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30+ years of corpus-based language variation studies. Experiences, challenges and inspirations

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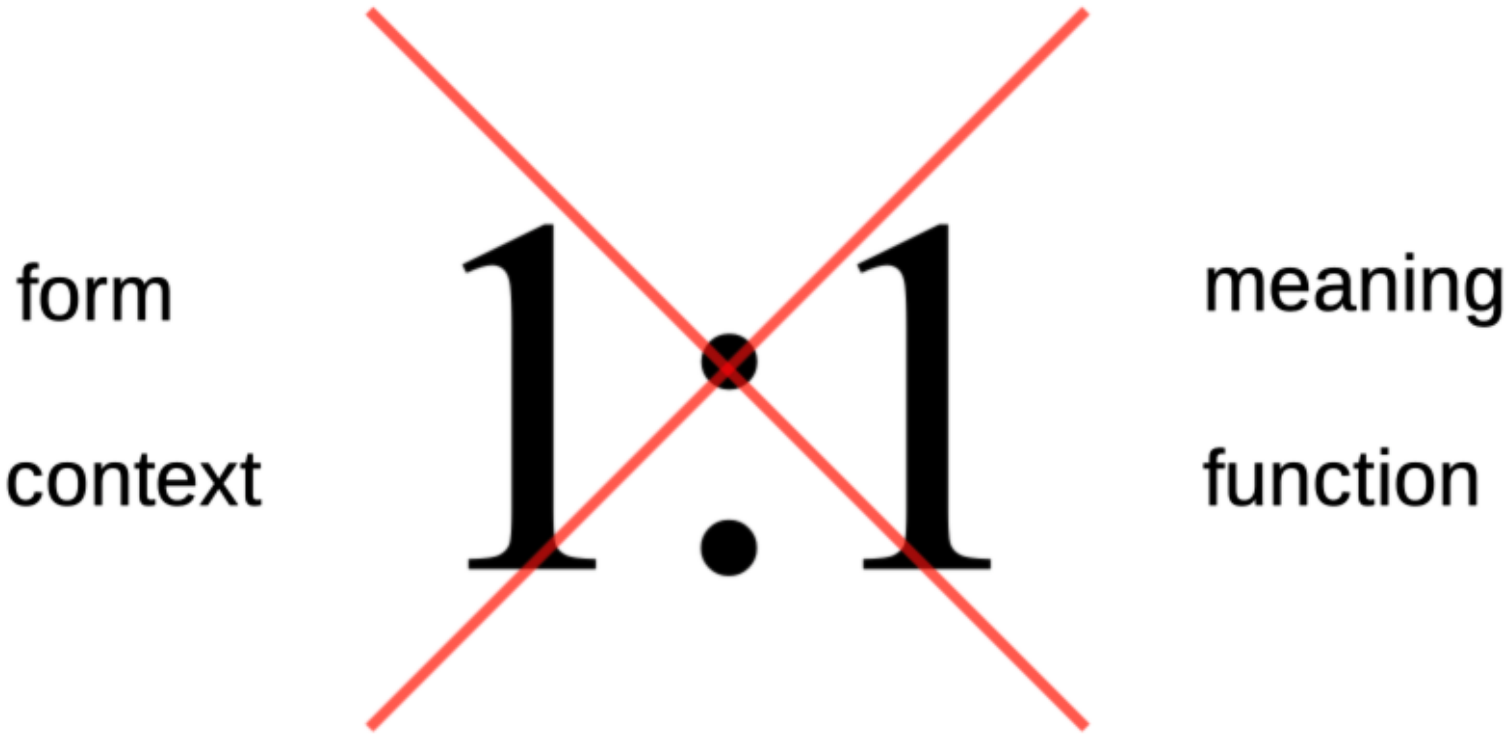
1:1


form
1:1
meaning
context
function


form
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1:1
meaning
function

Variation in language

Absence of 1:1 correspondence between form–function

- synonymy (more forms for one function)
  - *splendid* – *smashing*, *strong* – *powerful*
  - *robiť* – *drieť* (make, labour)
  - *lidma* – *lidmi* (people$^{Inst.pl.}$)

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  - *robiť* – *drieť* (make, labour)
  - *lidma* – *lidmi* (people$^{Inst.pl.}$)
- homonymy/polysemy (more functions of one form)
  - *stavení* (building$^{\{N,G,D,A,V,L\}sg.,\{N,G,A,V\}pl.}$)
  - *left* (leave, not right)

Variants of variation

Language levels

- phonology, morphematics – phonemes, morphemes
- morphology, derivation – indicators of variety
- lexicon, syntax – meaning/function
- text – register/style, sociolect

Perspectives

- synchronic (sociolinguistic, register)
- diachronic (dialectal)

Variation and linguistics

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- ...by denying/fighting it – prescriptive tendencies
  - but N.B.: variation is natural & *all-pervasive in human language* (Ferguson 1983: 154, cit. Biber-Conrad 2009: 23)

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  - but N.B.: variation is natural & *all-pervasive in human language* (Ferguson 1983: 154, cit. Biber-Conrad 2009: 23)
- ...by studying it – variability on lower levels is used on higher ones (emphasises hierarchical nature of language)

Variation as a pointer

- "free variation" does not exist (in the long run)
  - alternative forms → functional (or semantic) differentiation
  - alternative meanings → formal (or contextual) differentiation
- if there is a variability ⇒ language will employ it
- variation is a *pointer* to a (hidden) *function* (usually on a higher level)

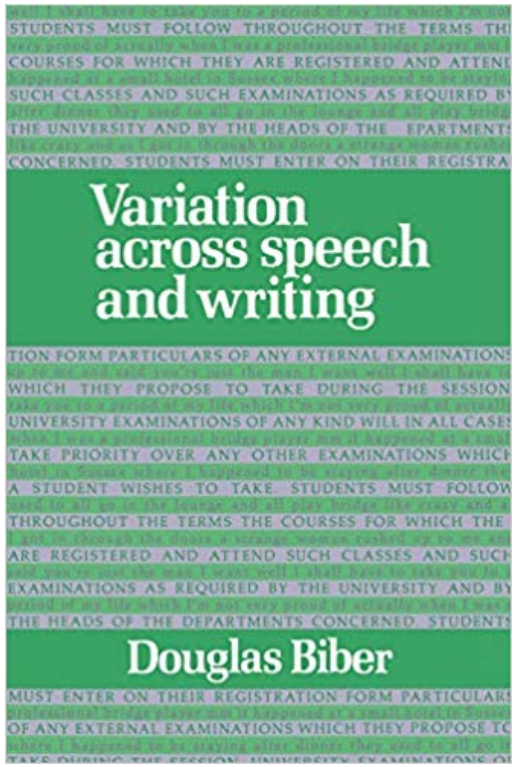
Variation and corpora

Corpus-based approaches to variation

- (annotation – lemmatization, tagging – as a way of coping with variability)
- variation is an empirical phenomenon *par excellence* – most of the variation cannot be captured by intuition
- finding invariant is parallel with searching for *pattern* ($\leftarrow$ very CL concept)
- $\Rightarrow$ frequency is crucial in describing variation (*SyD*, *Word at a Glance*)
- corpora are necessary for *identification* areas of variation as well as for describing their *principles*, *range* and *inventory*

30+ years of corpus-based...

Douglas Biber (1988): *Variation across speech and writing*. Cambridge: Cambridge University Press.



Variation in texts

Variability of texts

Invariant: information/message

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Invariant: information/message

Traditionally described by stylistics

- qualitative (what is general and what is specific?)
- absence of scaling (what is dominant and what is marginal?)

Two perspectives

Emphasised in CL approaches to text variation

- intratextual – *dough* – **register** (linguistic properties)
- extratextual – *cake* – **genre** (conventional categorization)

Multi-dimensional analysis (MDA)

Principles of MDA

Multi-dimensional analysis (Biber 1988; Biber & Conrad 2009)

- systemic & **functional** variability
- motivated by context & situation
- registers ($\sim$ intratextual) perspective
- assumption: text production involves **interrelated choices** $\rightarrow$ groups of features $\rightarrow$ dimensions of variation
- what is used, how often and together with what (bottom-up empirical approach)

Methodology of MDA

1. corpus compilation

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2. list of features

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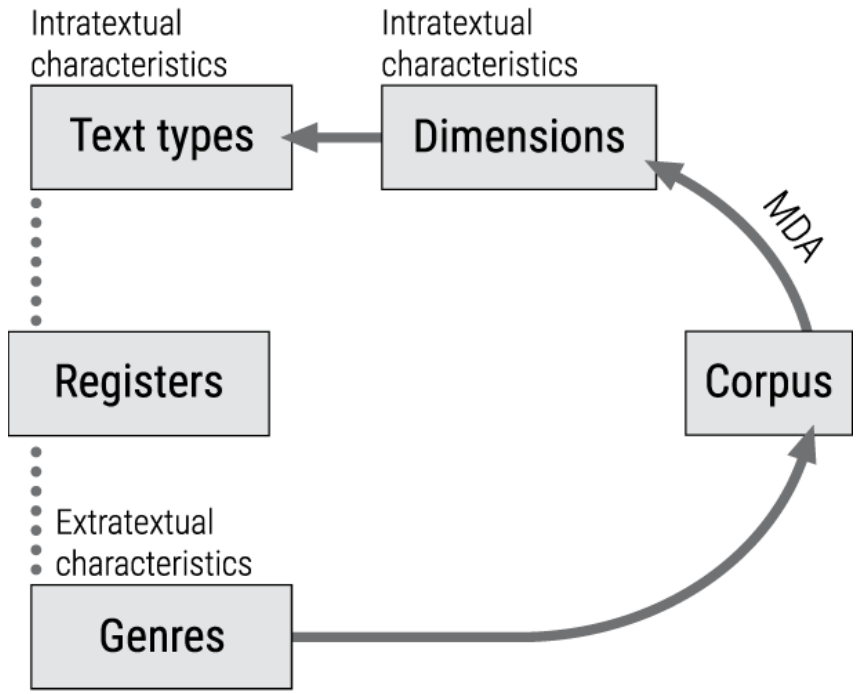

MDA of Czech

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Adrian Jan Zasina

MDA of Czech

Expected challenges / highlights of MDA...

- ...in Czech – situation bordering on **diglossia** (Bermel 2014): Literary × Common Czech
- ...in Slavic languages – specific morphology, **inflection**, free word order
- ...in 21st century – how to include the web data (Biber & Egbert 2016; Sharoff 2018)

Results published in:

- Cvrček, V. et al. (2018a): From Extra- to Intratextual Characteristics: Charting the Space of Variation in Czech through MDA. *Corpus Linguistics and Linguistic Theory*.
- Cvrček, V. et al. (2018b): Variabilita češtiny: multidimenzionální analýza. *Slovo a slovesnost* 79, 293–321.

Data: Corpus Koditex

- guiding principles: *diverse*, contemporary, *text length* control
  - "diversified" stratified sampling
  - after 1990, majority from 2007–2014
  - text excerpts = **chunks** (not whole texts)
- annotation: lemmas, tags, multi-word unit & named-entity recognition
- tools: KonText, MorphoDiTa, NameTag
- 3 modes – `wri`, `spo`, `web`
  - 8 divisions, 45 classes, ≈ 200,000 words per class

Category	#
Tokens	10,8 M
Words (excl. punct.)	9 M
Lemmata (types)	204 K
Text chunks	3 334

Features and their operationalization

Originally 140+ features, final list *122*, e.g.:

- phonetics – narrowing *é* > *í*, diphthongization *ý* > *ej*, average word length...
- morphology – freq. of cases, numbers, moods, tenses...
- derivation – adjectives denoting similarity, verbal nouns, diminutives...
- lexicon – indefinite pronouns, reporting verbs, verbs of thinking, semantically bleached nouns...
- pragmatics – contact expressions, fillers, intensifiers, downtoners...
- syntax – types of attributes, clusters of POS, types of dependent clauses...
- text/discourse – questions, phraseology, word repetition...

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Type-based features – inventories of pronouns, prepositions, conjunctions (relativized using **zTTR**, Cvrček & Chlumská 2015)
Lexical richness – Yule's K, thematic concentration (Popescu et al. 2007), unigrams & bigrams (zTTR)

Evaluation & statistics

Text-linguistic approach to variation

- frequency of all features in each text
- co-occurrence of features
- factor analysis: *latent factors* influencing use of features
- latent factors = dimensions of variation (major forces in shaping a text)
- dimensions are not equally important (hierarchy)

Factor analysis outputs

- loadings – ”correlations”of features and dimensions
  - participation of a feature on a dimension
- factor scores – positions of texts within dimensions
  - linguistic characteristics of a text
- 8 dimensions identified
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Interpretation follows these questions:

- what are the loadings of individual features (prominent vs. inert)?
- what is the position of individual text (based on factor scores)?
- what is the position of genres (groups of texts)?

Feature loadings – 1st dimension

Description	Loading
verbs: past tense	0.977
verbs	0.960
verbs: indicative forms	0.952
finite verbs	0.946
verbal aspect (perfective)	0.934
3rd person pronouns (personal + possessive)	0.778
semantically bleached verbs	0.721
function words	0.712
adverbs of time	0.687
pronouns	0.684
verbs: 1st person	0.682
reporting verbs (verba dicendi)	0.665

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Description	Loading
nominal post-modifiers without agreement	-0.792
adjectives	-0.781
noun pre-modifiers with agreement	-0.723
abstract nouns	-0.723
nouns: genitive	-0.723
adjective clusters	-0.705
noun clusters	-0.694
clusters of same-case adjectives	-0.675
average word length (number of syllables)	-0.674
nouns	-0.672
verbal nouns	-0.625

Qualitative double-check

„Opravdu si myslíš, že ti dovolím odplout?“ zeptal se vévoda, objal ji a přitáhl si ji k sobě. Na okamžik Valeria vůbec nedokázala uvěřit, že se něco takového děje. Pak však jeho rty zajaly její a on ji políbil a celý svět se náhle zatočil. Líbal ji něžně, ale majetnicky, stejně jako posledně. Když pak cítila, že v ní začíná narůstat extáze, zvedl hlavu a velmi tiše se zeptal: „Kdy si mě vezmeš, má lásko?“ Valeria na něj jen beze slova hleděla. Obličej se jí rozzářil, jako by v ní někdo zapálil tisíc svící.

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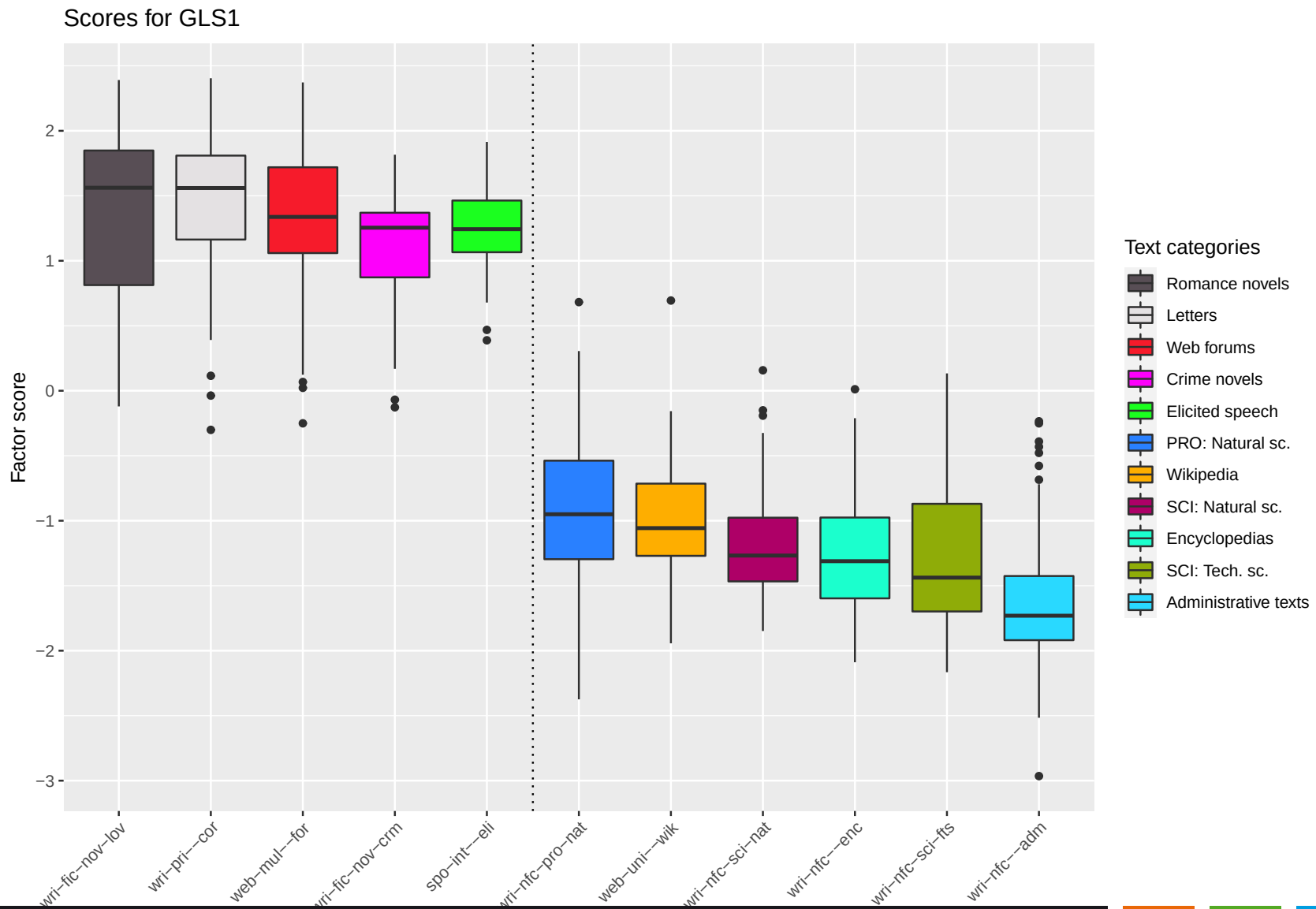
Speciální pedagog získává odbornou kvalifikaci vysokoškolským vzděláním získaným studiem v akreditovaném magisterském studijním programu v oblasti pedagogických věd zaměřené na speciální pedagogiku. (…) Psycholog získává odbornou kvalifikaci vysokoškolským vzděláním získaným studiem v akreditovaném magisterském studijním programu psychologie…

(Michalík, Jan: Katalog posuzování míry speciálních vzdělávacích potřeb; `wri-nfc-pro-ssc`)

Aggregated factor scores – 1st dimension



Interpretation – 1st dimension

Dimension 1: **dynamic** (+) vs. **static** (-)

- verbal (+related) vs. nominal (+related) constructions
- opposing strategies: elaboration of clause members (-) or adding new clauses (+) → *clausal* vs. *phrasal* (Biber 2014)
- inert feats: dim 1 is indifferent to preparedness of speakers/writers
- (+) factor scores: two shades of "verbality" – *narrative* (e.g. various kinds of novels) + *reflective* (verbs of thinking in `pri-cor` or `web` forums)
- (-) factor scores: information-dense texts – official documents, hard science papers, encyclopaedias
- most variance explained

Feature loadings – 2nd dimension

Description	Loading
contact expressions	0.974
fillers	0.854
interjections	0.824
demonstrative pronouns (excl. 'to')	0.821
expressive particles	0.795
pronoun non-dropping	0.793
vowel breaking *ý* > *ej* in endings	0.778
demonstrative adverbs	0.776
word repetition	0.767
locative adverbs	0.763
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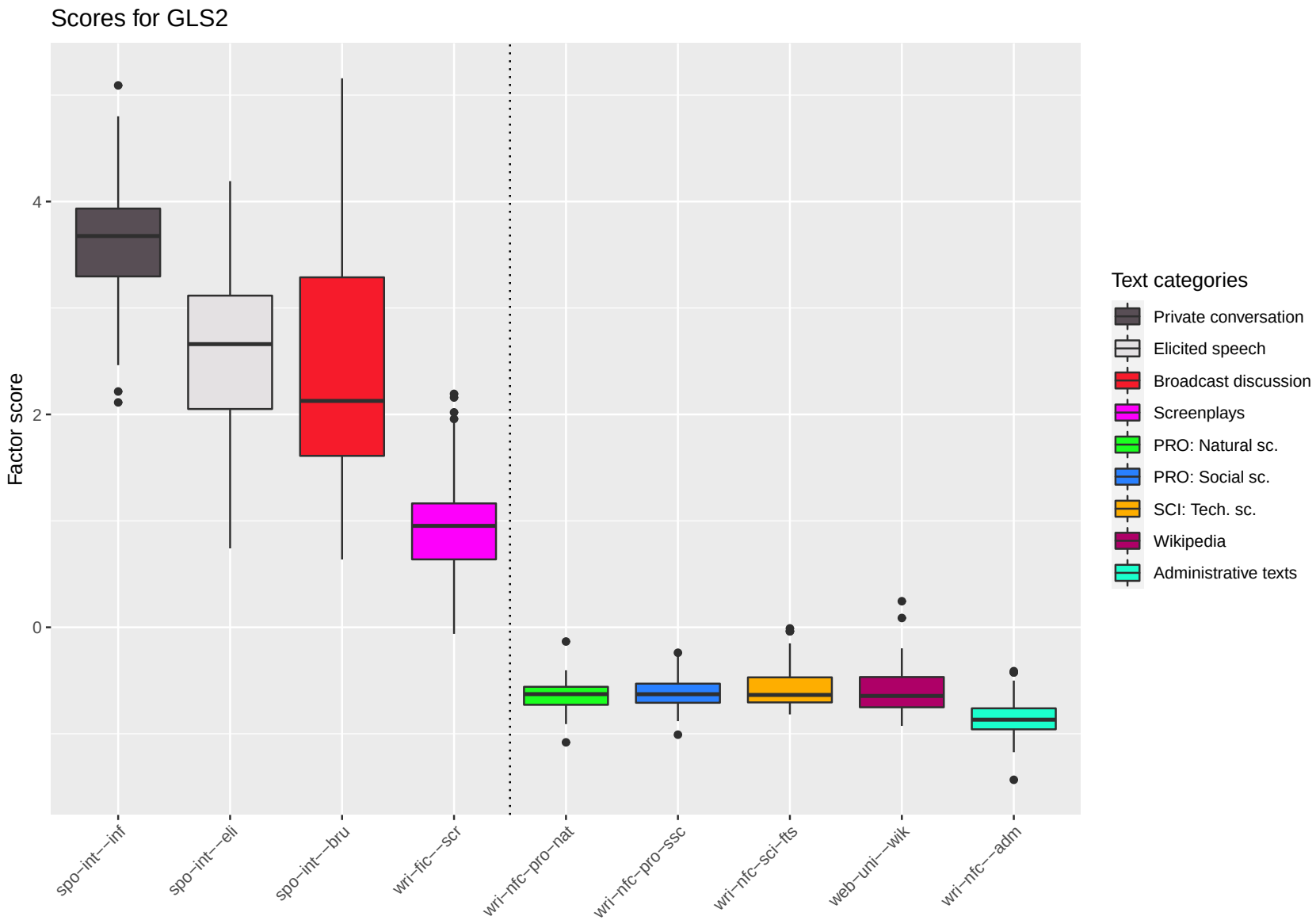
Description	Loading
nominal cases with prepositions	-0.624
clauses with wh-adverbs	-0.567
prepositions	-0.559
verbal aspect (perfective)	-0.493
unigrams	-0.463
nouns: nominative-accusative	-0.460
nouns	-0.367
repertoire of prepositions	-0.360
average word length (number of syllables)	-0.357
nouns: instrumental	-0.349
nouns: locative	-0.307

Factor scores – 2nd dimension



Interpretation – 2nd dimension

Dimension 2: **spontaneous** (+) vs. **prepared** (-)

- reflects differences in conditions of production: `wri` (editing and refining possible) vs. `spo` (online production)
- positive features mark:
  1. interactivity (contact exp., fillers, demonstratives, pronouns, word repetition)
  2. informality (expressive particles, interjections)
  3. conventionalised non-standard Common Czech morphonological variants
- (+) texts: `spo-int-inf`, `pri-cor`, `web-mul` (`fcb` / `for`)
- (-) texts: administrative texts, Wikipedia, `sci-fts`, `pro-nat`

2D graph


GLS2
4
2
0
-3
-2
-1
0
1
2
GLS1
DIVISION
spo-int
spo-nln
web-mul
web-unl
wrl-flc
wrl-nfc
wrl-nmg
wrl-prl
MODE
spo
web
wrl

All dimensions

1. *dynamic* (+) × *static* (-): verbal/clausal × nominal/phrasal constructions
2. *spontaneous* (+) × *prepared* (-): hit-and-miss redundant coding × carefully worded formulations
3. *higher* (+) × *lower* (-) *level of cohesion*: propensity to use connecting devices and means of intratextual reference
4. *polythematic* (+) × *monothematic* (-): lexically rich × repetitive texts
5. *higher* (+) × *lower* (-) *amount of addressee coding*: explicit references to communication partners
6. *general* (+) × *particular* (-): description of general qualities × discussion of particular referents
7. *prospective* (+) × *retrospective* (-): present and future tense, non-narrative × past tense, narrative
8. *attitudinal* (+) × *factual* (-): degree of explicit epistemic certainty, higher × lower amount of hedging

Note: not all dims are equal – most important: 1, 2, 5, 8

MDA summary

MDA of Czech – outcomes

- hierarchical description of variation
  - projection of low-level features (e.g. morphology) on higher levels (register)
  - relative importance of dimensions and features

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- better description of features (systemic functional variation)

MDA summary

MDA of Czech – outcomes

- hierarchical description of variation
  - projection of low-level features (e.g. morphology) on higher levels (register)
  - relative importance of dimensions and features
- better description of features (systemic functional variation)
- applications of MD model
  - landscape description (registers)
  - sources of variation (idiolect vs. register)
  - practical implications (corpus design etc.)

Establishing registers

Intratextual classification

Registers

- classification based on features used (rather than convention or tradition)
- clusters of texts in 8-D space (distance $\sim$ similarity)

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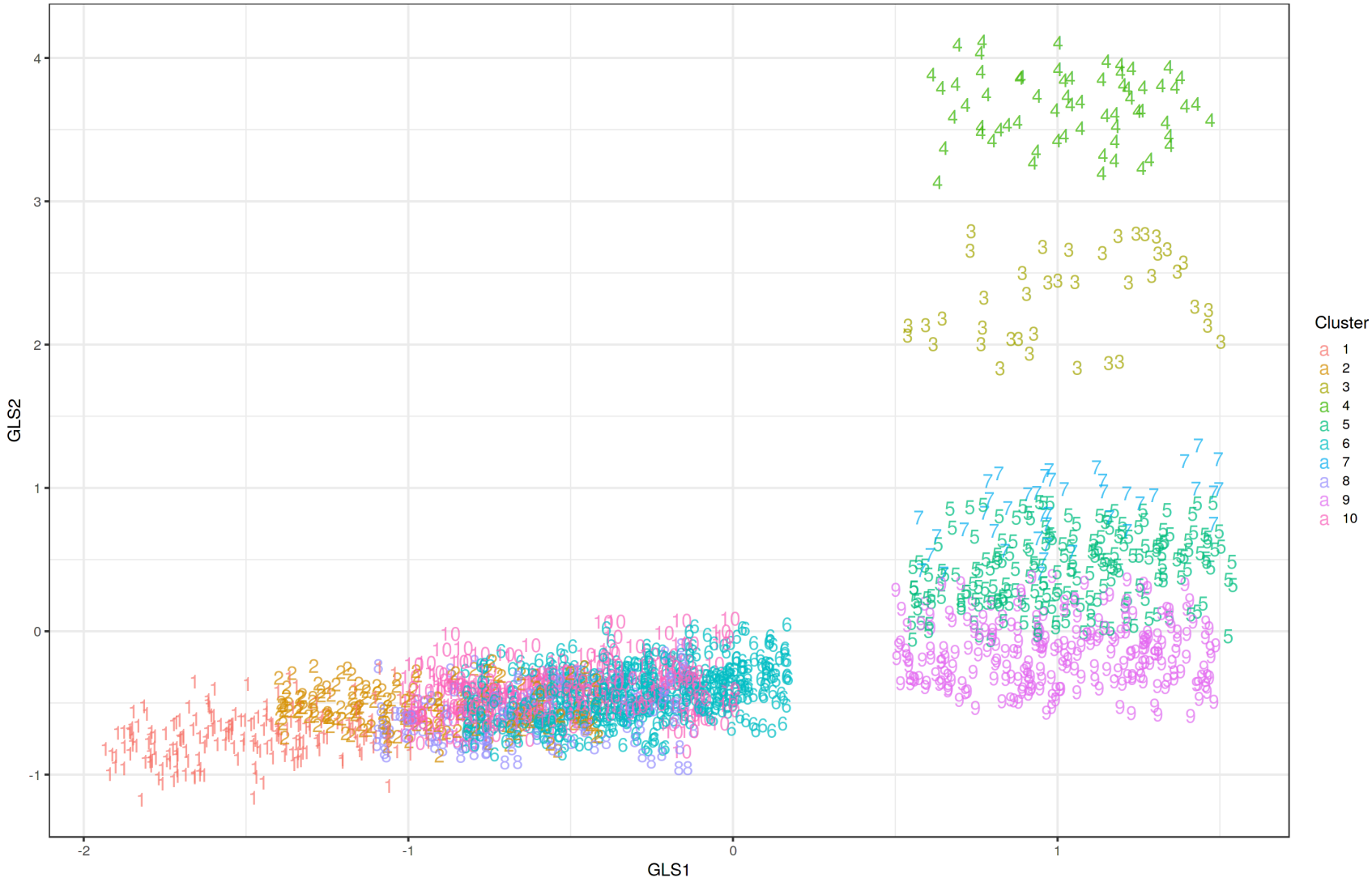
Motivation

- "register matters" (cf. Biber et al. Longman Grammar 1999, Cvrček et al. 2010)
- "know your data" – popularization (non-fiction or journalism?), memoirs (non-fiction, fiction or journalism?)

Clusters – registers

K-means clustering: 10 registers



Registers

- static registers
  - analysis: static monothematic
  - popularization: static polythematic general
  - journalism: static indefinite
  - facts: static polythematic particular
  - reasoning: static cohesive
- dynamic registers
  - survey: dynamic non-addressing
  - conversation: dynamic spontaneous
  - commentary: dynamic attitudinal
  - screenplay: dynamic addressing
  - narration: dynamic retrospective

$\Rightarrow$ further elaboration to subregisters is possible (J. Henyš – 20 web registers)

Proportion of registers within text classes

Web multidirectional (`dis`, `fcb`, `for`)

- commentary (73 %)
- journalism (10 %)
- reasoning (9 %)

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Written fiction (`crm`, `lov`, `scf`, `scr`, `ver`…)

- narration (75 %)
- screenplay (13 %)
- commentary (4 %)

Register versus idiolect

Projecting CPACT data on MD model

CPACT data

- data collected within *CPACT* project (D. Kučera)
- 200 native speakers of Czech – proportionate stratified sampling (age, gender, education)
- rich psychological metadata – *Big Five personality traits*, *DASS 21* (Depression, Anxiety, Stress Scale) etc.
- each participant wrote 4 texts within one day following a scenario (Letter from vacation, Letter of complaint, Letter of apology, Cover letter)
  - form/genre: letter
  - length: 180–200 words

Analysis of CPACT data

- same set of features as used in original MDA
- results projected onto original MD model

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Statistical modeling:

- ANOVA – effect size (η)
- Kruskal-Wallis test – effect size (E_R^2)
- Linear Mixed-effects models (LMER) – coefficient of determination (R^2)

Response: Text factor score $\sim$ Explanatory: Scenario $+$ Author

Idiolect vs. register (1:2)

Range of variation and corpus design

Representativeness

Corpus representativeness & variation

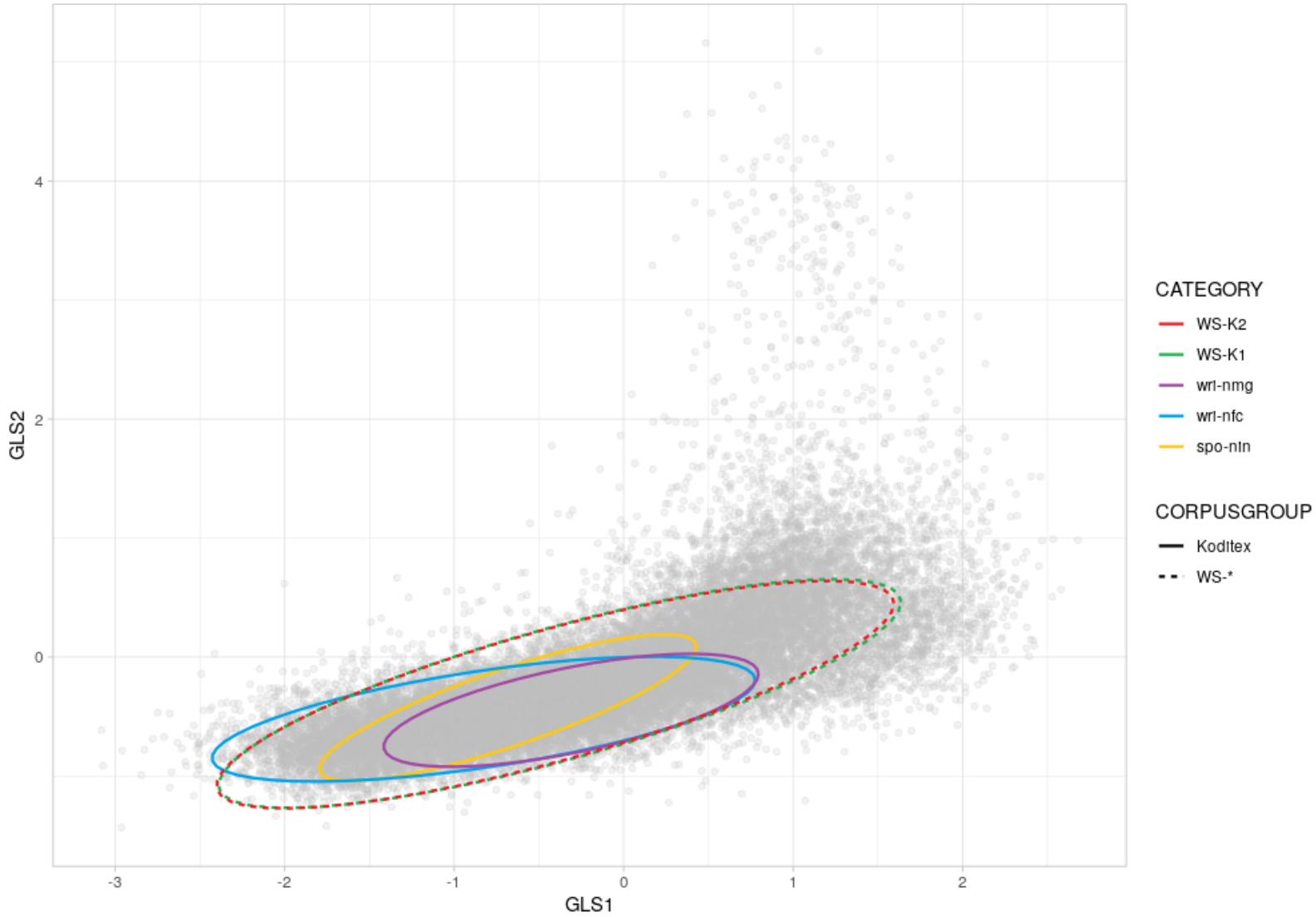
- known issue of CL
- "Representativeness refers to the extent to which a sample includes the full range of variability in a population." (Biber 1993: 243).
- "Thus a corpus design can be evaluated for the extent to which it includes: (1) the range of text types in a language, and (2) the range of linguistic distributions in a language." (Biber 1993: 243).
- $\Rightarrow$ comparing corpora w.r.t. the **variability they cover**

Traditional vs. web-crawled corpus

Sampling the Araneum Bohemicum corpus

- Araneum Bohemicum Maximum 15.04 (May and June 2013, 5.4. bln. tokens; Benko 2016)
- opportunistic design
- representation of "searchable"web
- 2 samples (WS-K1, WS-K2 – 5000 texts each)
- text length distributions modelled after Koditex
- subsequent processing analogous to Koditex texts

Koditex vs. WebSample in 2D



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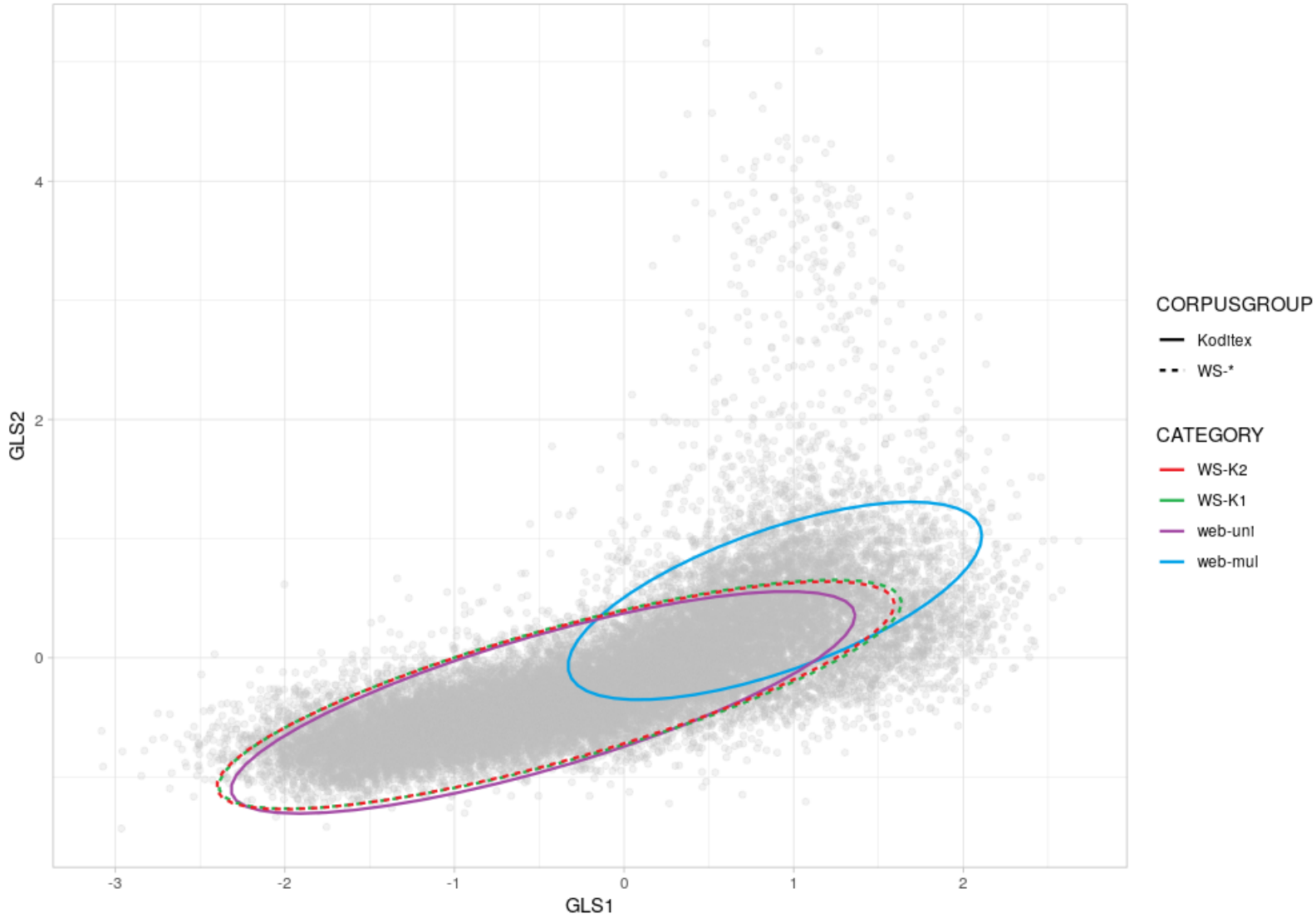

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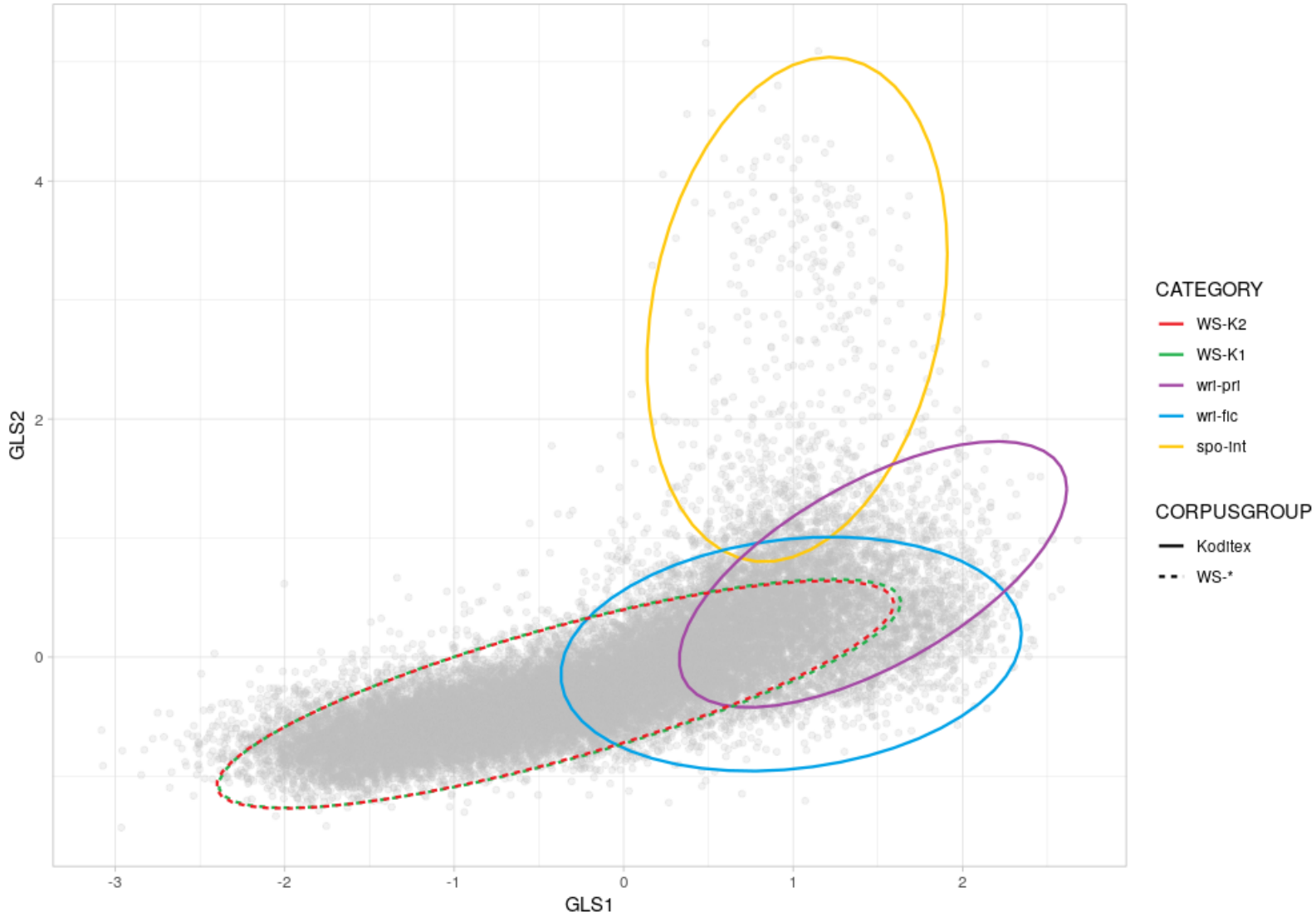

Conclusions

Inspirations

Corpus-based studies of language variation

- reveal the functions of linguistic features, e.g.
  - *vocative* as a typical feature of dialogue (not necessarily spontaneous spoken conversation)
  - *demonstratives* as a correlate of unprepared spoken production

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- web = *terra incognita* (J. Henyš – 20 web /sub/registers: review, advise, description, Q&A, how-to, encyclopaedia…)
- register-sensitive annotation (lemmatization and tagging)

Challenges

- overcoming the stereotypes in variation descriptions
  - based on axiology and prescription
  - non-hierarchical approach of traditional stylistics $\times$ not all factors/dimensions or registers are "born equal"
  - qualitative approach $\times$ distinguishing the marginal and major variants

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  - the impact of MDA settings (features and texts used) on its results
  - register – topic relationship

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- replicability and reliability of MDA
  - the impact of MDA settings (features and texts used) on its results
  - register – topic relationship
- uncovering the functions of variation

1:1

Thank you for your attention!

Acknowledgement

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