Detecting linguistic variation with geographic sampling

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Presentation is available here: tinyurl.com/y7kjsp67

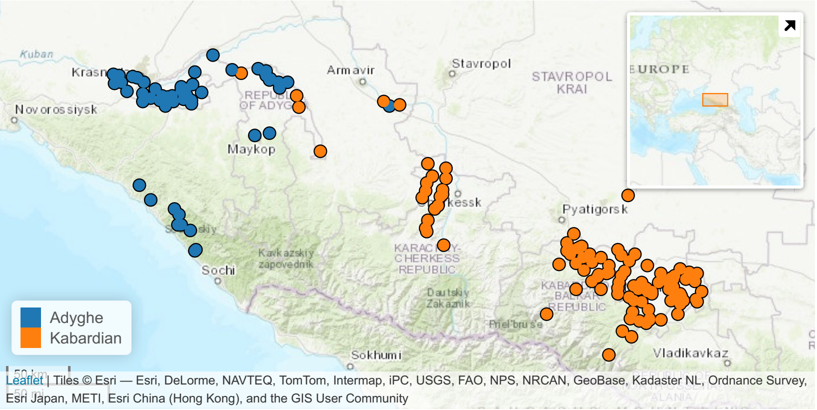
Outline of the talk

Introduction

- Geolectal variation is often present in settings where one language is spoken across a vast geographic area [Labov 1963].
- It can be found in phonological, morphosyntactic, and lexical features.
- Could be overlooked by linguists [Dorian 2010].

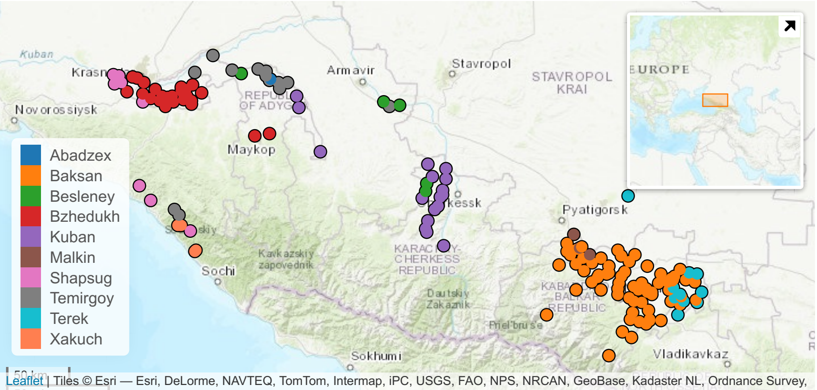
The problem

- Let us consider a geographical dialect continuum formed by a group of small villages [Chambers and Trudgill 2004: 5–7]
- We are interested in spotting variation of a discrete parameter among the lects spoken on these villages



The problem

- We will very unlikely be able to conduct fieldwork in each single village. Therefore, we need to choose a *sample* of locations.
- *Research Question*: How to choose the sample of villages to survey?
    1. How many villages is enough for spotting variation?
    2. Given an amount of sampled villages, how to decide which ones are representative of our population?



Outline of the talk

Our approach

- We assume that we want to find the distribution of variation for one feature, and we try different ways of choosing the sampled villages for finding it:
- As we assume we don't have any data beyond the geographic location of each village, we use these locations for building our sample
- We generate clusters with different algorithms (k-means, hierarchical clustering) and pick our sampled locations based on them (package stats, [R Core Team 2020]).
- We compare our results with random sampling for two different scenarios:
    - Binary categories for simulated data with different distributions
    - Multiple categorical data for Circassian languages

Information entropy

In order to measure the diversity of the questions we used the easiest measure — information entropy, introduced in [Shannon 1948]:

$$H(X) = -\sum_{i=1}^{n} P(x_i) \times \log_2 P(x_i)$$

Range of the information entropy is $H(X) \in [0, +\infty]$:

data	entropy
A-A-A-A-A	0.00
A-A-A-A-B	0.72
A-A-A-B-B	0.97
A-A-B-B-B	0.97
A-A-B-B-C	1.52
A-B-C-A-B	1.52

Outline of the talk

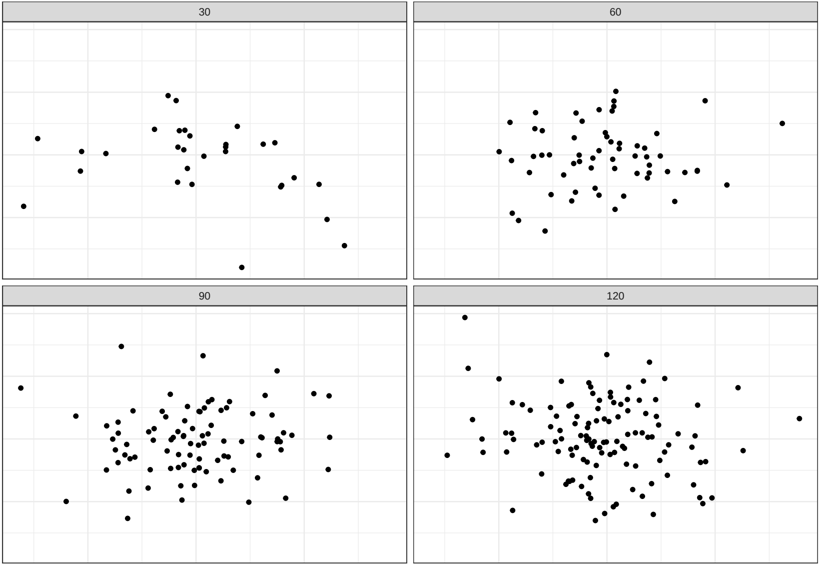
Simulated data

- total number of locations (N): 30, 60, 90, 120
- type of spatial relations:
    - random
    - two more or less separable regions
    - central and periphery
- proportion of variation in the explored variable (p): 0.1, 0.2, 0.3, 0.4, 0.5
- amount of clusters (k): $2, \ldots N/2$
- percantage of observations taken from each cluster (r): $0.1, 0.2, \ldots$

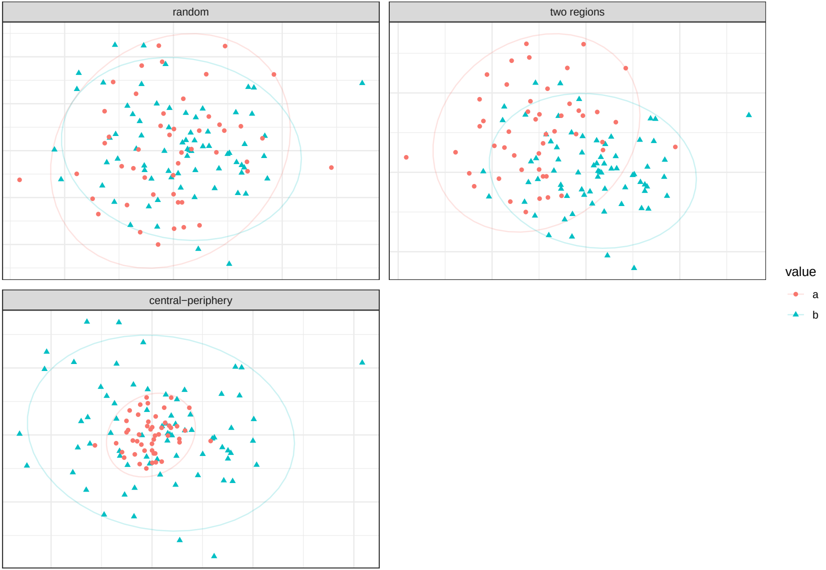
From those values we could derive a number of sampled locations (n):

$$n = N \times r$$

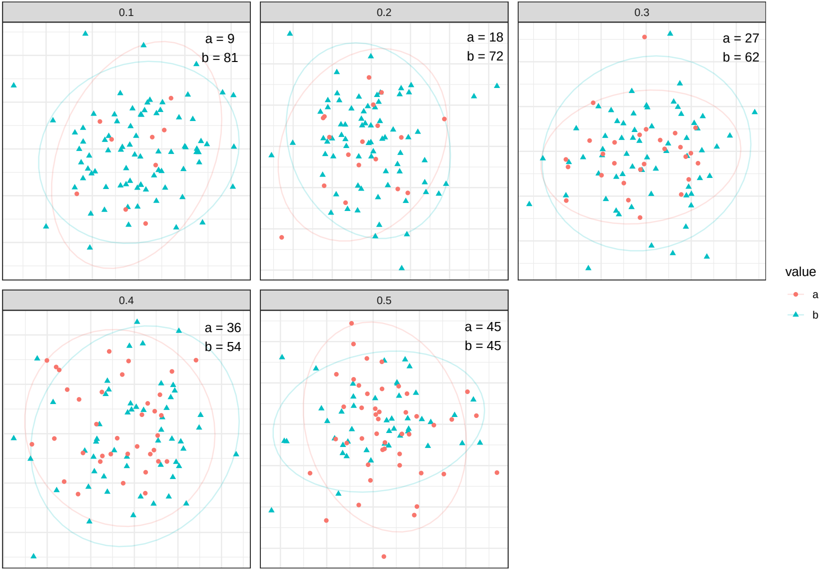
Example of different number of locations (N)



Example of different type of spatial relations



Example of different proportions of variation in the explored variable (p)



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