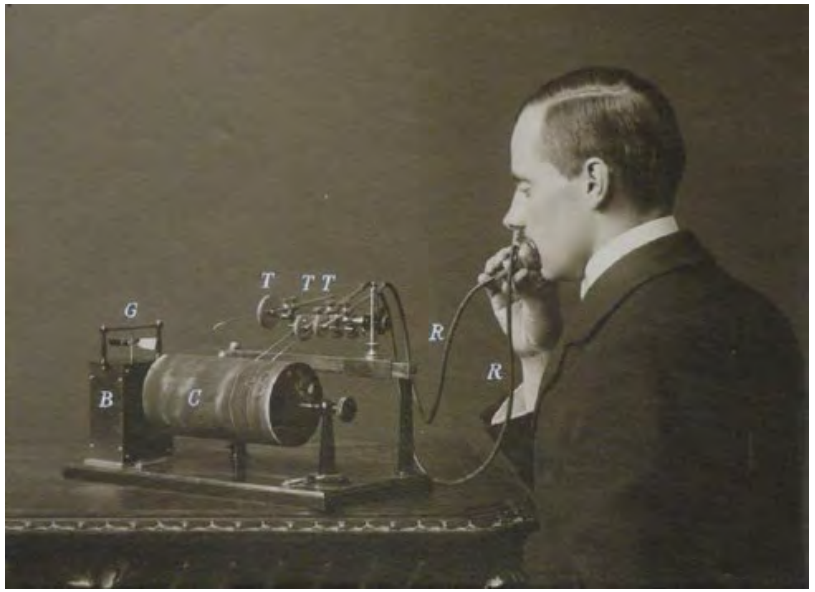
Very early recording by A. G. Bell in 1885:
"This record has been made by Alexander Graham Bell in the presence of Dr. Chichester A. Bell on the 15th of April 1885 at the Volta laboratory, 1221 Connecticut Avenue, Washington, DC. In the witness whereof HEAR MY VOICE; Alexander Graham Bell"

- different approaches to transcription
(IPA only formed after 1886)

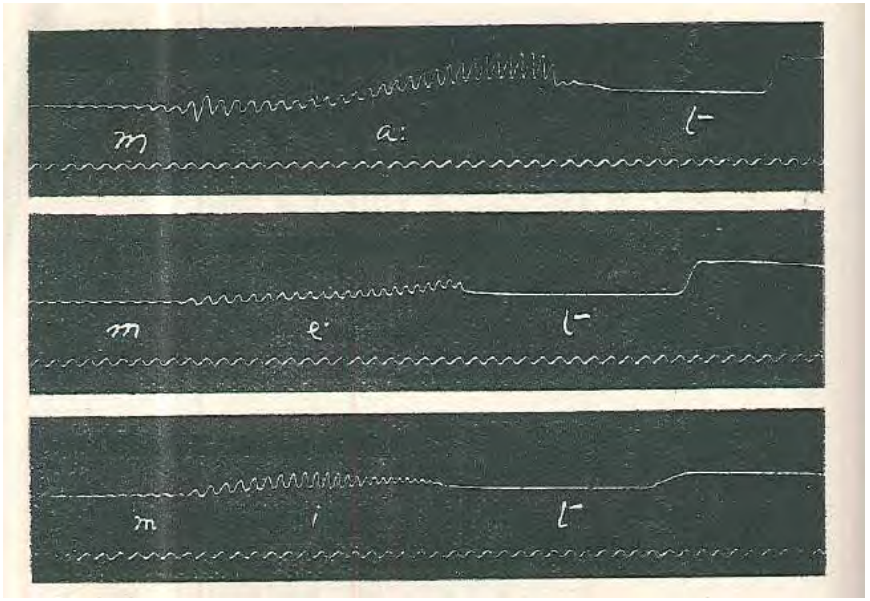


Scottish Lowland Dialects
(Ellis and Murray 1890)

The Past

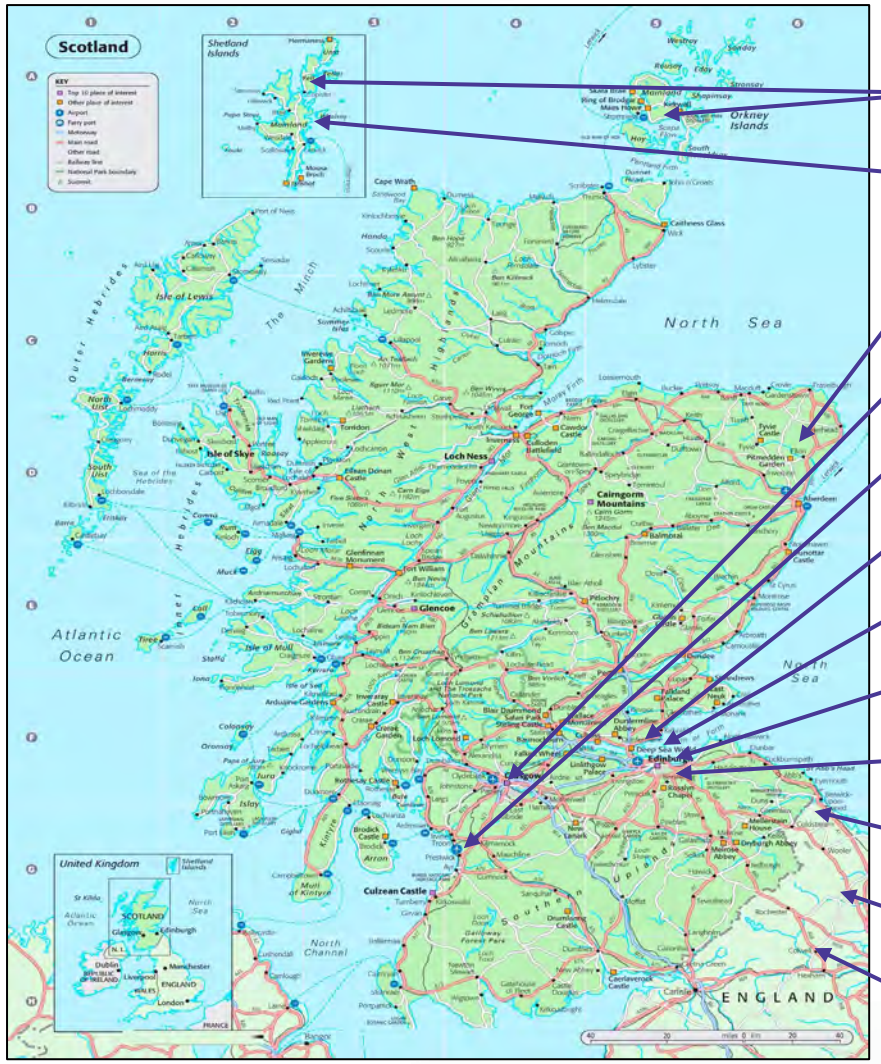


Kymograph recording by Daniel Jones
(probably before 1914)



Kymograph measurements of Scottish vowels
by Dieth (1932: 62)

The Past: Empirical studies in controlled speech



Empirical studies in controlled speech

- van Leyden 2002
- Scobbie 2005
- Watt and Yurkova 2007
- Scobbie et al. 1999
- Pukli 2006
- McKenna 1988
- Agutter 1988
- McMahon 1991
- Hewlett, Matthews and Scobbie 1999
- Watt and Ingham 2000
- Milroy 1995
- Llamas et al. 2011

The Past: Empirical studies in controlled speech

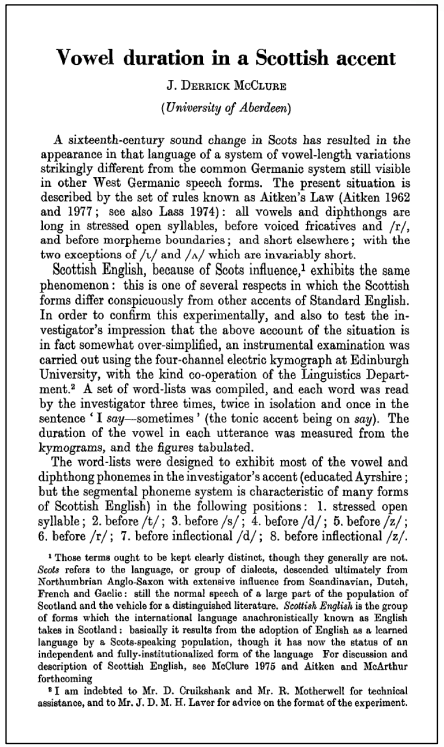
McClure (1977)

Derrick McClure at the University of Aberdeen

	/i/	/ɪ/	/e/	/ɛ/	/a/
1	PEA	—	PAY	—	PA
2	PEAT	KIT	PATE	PET	PAT
3	PEACE	KISS	PACE	TESS	PASS
4	(IM)PEDE	KID	CADE	TED	PAD
5	TEASE	HIS	(U)KAZE	DES	DAZ
6	PEER	GIRR	PAIR	KERR	PARR
7	TEE'D	—	PAID	—	BAA'D
8	TEES	—	PAYS	—	BAAS

	/ʌ/	/ɔ/	/o/	/u/	/ae/	/ʌu/
1	—	PAW	TOW	COO	TIE	COW
2	CUT	POT	TOTE	COOT	TIGHT	POUT
3	CUSS	TOSS	—	PUSS	DICE	HOUSE (n.)
4	CUD	POD	TOAD	COULD	TIDE	—
5	BUZZ	PAUSE	POSE	BOOZE	GUISE	HOUSE (vb.)
6	CUR	TOR	POUR	POOR	TIRE	POWER[4]
7	—	PAWED	TOWED	COOED	TIED	COWED
8	—	PAWS	TOWS	COOS	TIES	COWS

Word list by McClure (1977)



Vowel duration in a Scottish accent

J. Derrick McClure

(*University of Aberdeen*)

A sixteenth-century sound change in Scots has resulted in the appearance in that language of a system of vowel-length variations strikingly different from the common Germanic system still visible in other West Germanic speech forms. The present situation is described by the set of rules known as Aitken's Law (Aitken 1962 and 1977; see also Lass 1974): all vowels and diphthongs are long in stressed open syllables, before voiced fricatives and /r/, and before morpheme boundaries; and short elsewhere; with the two exceptions of /ɪ/ and /ʌ/ which are invariably short.

Scottish English, because of Scots influence,[1] exhibits the same phenomenon: this is one of several respects in which the Scottish forms differ conspicuously from other accents of Standard English. In order to confirm this experimentally, and also to test the investigator's impression that the above account of the situation is in fact somewhat over-simplified, an instrumental examination was carried out using the four-channel electric kymograph at Edinburgh University, with the kind co-operation of the Linguistics Department.[2] A set of word-lists was compiled, and each word was read by the investigator three times, twice in isolation and once in the sentence 'I *say*—sometimes' (the tonic accent being on *say*). The duration of the vowel in each utterance was measured from the kymograms, and the figures tabulated.

The word-lists were designed to exhibit most of the vowel and diphthong phonemes in the investigator's accent (educated Ayrshire; but the segmental phoneme system is characteristic of many forms of Scottish English) in the following positions: 1. stressed open syllable; 2. before /t/; 3. before /s/; 4. before /d/; 5. before /z/; 6. before /r/; 7. before inflectional /d/; 8. before inflectional /z/.

[1] Those terms ought to be kept clearly distinct, though they generally are not. *Scots* refers to the language, or group of dialects, descended ultimately from Northumbrian Anglo-Saxon with extensive influence from Scandinavian, Dutch, French and Gaelic: still the normal speech of a large part of the population of Scotland and the vehicle for a distinguished literature. *Scottish English* is the group of forms which the international language anachronistically known as English takes in Scotland: basically it results from the adoption of English as a learned language by a Scots-speaking population, though it has now the status of an independent and fully-institutionalized form of the language. For discussion and description of Scottish English, see McClure 1975 and Aitken and McArthur forthcoming

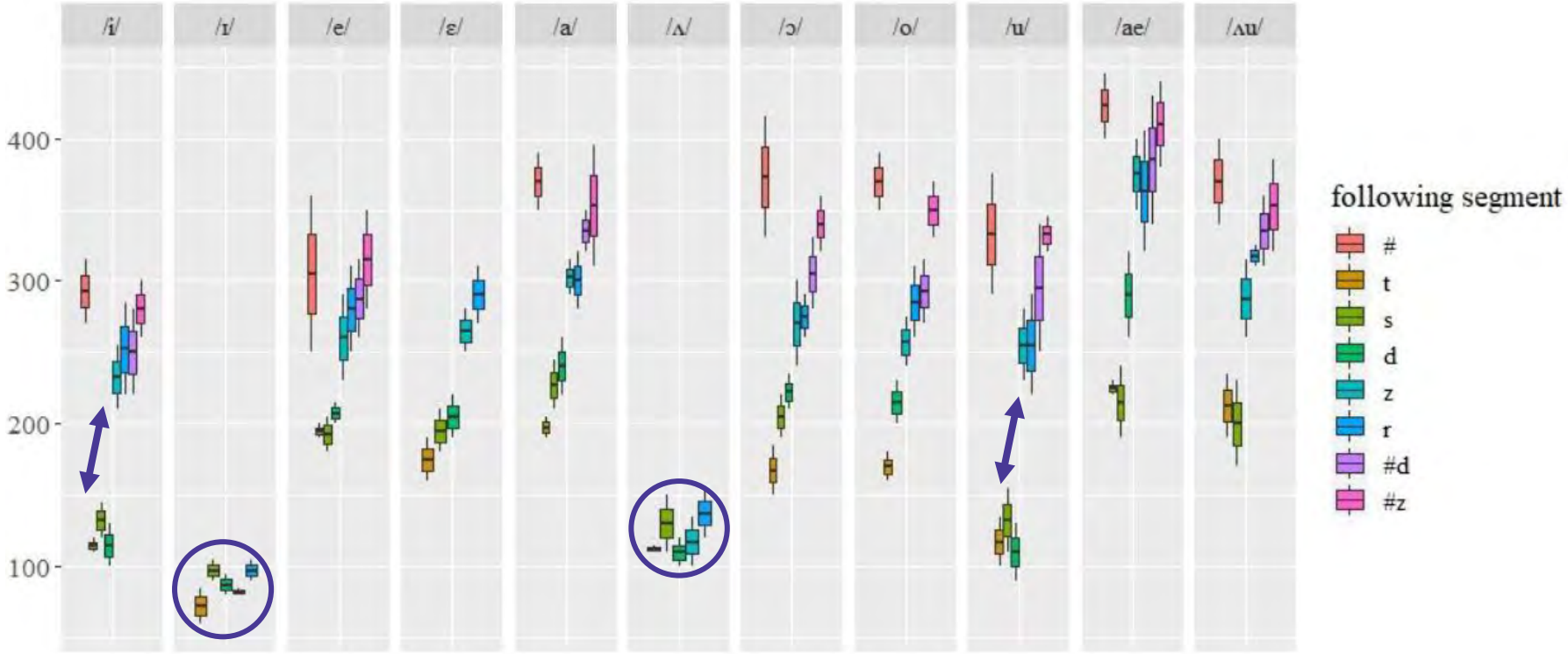
[2] I am indebted to Mr. D. Cruikshank and Mr. R. Motherwell for technical assistance, and to Mr. J. D. M. H. Laver for advice on the format of the experiment.

Vowel duration in a Scottish accent (McClure 1977)

The Past: Empirical studies in controlled speech

Derrick McClure at the University of Aberdeen

Average vowel durations by McClure (1977)

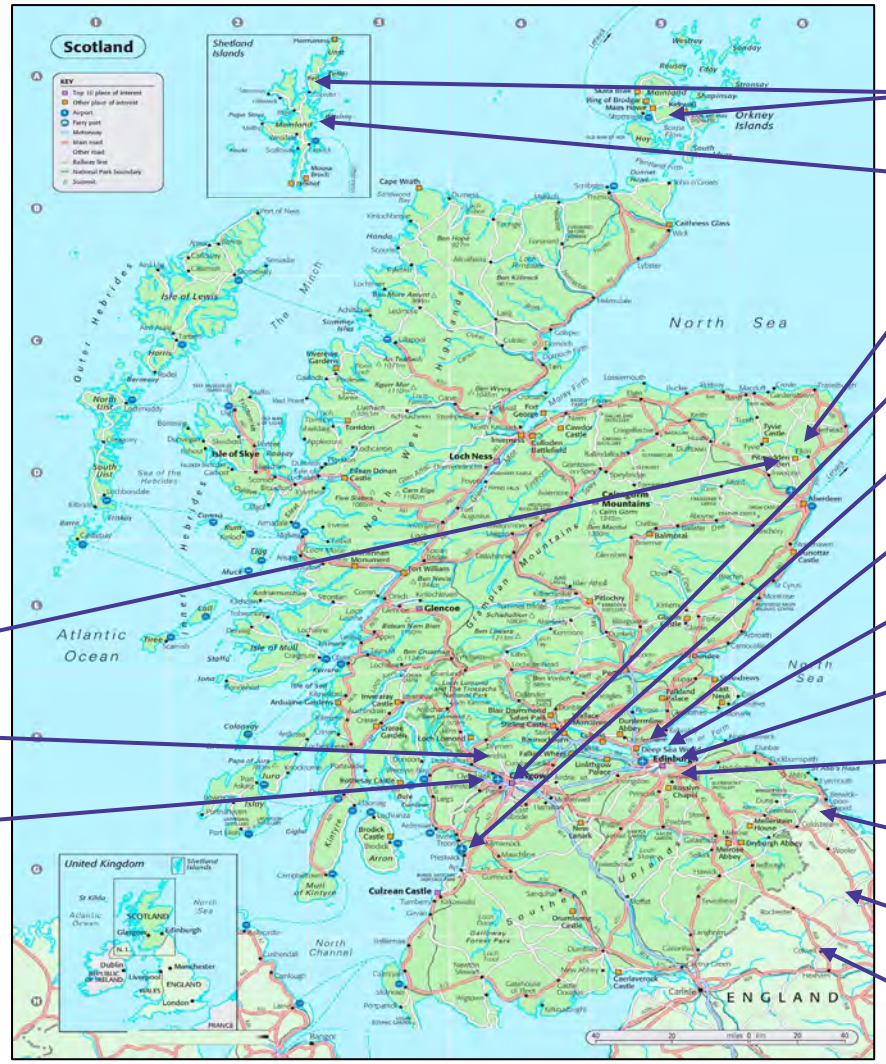


The Present

The Present: Empirical studies in uncontrolled speech

Empirical studies in uncontrolled speech

- Warren 2018
- Stuart-Smith and Rathcke 2016
- Chevalier 2019
- Stuart-Smith et al 2019
- Weilinghoff fc. 2023



Empirical studies in controlled speech

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- Milroy 1995
- Llamas et al. 2011

The Present: Empirical studies in uncontrolled speech

Rathcke and Stuart-Smith (2016)

Jane Stuart-Smith

me

- investigation of /i/, /u/ and /a/ in spontaneous Glaswegian Scots from the *Sounds of the City corpus*
- data taken from 1970s and 2000s (diachronic perspective of the SVLR), only male speakers
- Statistical analysis applies linear mixed-effects modelling with a backward fitting procedure
- **force-aligned** speech data

On the tail of the Scottish Vowel Length Rule in Glasgow

Tamara V. Rathcke

Jane H. Stuart-Smith

Abstract

Keywords

On the tail of the Scottish Vowel Length Rule in Glasgow (Rathcke and Stuart-Smith 2016)

Previous findings

- SVLR applies most consistently in the vowels

/i/
McClure 1977
McKenna 1988
McMahon 1991
Hewlett et al. 1999
Scobbie et al. 1999
Watt & Ingham 2000
van Leyden 2002
Scobbie 2005
Pukli 2006
Llamas et al. 2011
Rathcke & Stuart-Smith 2016
Chevalier 2019
Stuart-Smith et al. 2019

/ʉ/
McClure 1977
McKenna 1988
Hewlett et al. 1999
Scobbie et al. 1999
Watt & Ingham 2000
Scobbie 2005
Pukli 2006
Llamas et al. 2011
Rathcke & Stuart-Smith 2016
Chevalier 2019
Stuart-Smith et al. 2019

/aɪ/
Agutter 1988
McMahon 1991
Milroy 1995
Scobbie et al. 1999 Watt & Ingham 2000
Pukli 2006
Llamas et al. 2011

- Anti-Voicing Effect reported by SPADE study (Stuart-Smith et al. 2019)

Previous findings – remaining issues

→ geographical scope of the SVLR?

(e.g. McClure 1977 | Aitken 1981) vs. (Lodge 1984 | Agutter 1988 | Watt & Yurkova 2007 | Warren 2018)

→ age-related variation?

(Agutter 1988 | Milroy 1995 | Watt and Ingham 2000 | Warren 2018) vs. (Scobbie et al. 1999; Llamas et al. 2011)

→ gender-related variation?

(Agutter 1988 | Watt and Ingham 2000 | Stuart-Smith and Rathcke 2016; Chevalier 2019)

→ SVLR in naturally spoken SSE? → emerging VE patterns in SSE?

PhD thesis

PhD Project – RQs and aims

RQ1: **Which vowels** are affected by Aitken's Law / the VE in 21st century spoken SSE?

RQ2: What is the **effect of regional, age- and gender-related variation** on Aitken's Law / the VE in 21st century spoken SSE?

RQ3: **Which prosodic factors** have an influence on Aitken's Law / the VE in 21st century spoken SSE?

→ all vowels of the *Basic Scottish Vowel System* (Abercrombie 1979)

→ representativeness for the whole of the country in terms of age, gender and regional background

→ accounting for all possible prosodic factors, implementing scripted and unscripted speech

PhD Project – Dataset

→ Two data sources: **ICE Scotland** + **Self-collected data**

(Schützler et al. 2017)

- 130 (64 f) speakers from 3 age groups & 6 dialect regions

→ 150995 words

Variable	Level	Number of words
Regional background	East-Mid	27199
	HHE	23604
	Insular	26147
	Northeast	18007
	South	24412
	West-Mid	31626
Gender	female	67726
	male	83269
Age group	old (60+)	33165
	middle (31-60)	94683
	young (18-30)	23147
Style	scripted	85044
	unscripted	65951
Total		150995

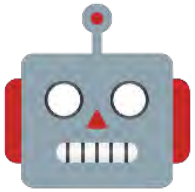
PhD Project – Data preparation

Large speech dataset

- How to precisely measure the vocalic durations?
- What should be the transcription format?
- How to identify the vowels and postvocalic contexts?
- How to account for all relevant segmental and suprasegmental factors?
- How to analyse the data?

PhD Project – Data preparation

Solution:



Human + Technology

Transcription software:

Praat

ELAN

Forced aligners:

WebMAUS

MFA 2.0

Data preparation

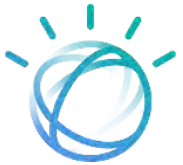
Python

R

Statistical analysis

R

Other tools:



Watson STT

ProsoBox

PhD Project – Data preparation

Semi-automatic data preparation using Praat (Boersma and Weenink 2019) and Python (Python Software Foundation 2022) scripts with the *textgrids* library (Nieminen 2019)

Praat

Python

R

dataset	file name	phone label	phone xmin	phone xmax	phone duration	phone code	syl structure	syl label	+ other columns
ICE	btal_10	m	1.433	1.495	0.062	C	CVC	mEm	...
ICE	btal_10	E	1.495	1.550	0.05	V	CVC	mEm	...
ICE	btal_10	m	1.550	1.647	0.097	C	CVC	mEm	...
ICE	btal_10	b	1.647	1.664	0.017	C	CVC	b@z	...
ICE	btal_10	@	1.664	1.694	0.03	V	CVC	b@z	...
ICE	btal_10	z	1.694	1.772	0.078	C	CVC	b@z	...
ICE	btal_10	@	1.772	1.79	0.018	V	VC	@v	...
ICE	btal_10	v	1.79	1.824	0.034	C	VC	@v	...
ICE	btal_10	D	1.824	1.85	0.026	C	CV	D@	...
ICE	btal_10	@	1.85	1.882	0.032	V	CV	D@	...
ICE	btal_10	s	1.882	1.959	0.077	C	CCV	skO	...
ICE	btal_10	k	1.959	2.037	0.078	C	CCV	skO	...
+ other rows	...	...	...	...	...	...	...	...	...

Step 5:

- ... (Kisler et al. 2017)
- morphological parsing information from CELEX (Baayen et al. 1995)
- calculation of articulation rate

PhD Project – Own data preparation

ELAN

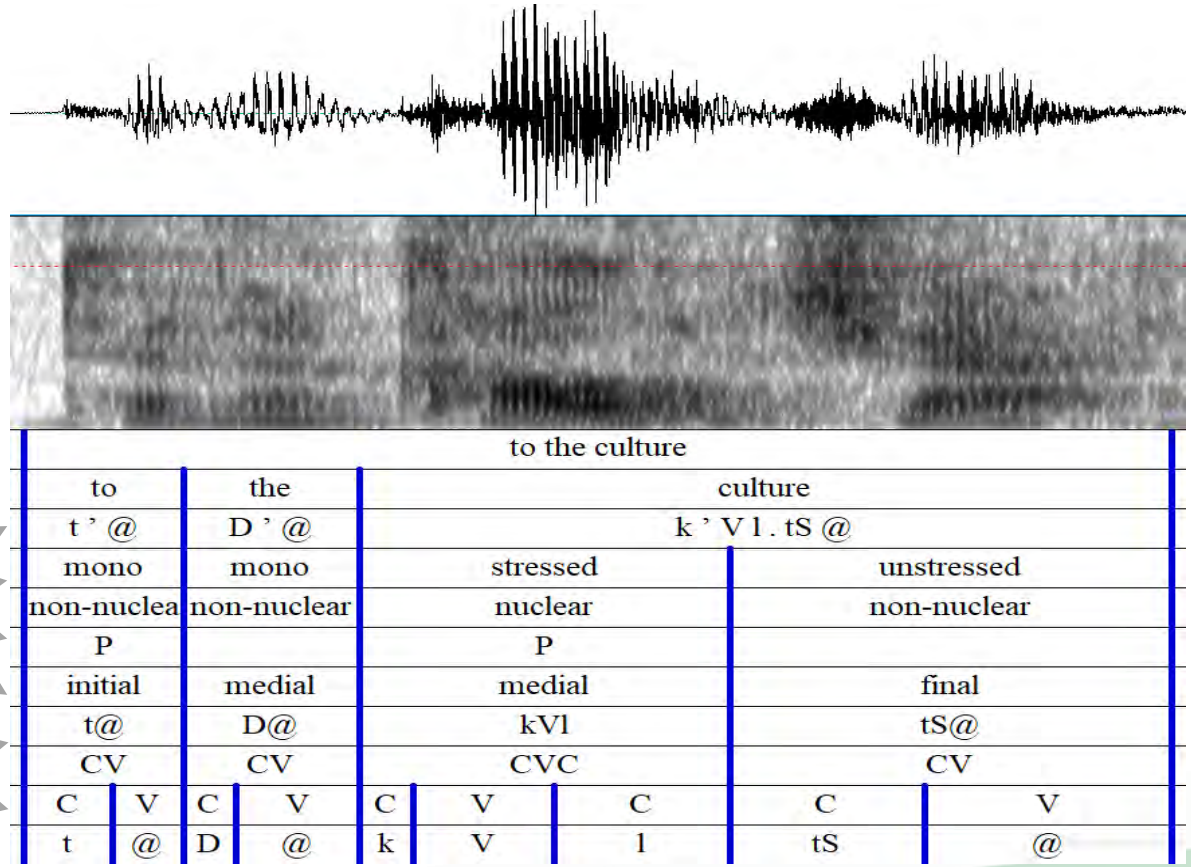
WebMAUS

MFA 2.0

Praat

Python

R



Subsequent steps:

= Broad orthographic utterance transcription via ELAN (identical to the data preparation procedure of ICE Scotland)

- Forced-alignment with WebMAUS (Kisler et al. 2017) and MFA 2.0 (McAuliffe et al. 2017)

→ Syllable and word stress information via WebMAUS

→ Stronger alignment via MFA 2.0 (Gonzalez et al. 2020)

→ Algorithm adapting the WebMAUS boundaries to the stronger MFA 2.0 alignment

PhD Project – statistical analysis

- Linear mixed effects modelling on log-transformed vowel duration with *lme4* and *lmerTest* packages (Bates et al., 2015; Kuznetsova et al., 2017)

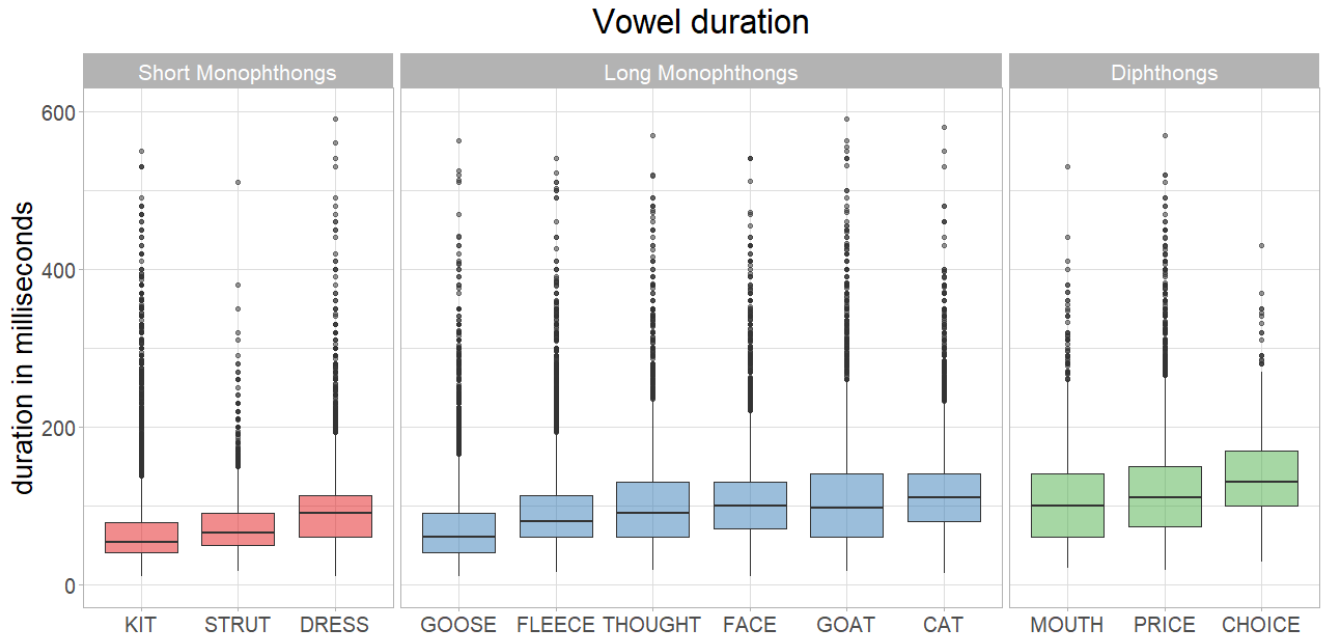
  Random factors: speaker, word
  Fixed factors: SVLR / VE categorization, phrasal position, stress, word frequency, local articulation rate, syllable phone count, word syllable count, style, age, gender, region + all possible interactions

→ stepwise regression with backward selection (AIC | R2) & subsampling technique PrInDT for automatic model generation for the sample including all vowels (Weihs & Buschfeld 2021; Weihs & Weilinghoff forthcoming)

- vowels analyzed collectively and independently; different models for different SVLR and VE classification schemes → avoid collinearity

Findings – vowel overview

Vowel(s)	Lexical Set	Type	Tokens	Mean duration (ms)	Standard deviation (ms)
/ɪ/	KIT	Short monophthong	44382	64.71	41.14
/ʌ/	STRUT	Short monophthong	6467	71.72	35.70
/ɛ/	DRESS	Short monophthong	13714	91.76	47.27
/u/	GOOSE	Long monophthong	6351	92.33	55.55
/i/	FLEECE	Long monophthong	9146	100.42	53.91
/ɔ/	THOUGHT	Long monophthong	7762	112.64	55.79
/ʌʊ/	MOUTH	Diphthong	9394	114.90	56.95
/e/	FACE	Long monophthong	6708	113.00	57.34
/o/	GOAT	Long monophthong	10868	119.10	70.32
/a/	CAT	Long monophthong	2992	119.71	51.23
/ʌɪ/ /ae/	PRICE	Diphthong	9540	125.02	60.52
/ɔe/	CHOICE	Diphthong	480	140.74	59.09

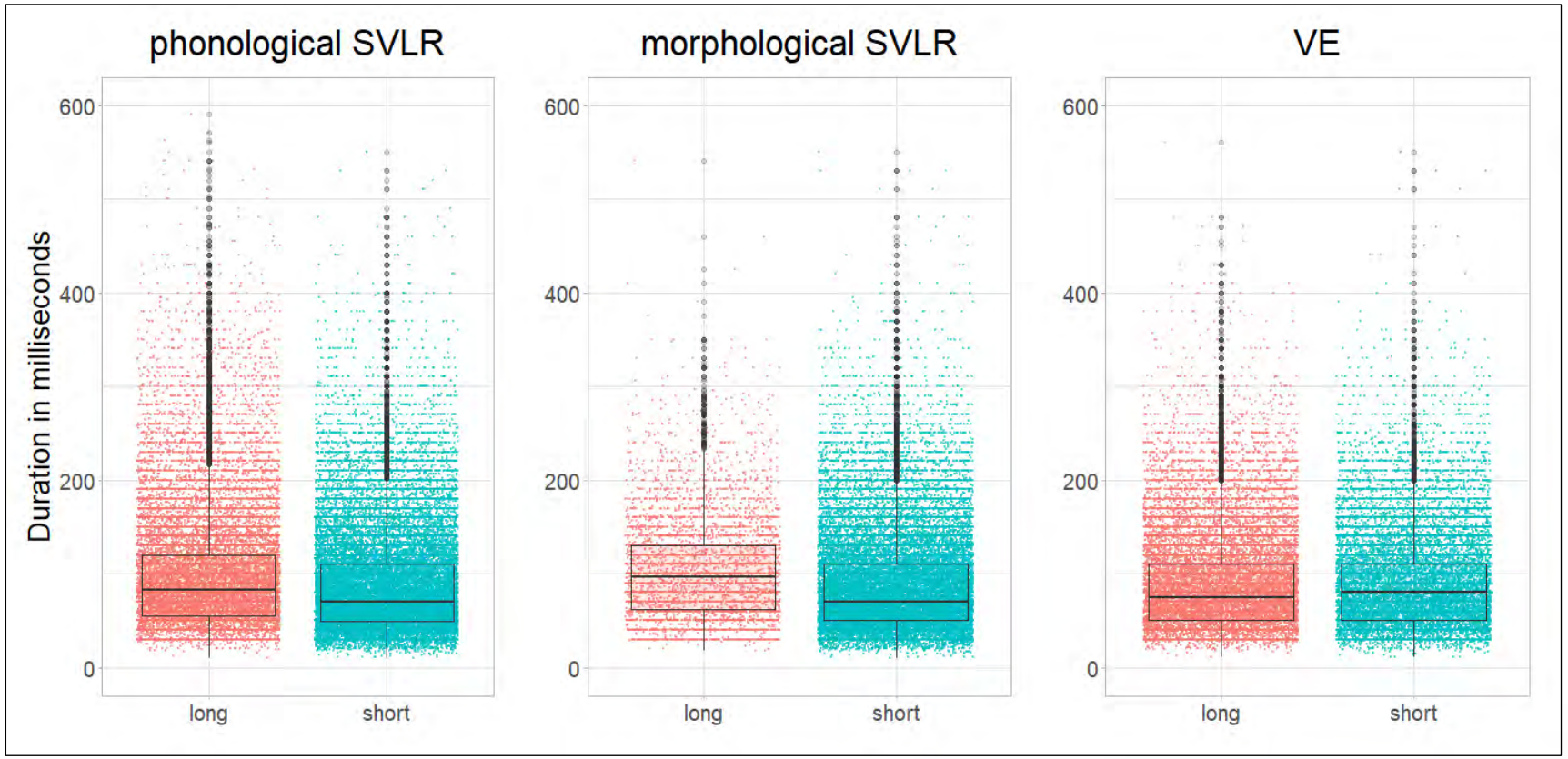


Findings – all vowels

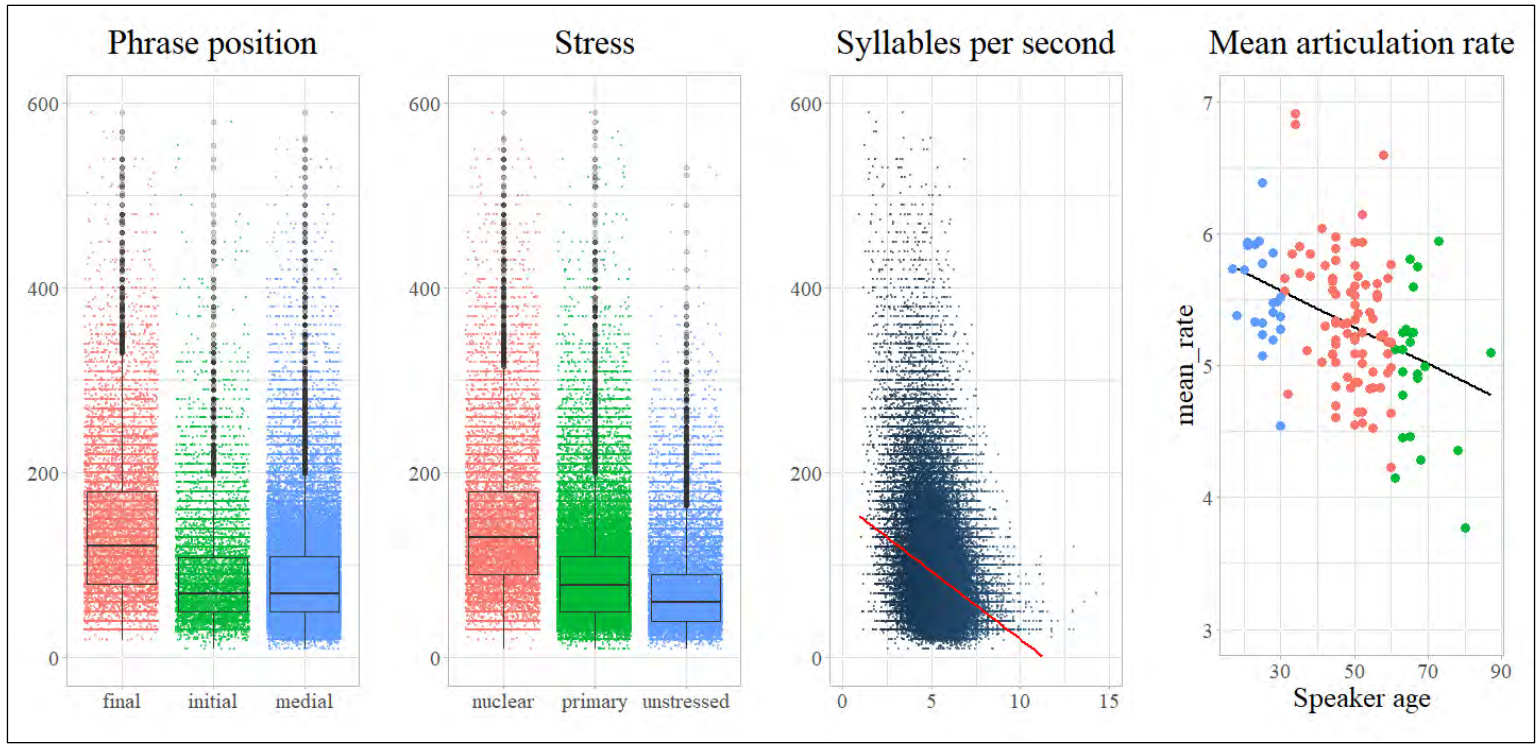
Phonological SVLR:
freeze vs. feed

Moprhological SVLR:
agreed vs. greed

VE
feed vs. feet



Findings – all vowels



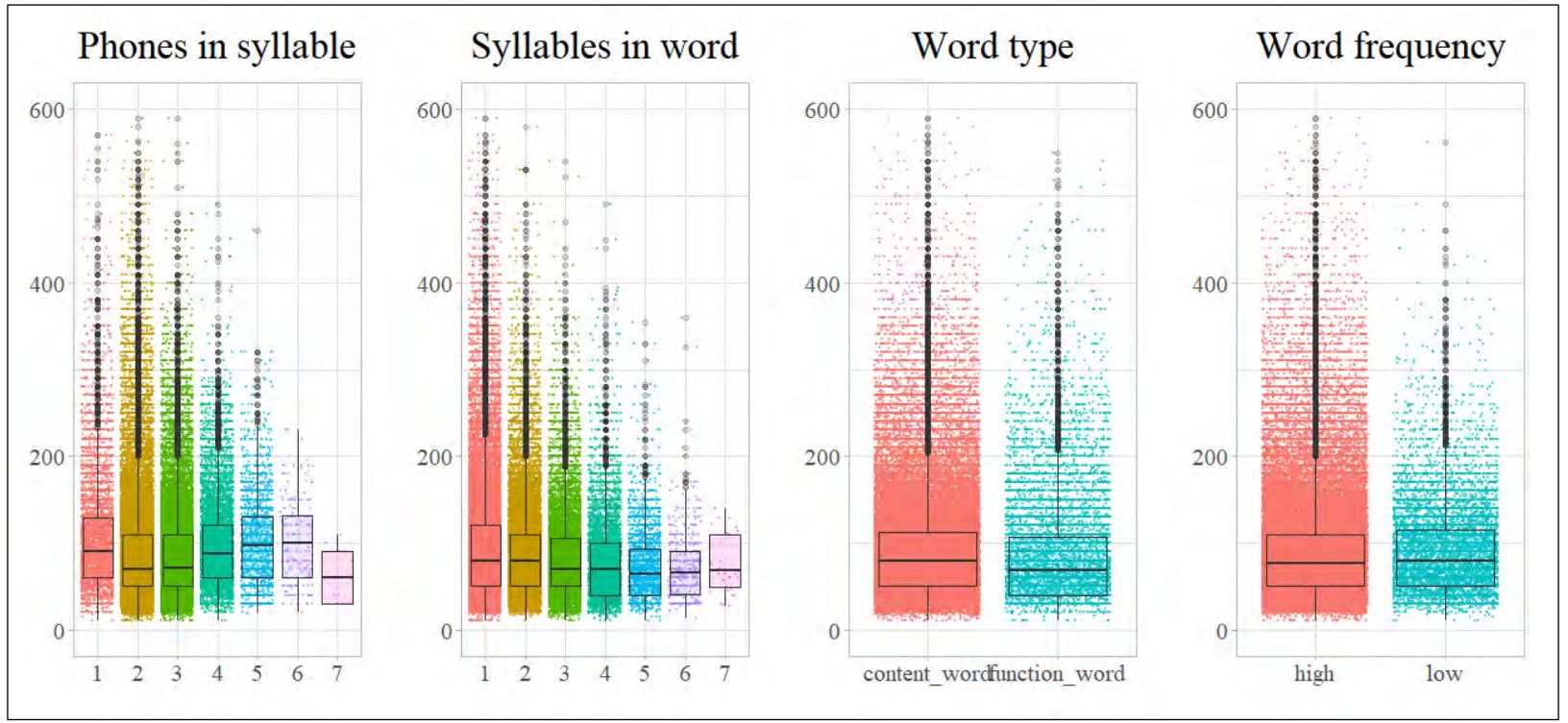
pre-pausal / phrase-final lengthening

nuclear stress

the faster the speech, the shorter the vowels

the older the speaker, the slower the speech

Findings – all vowels



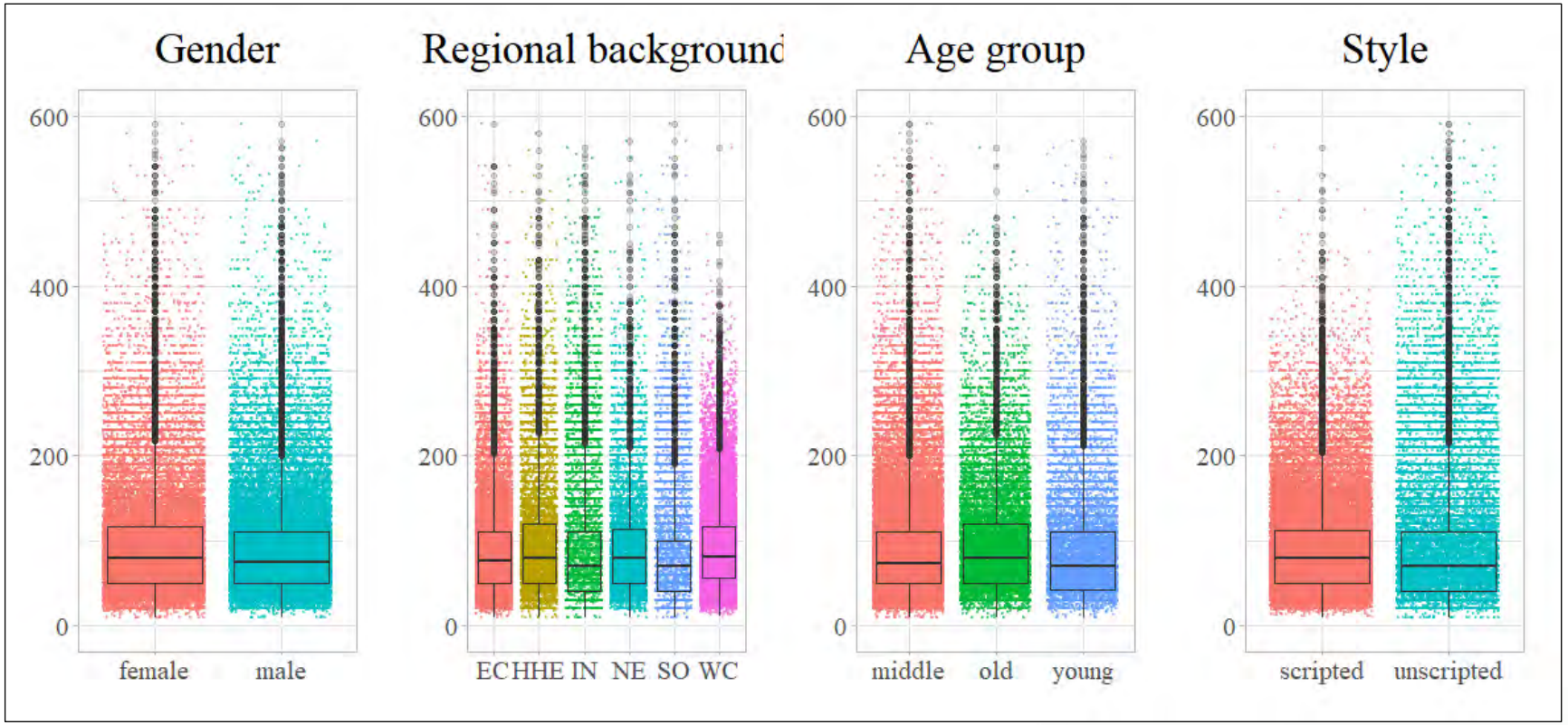
intrasyllabic compression?

polysyllabic shortening?

word category effects?

word frequency effects?

Findings – all vowels



extralinguistic variables?

Findings – individual vowels

Lexical Set	Vowel(s)	Aitken's (1981) SVLR status	Phon SVLR	Morph SVLR	VE	VE (plosive contexts)	Highest cond. R^2	Other important observation
KIT	/ɪ/	no	no	no	no	no	0.36	shortest before nasals
STRUT	/ʌ/	no	no	no	opposite	opposite	0.42	shortest before nasals, anti-VE
DRESS	/ɛ/	yes	opposite	no	opposite	no	0.42	shortest before voiced fricatives
GOOSE	/u/	yes	yes	yes	yes	no	0.40	VE1 significant but not VE2; shortest before nasals
FLEECE	/i/	yes	yes	yes	yes	yes	0.49	shortest before nasals
THOUGHT	/ɔ/	regional variation	weak	weak	opposite	no	0.53	shortest before nasals; anti-VE
FACE	/e/	yes	yes	yes	yes	yes	0.49	shortest before laterals
GOAT	/o/	regional variation	yes	yes	yes	yes	0.41	shortest before voiceless fricatives
CAT	/a/	yes	no	weak	no	yes	0.48	shortest before voiced fricatives
MOUTH	/ʌʊ/	yes	yes	no	opposite	no	0.47	shortest before nasals
PRICE	/ʌɪ/ /ae/	yes	yes	yes	yes	yes	0.46	shortest before voiceless fricatives
CHOICE	/ɔe/	yes / regional variation	no	no	opposite	unclear	0.61	shortest before nasals

Findings – individual vowels

- consistent SVLR patterns in GOOSE, FLEECE, PRICE, FACE, GOAT (/ʉ/, /i/, /aɪ/, /e/ and /o/)
- Aitken's Law does not operate in KIT, STRUT, DRESS, THOUGHT or CHOICE (/ɪ/ /ʌ/ /ɛ/ /ɔ/ /ɔe/)
- SVLR patterns less stable in the Highlands and Southern Scotland
- weak influence of age and genders

Findings – individual vowels

- all vowels are significantly influenced by *tempo*, *stress* and *phrasal position*
- strong interactions between Aitken‘s Law and the factors *stress* and *phrasal position*

→ SVLR is amplified in prominent prosodic contexts

- Anti-voicing effect (Stuart-Smith et al. 2019) found in STRUT, DRESS, THOUGHT, MOUTH, CHOICE

→ **strong shortening before nasals**

Discussion

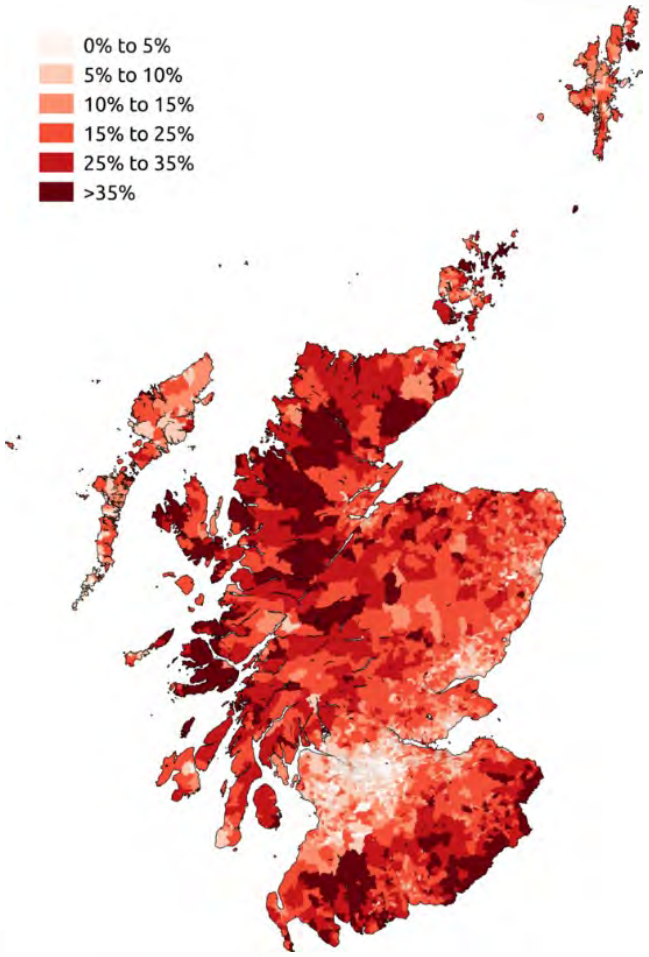
- SVLR operates in 21st century Scottish Standard English

→ stable across genders and age groups

→ slight regional differentiation (weaker in Highlands and South)

→ Relatively stable phenomenon across
GOOSE, FLEECE, PRICE, FACE, GOAT

→ Strong shortening before nasals



Percentage of population born in England

Discussion

- Strong influence of prosodic factors

→ General patterns than can be observed in controlled speech are heavily influenced by prosody in spontaneous speech

- Anti-Voicing effect corroborated in many vowels

→ contradicts established phonological classifications (House and Fairbanks 1953)

Vowel durational patterns differ in controlled and uncontrolled speech settings.

Tech Demonstration

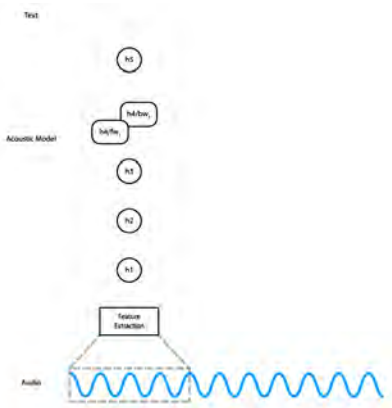
Conventional Automatic Speech Recognition

More info

inner week condition

in a week condition

in a weak condition



I n @ w i k @ n d i S @ n

Acoustic model

Language model

(Yu and Deng 2015: 4)

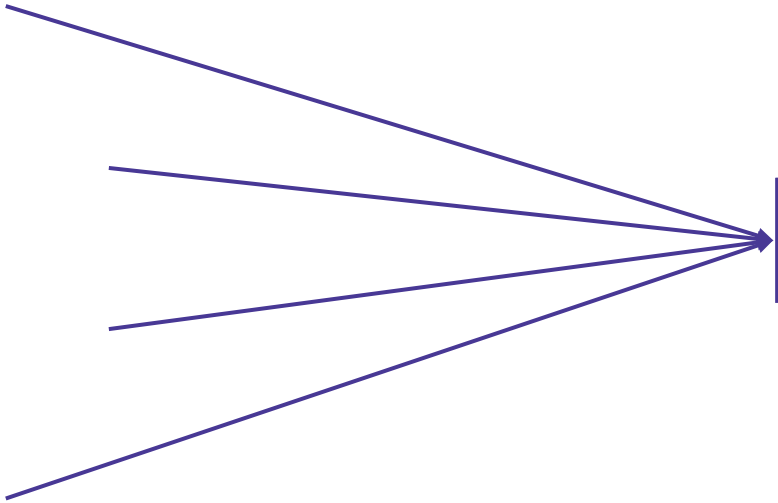
ASR Performance

... the higher the audio quality

... the more structured the speech

... the more ‘standard‘ the speech

... the less speakers involved

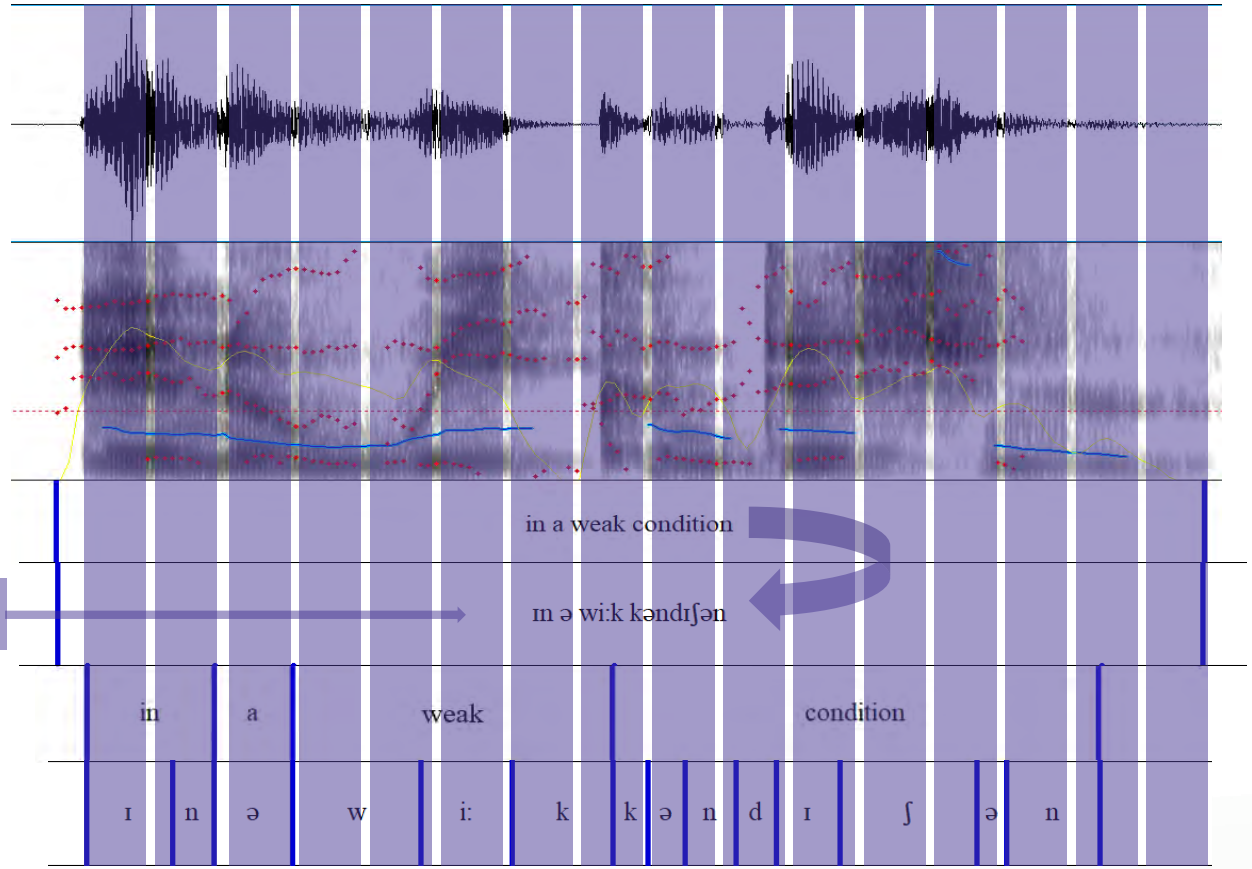


... the better

(Jurafsky and Martin 2023: 331)

Forced alignment

The automatic identification and segmentation of phones based on the input audio and a corresponding broad transcription.



Waveform

Spectogram

Broad transcription

Forced aligner

G2P conversion

Acoustic model

Example: IBM Watson on two sound files

IBM 2022

- ‚state-of-the-art' commercial ASR service
- in-time and long sound file speech recognition possible
- relatively good timestamps and word alignment
- different language models for AusE, BrE and AmE

Testfile 1

Testfile 2

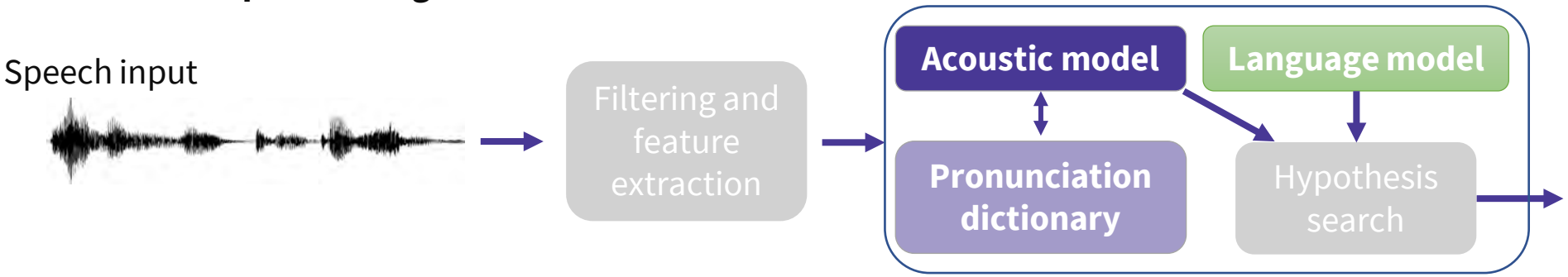
My python script for Watson STT

A possible future?

The increasing strength of AI

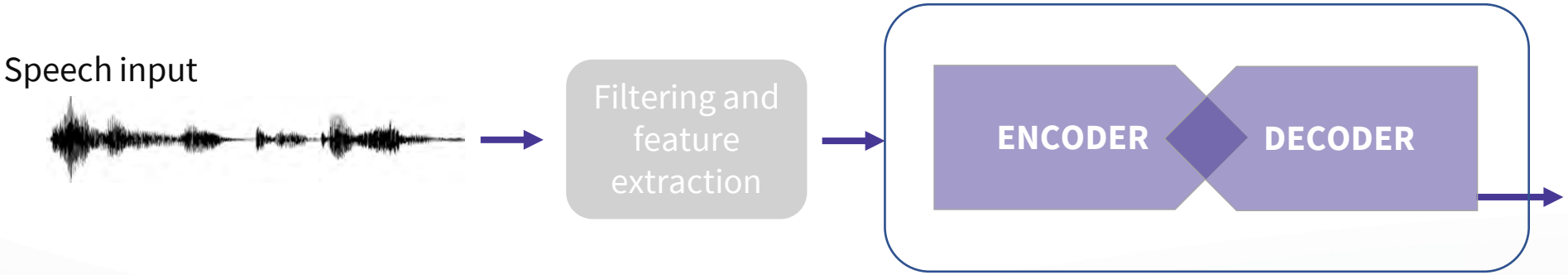
Current breakthroughs in speech recognition

Conventional speech recognition architecture:



(Yu and Deng 2015: 4)

End-to-end speech recognition:



(Jurafsky and Martin 2023: 336 f.)

Example: OpenAI Whisper

Radford et al. 2022

- Latest and arguably strongest research ASR model
  (Radford et al. 2022: 9)
- End-to-end architecture with encoder and decoder blocks
- trained on 680,000 hours of speech, unsupervised learning
- free and open source models
  (larger model = better accuracy but slower performance)
- Multilingual ASR in 96 languages, machine translation to English, punctuation and capitalization

My python script for OpenAI Whisper

Example: OpenAI Whisper

My python script for OpenAI Whisper

OpenAI

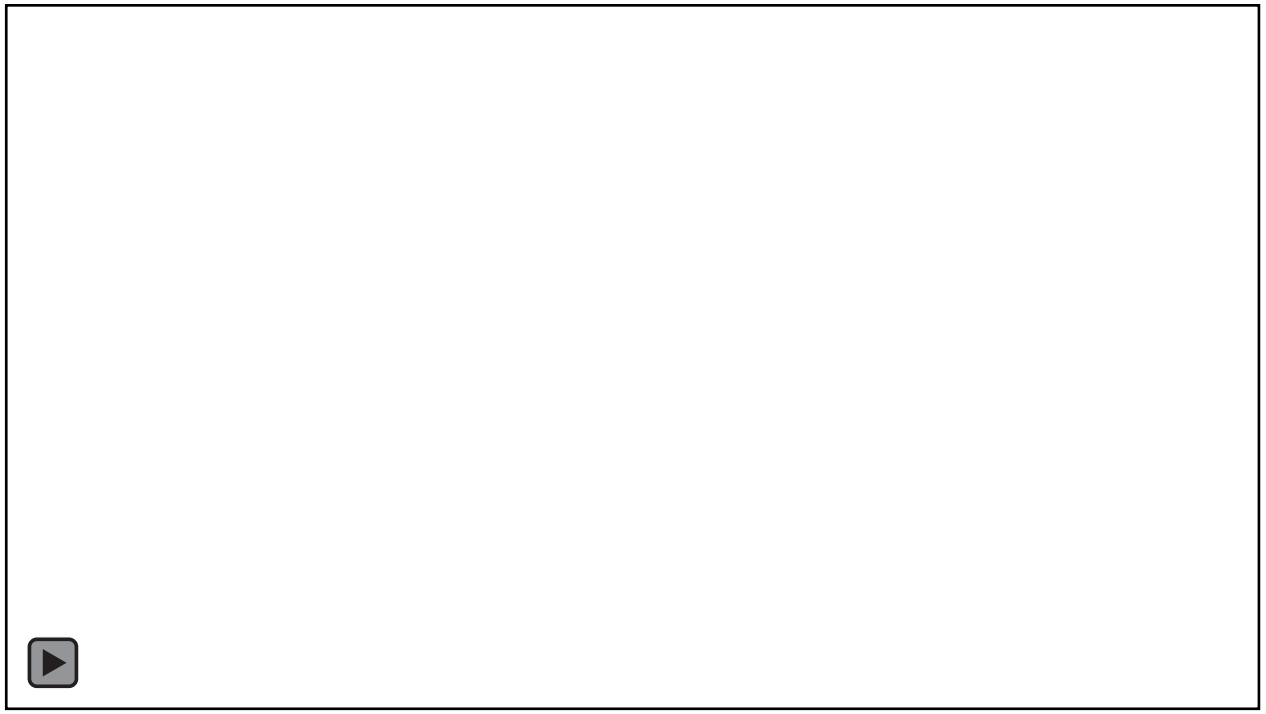
Radford et al. 2022

Size	Parameters	English-only model	Multilingual model	Required VRAM	Relative speed
tiny	39 M	`tiny.en`	`tiny`	~1 GB	~32x
base	74 M	`base.en`	`base`	~1 GB	~16x
small	244 M	`small.en`	`small`	~2 GB	~6x
medium	769 M	`medium.en`	`medium`	~5 GB	~2x
large	1550 M	N/A	`large`	~10 GB	1x

Example: OpenAI Whisper

OpenAI

Radford et al. 2022



My python script for OpenAI Whisper

Testfile 2

Scouse

Swiss

Looking ahead and implications for research and teaching

→ Transcription work will become much easier in the near future

→ Speech recognition, machine translation, grammar checkers and chatbot services (e.g. ChatGPT) will become much stronger in the near future → powerful tools

→ Great potential for data preparation and data processing

→ Reevaluation of written/digital university examinations
(e.g. term papers, essays, translation work, etc.)

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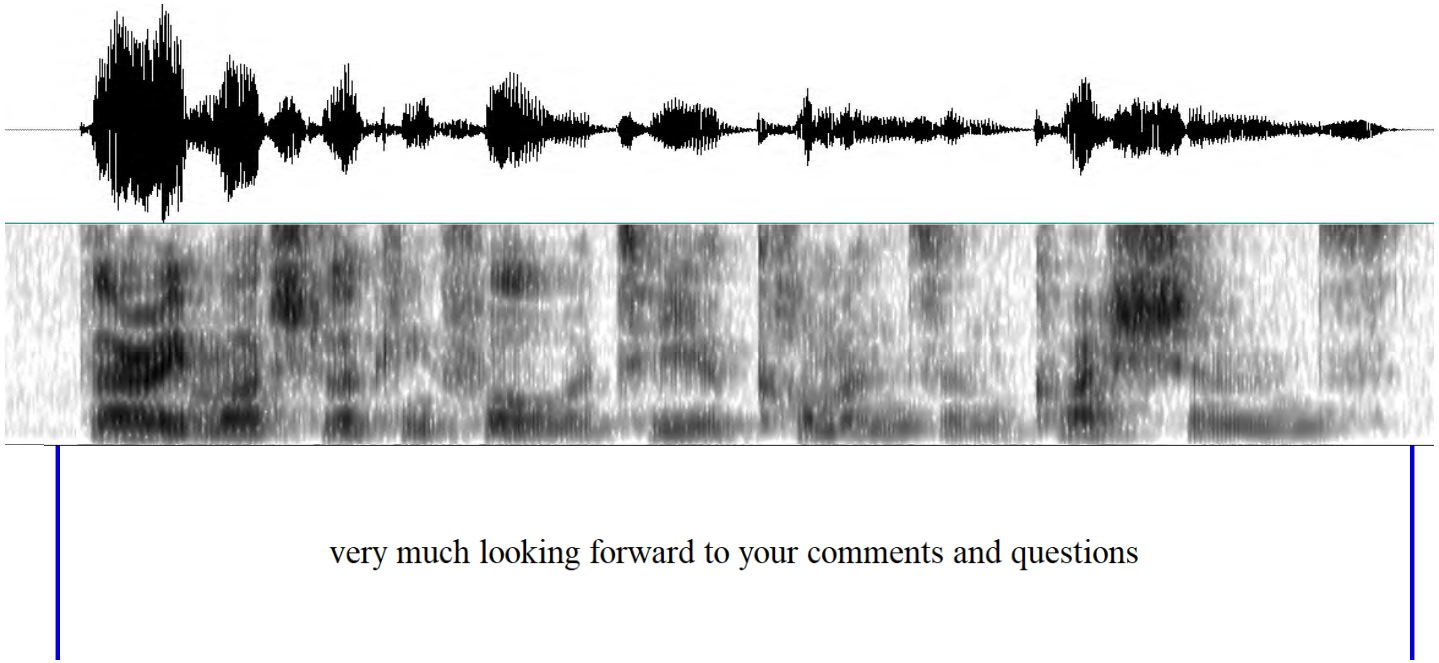
Thank you very much for your attention!



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