

# Mining Democracy

A data-driven exploration of the Swiss political landscape

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# Motivation

- **Open government** initiatives adopted worldwide
  - Datasets about multiple aspects of state affairs released
- **Voting advice applications** (VAA) set up in several countries
  - Candidates advertise their opinion by answering questions on several political aspects
  - Citizens can answer the same questions and get personalized voting recommendations
- Gives an **unprecedented view** of political opinions

# Many questions

- Such data allow to answer many interesting questions:
  - Do politicians and citizens share **similar concerns**?
  - Could a candidate **abuse a VAA**?
  - On the contrary, can you use VAAs to **monitor politicians**?
  - How do **voting behaviors** change across a country?
  - ...

# Our laboratory: Switzerland

- **Diversified** party landscape
- Four official **languages**
- **smartvote**: VAA available since 2003
- Direct democracy with **frequent issue votes** on various subjects
  - at both parliamentary and citizen levels



# smartvote dataset

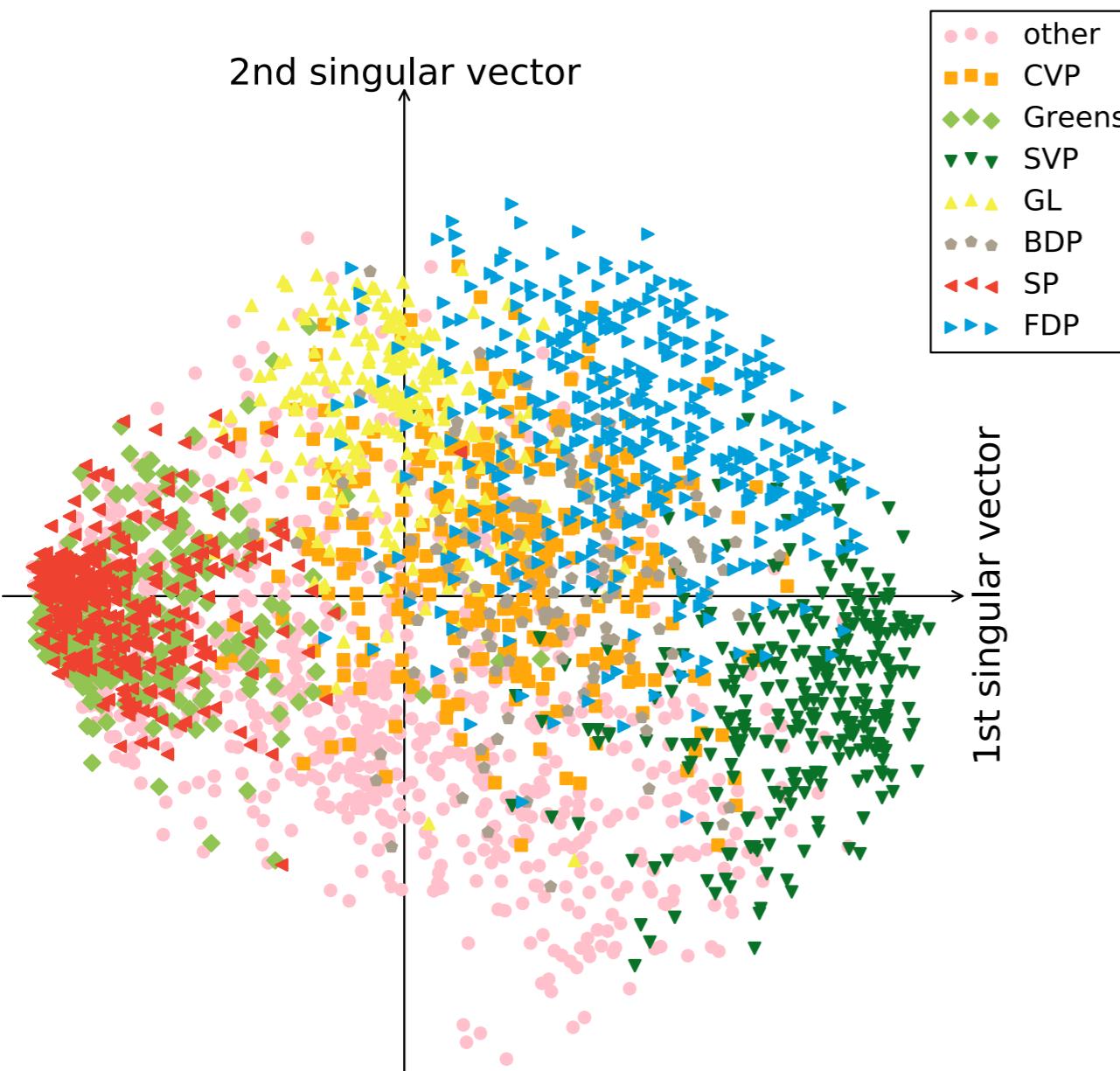
- **smartvote pre-electoral opinions** of the 2011 parliamentary elections
  - 2,985 candidates (82.4% of all candidates)
  - 229,133 citizens (~9% of total turnout)
- **Examples** of questions:
  - Should Switzerland embark on negotiations in the next four years to join the EU?
  - How much should the public transport budget be?
- **Possible answers** (mapped to  $\{0.0, 0.25, 0.5, 0.75, 1.0\}$ )
  - strongly disagree - disagree - agree - strongly agree
  - less - no change - more

# Discriminative questions

- What questions **discriminate** best the opinion of candidates?
  - Is the **traditional left/right view** meaningful?
- Use **dimensionality reduction** to find out
- Use SVD on the matrix of candidates' responses  $\mathbf{C}$

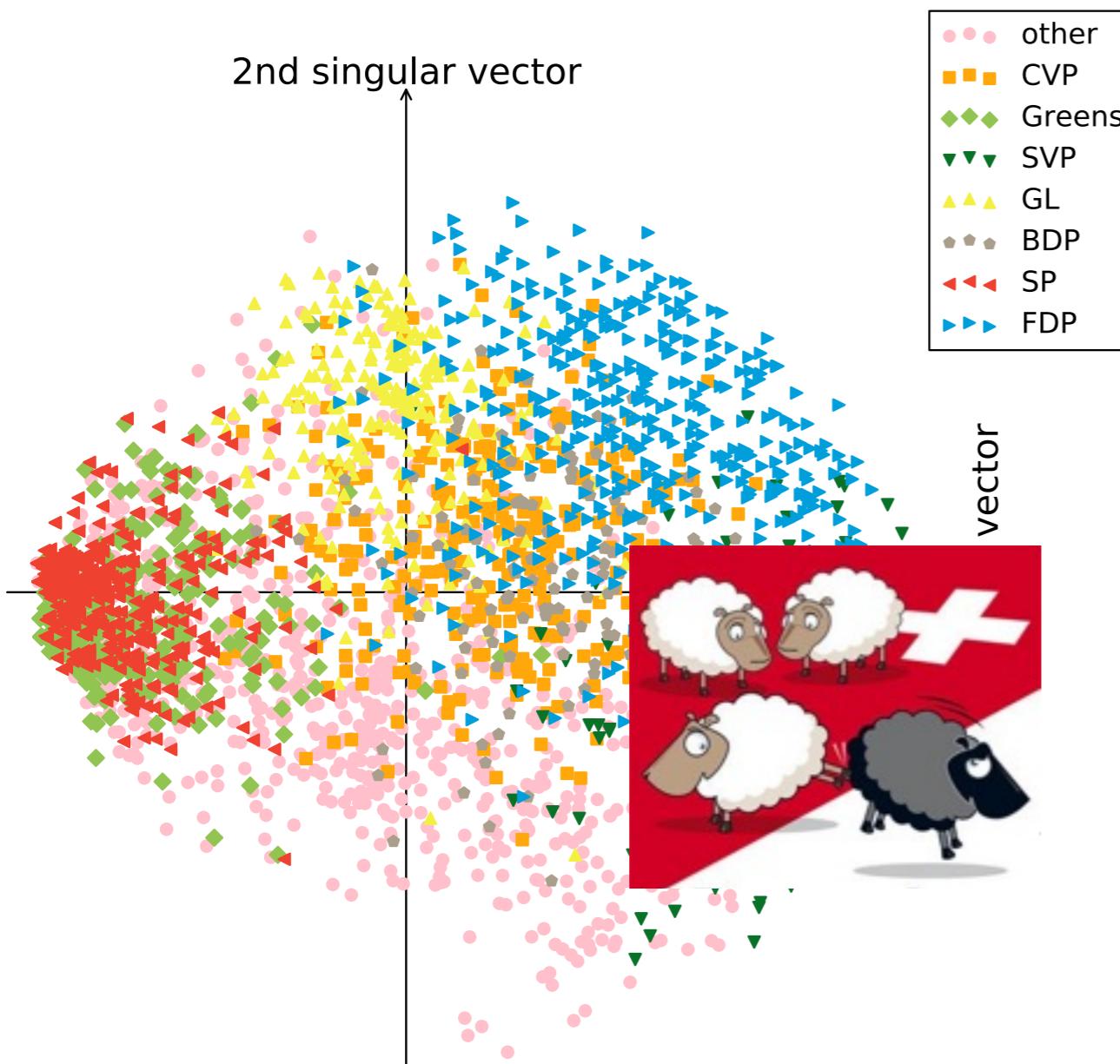
$$C \text{ candidates} \left\{ \overbrace{\begin{pmatrix} 0.5 & 0.25 & \dots & 0.0 \\ 0.75 & 0.5 & \dots & 1.0 \\ \vdots & \vdots & \ddots & \vdots \\ 1.0 & 0.25 & \dots & 0.75 \end{pmatrix}}^{n \text{ questions}} \right\}$$

# Ideological space of candidates



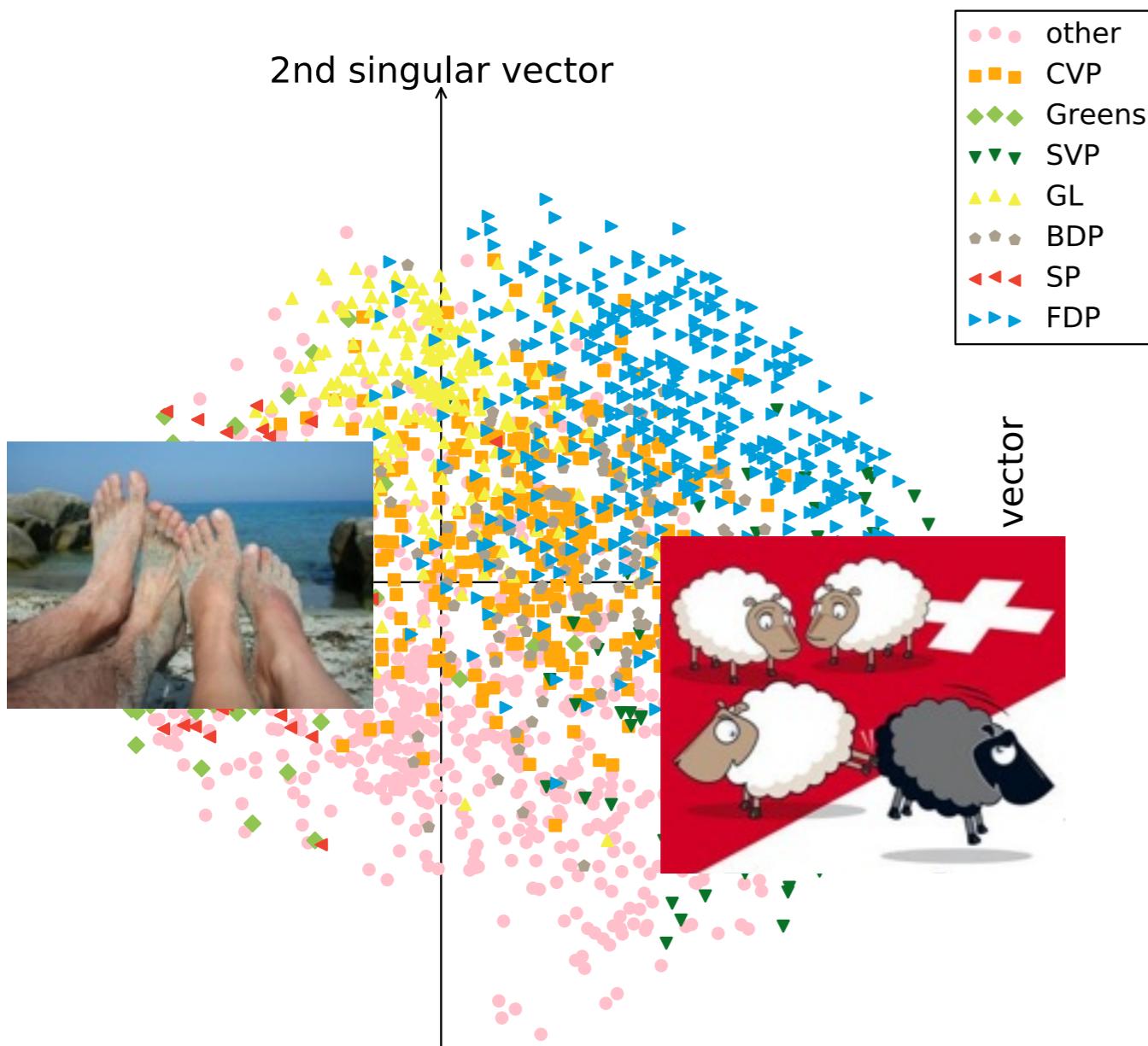
Singular vector	First two questions
1st	<ol style="list-style-type: none"><li>1. Would you support foreigners who have lived for at least ten years in Switzerland being given voting and electoral rights at municipal level?</li><li>2. Are you in favour of legalizing the status of illegal immigrants?</li></ol>
2nd	<ol style="list-style-type: none"><li>1. Are you in favour of the complete liberalization of shop opening times?</li><li>2. Should Switzerland conclude an agricultural free trade agreement with the EU?</li></ol>
3rd	<ol style="list-style-type: none"><li>1. Should Switzerland legalize the consumption of hard and soft drugs?</li><li>2. Should same-sex couples who have registered their partnership be able to adopt children?</li></ol>

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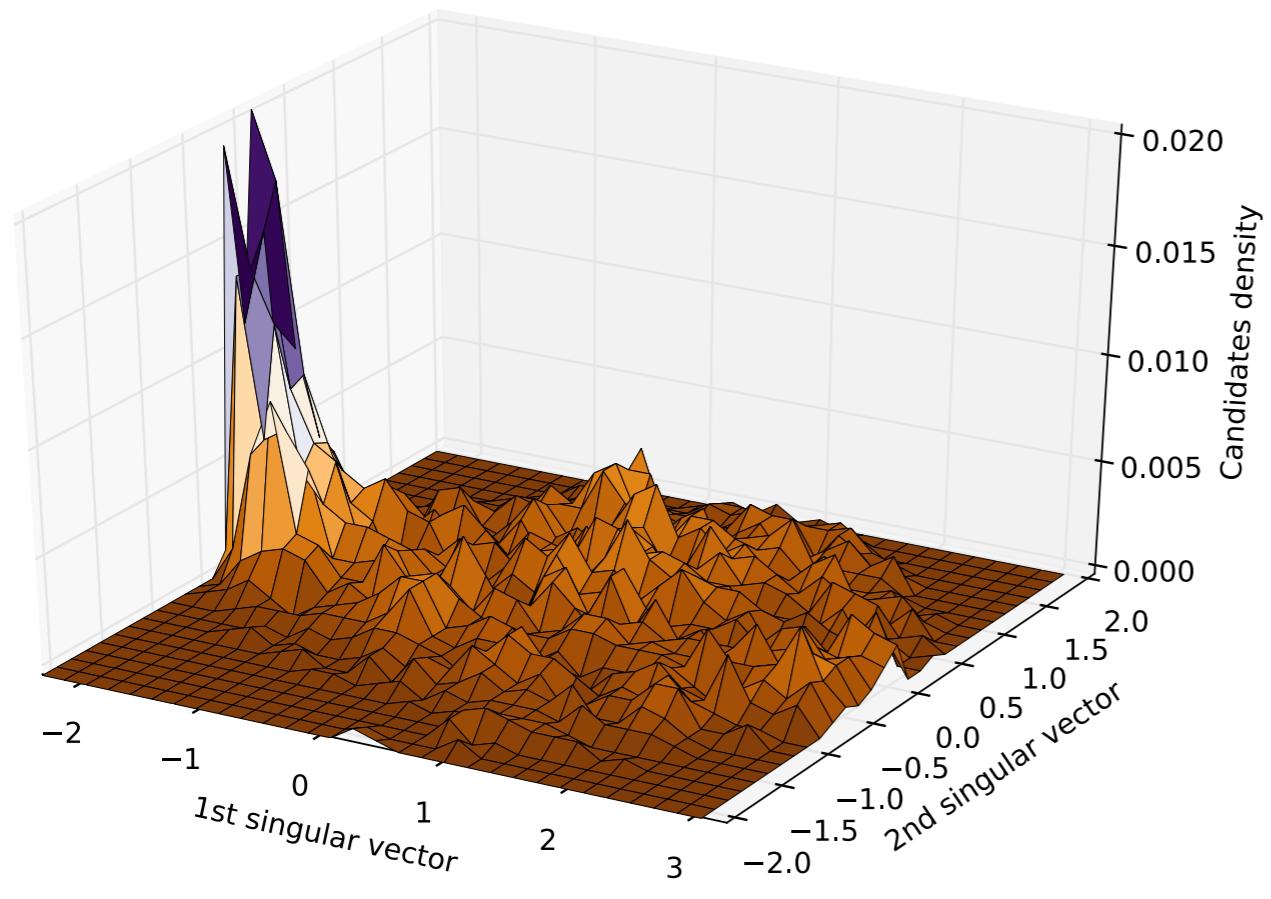
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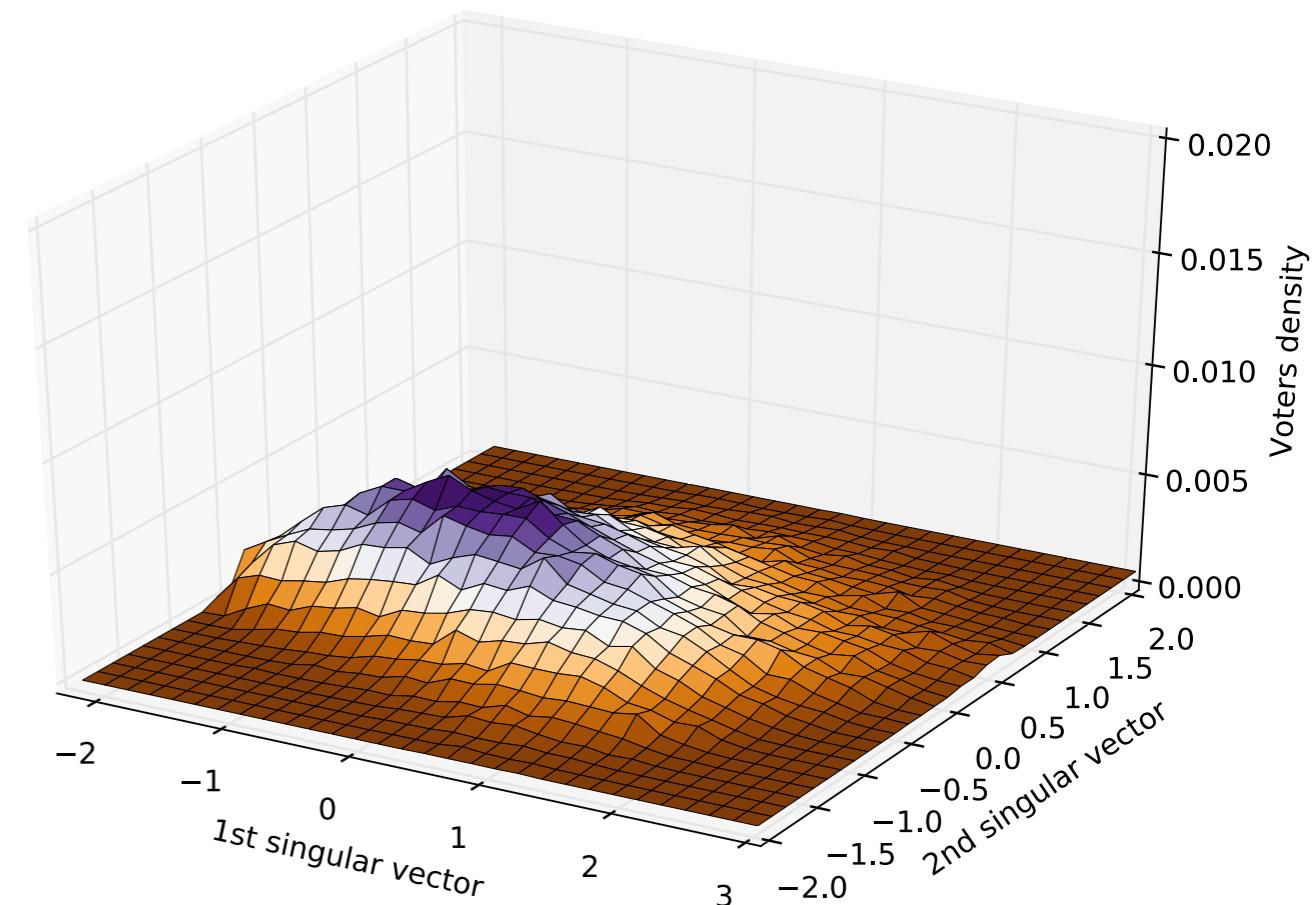
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# Densities

- The density of candidates and citizens in the ideological plane varies



Candidates



Citizens

# Abusing VAAs

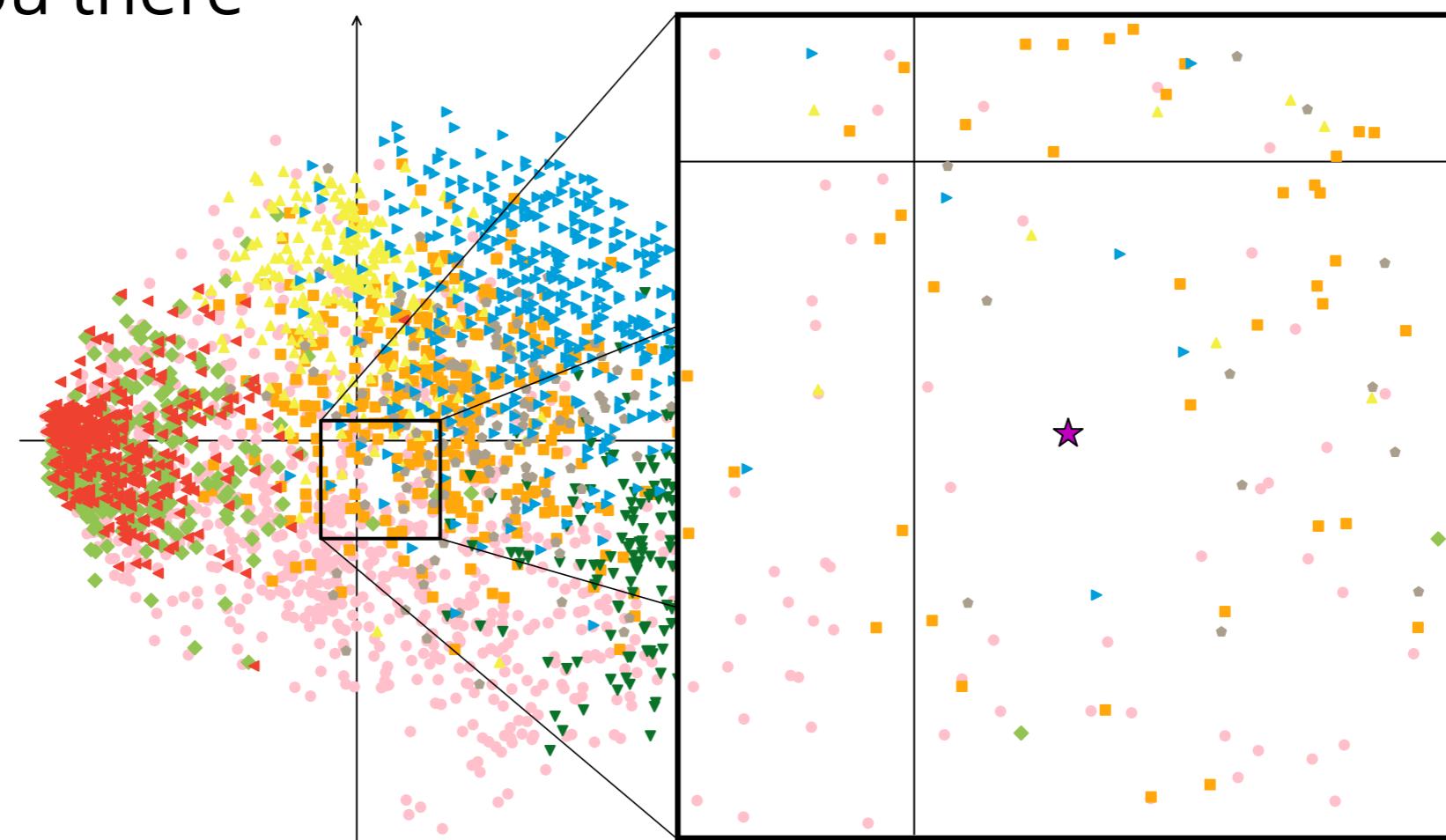
- VAAs are **beneficial** on several aspects
  - Citizens can get **personalized recommendations**, and get to know candidates better
  - Data extracted from VAAs give **great insights** on the political landscape of a country
- Could this data be **misused**?
  - Candidate profiles are public, and used for recommendations
  - Could a **new candidate** use this to his advantage?

# Crafting a profile

- smartvote (as most VAAs) simply uses the **Euclidean distance** to compute voting recommendations
  - the **50 closest candidates** are recommended, in increasing order of distance to the citizen's answer
- A **malicious** candidate could thus **tailor** his answers, such that he is:
  - far away from other candidates
  - close to many citizens

# Empirical solution

- **Manually** pick your location in the ideological space
- Use the **inverse transformation** to find the answers that get you there

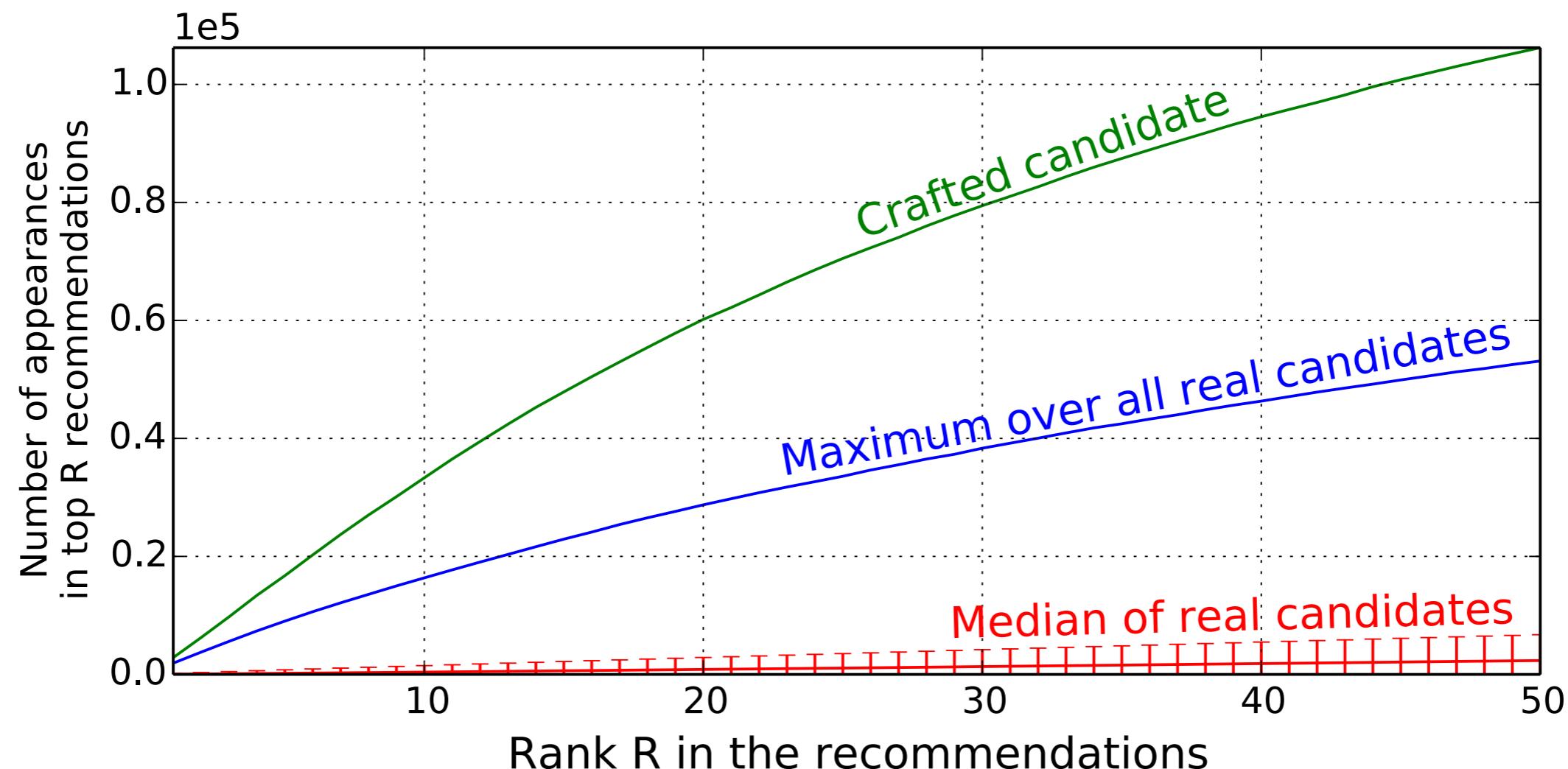


# Effect of crafted profile

- We **crafted** the profile corresponding to the star in the previous plot
- Then, we **re-computed the recommendations** for all 229,133 citizens
- We checked how many times each candidate appears in the top  $R$  recommendations, for  $R \in \{1, \dots, 50\}$

# Recommendation results

- The crafted profile appears in the 50 closest candidates of nearly **half of the citizens!**



# Quantifying opinion shifts

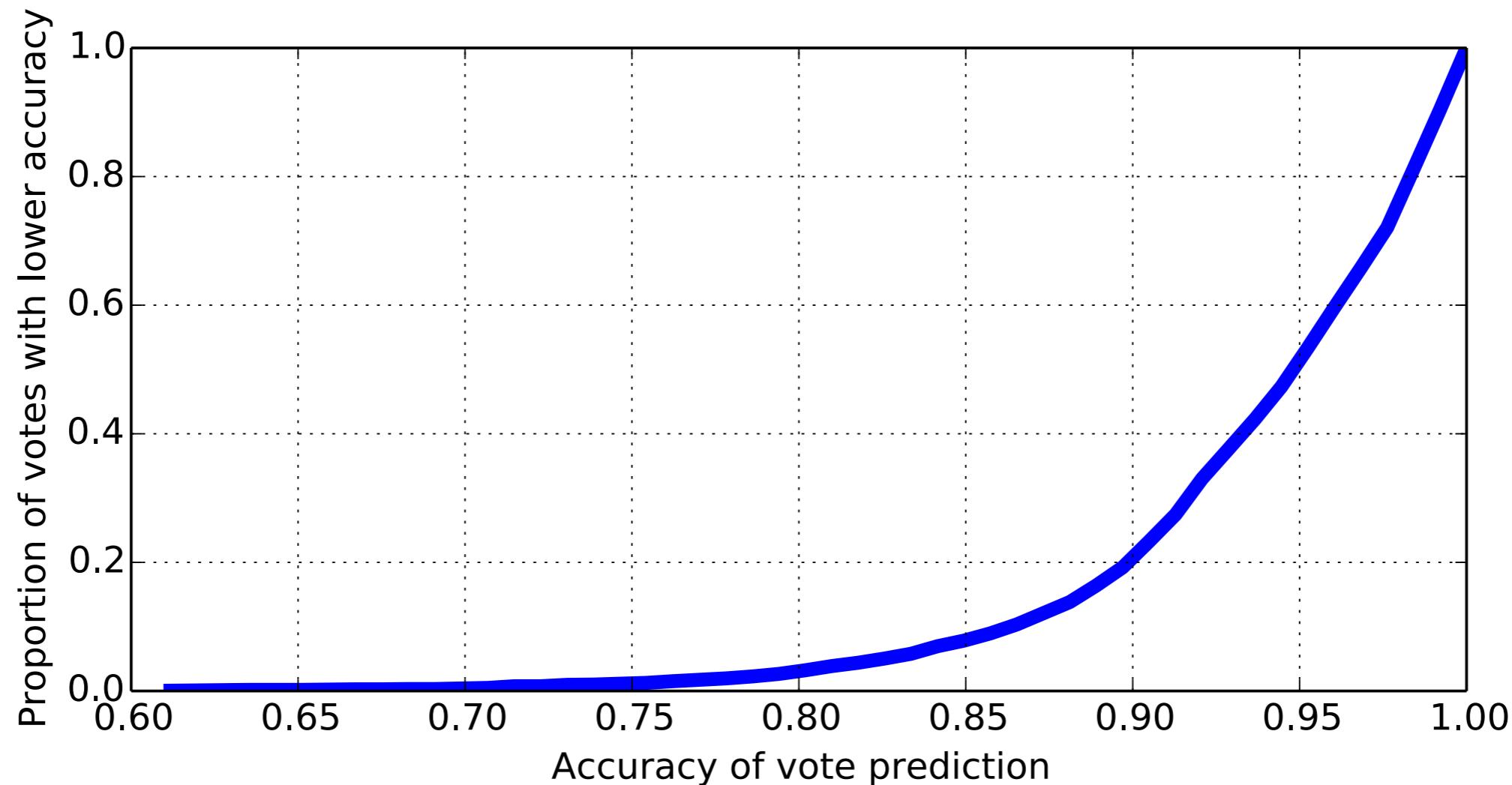
- Is it possible to **detect** whether a politician crafted his profile, **given the way he votes once elected** ?
- **Parliament votes** (2,494 since the 2011 elections) are public
- Requires a mapping **VAA answers**  $\longleftrightarrow$  **parliament votes**
- Learning problem:

**Training data:** all VAA responses  $\mathbf{C}$  and votes  $\mathbf{v}$  on a particular issue

**Predict:** vote  $\mathbf{v}_c \in \{\text{yes}, \text{no}\}$  of candidate  $c$

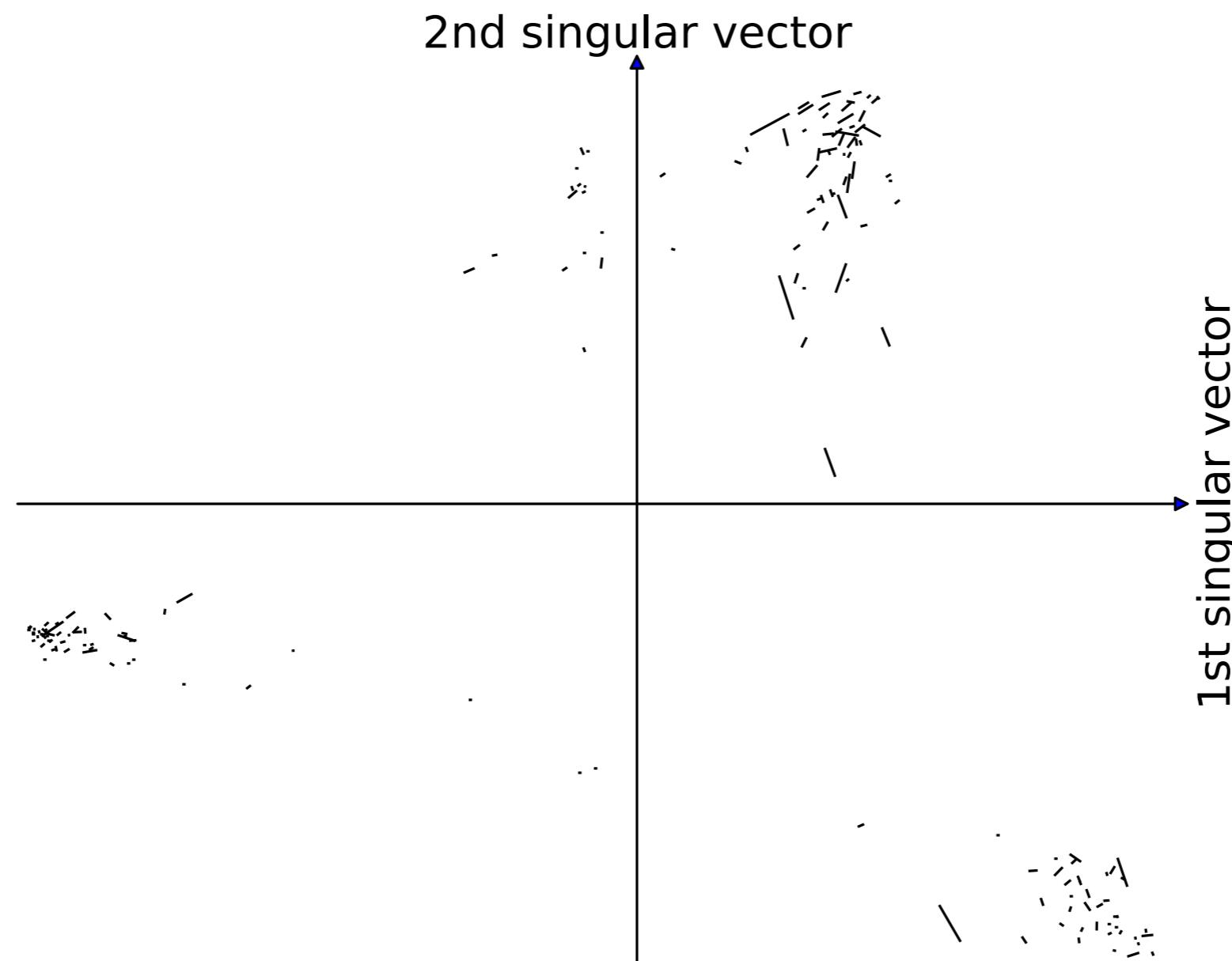
# VAA responses can be used to predict parliament votes

Using only a linear regression, **one can predict  $\geq 50\%$  of the votes with  $\geq 95\%$  accuracy**



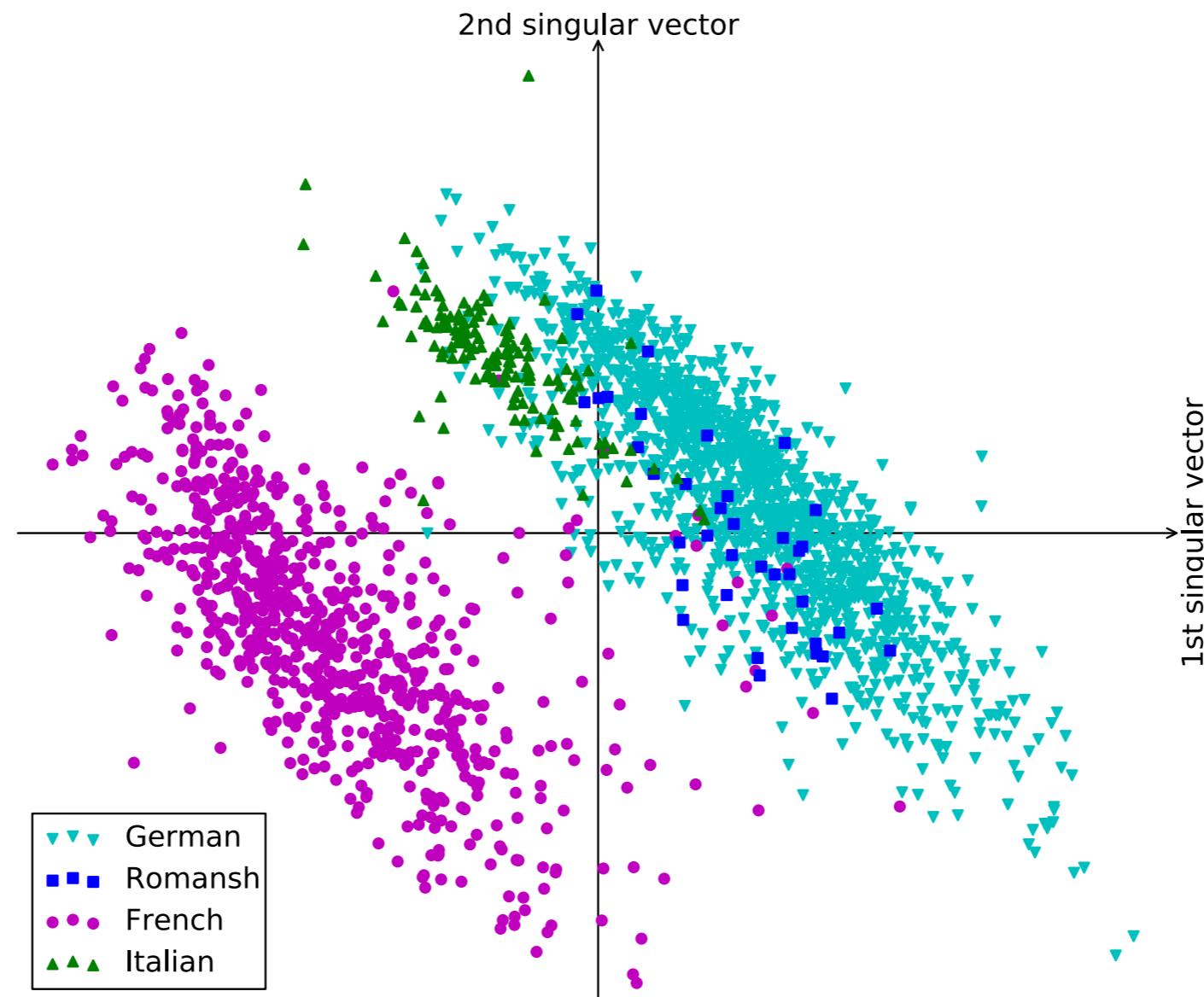
# Opinions shifts

Comparison between votes **expected** from VAA responses and **actual** votes cast in parliament (using votes predicted with accuracy > 95%)



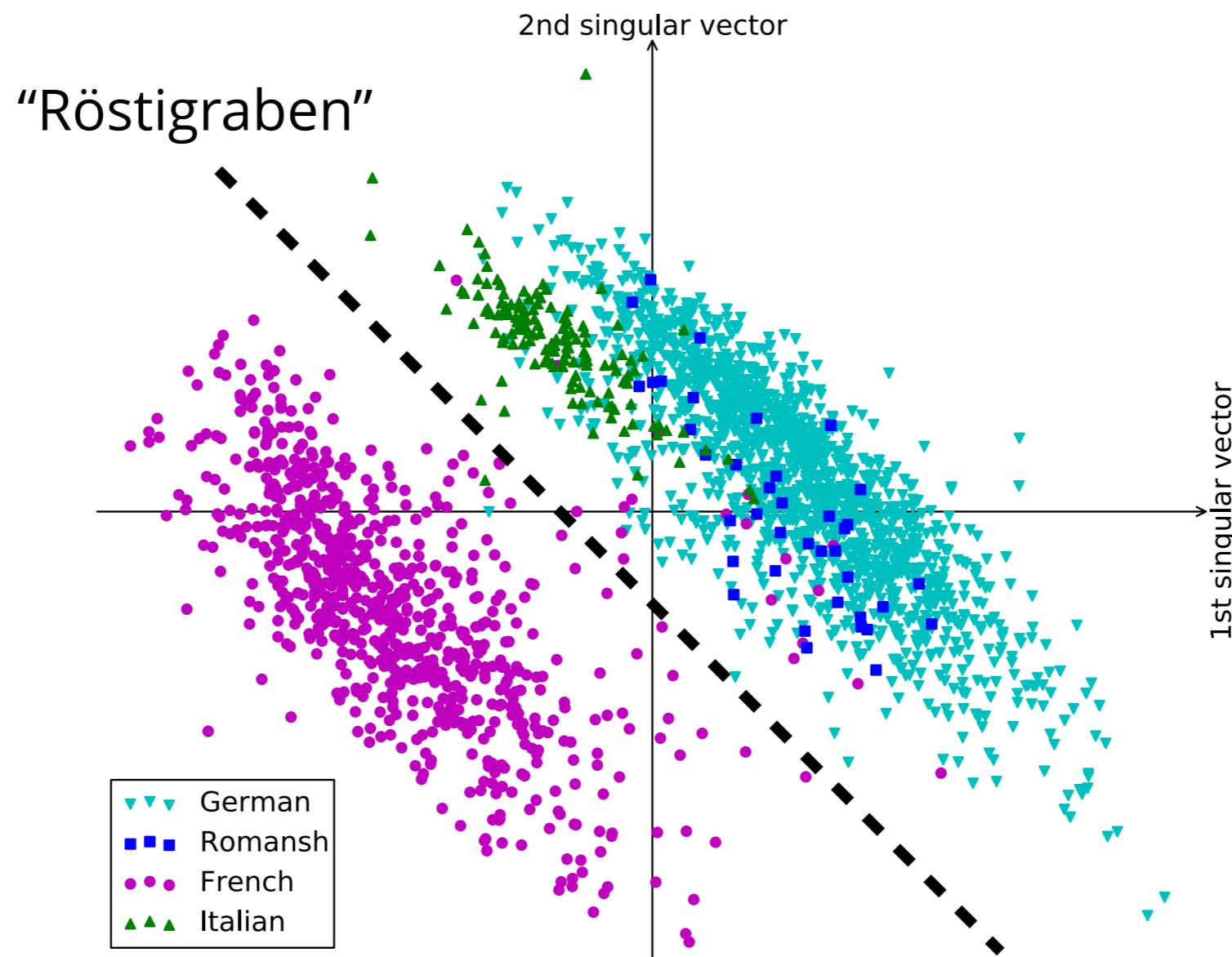
# Voting patterns at municipality level

- **Dataset:** outcome (% yes) of 245 votes since 1981 in 2,398 municipalities
- Dimensionality reduction highlights **linguistic/cultural** contrasts



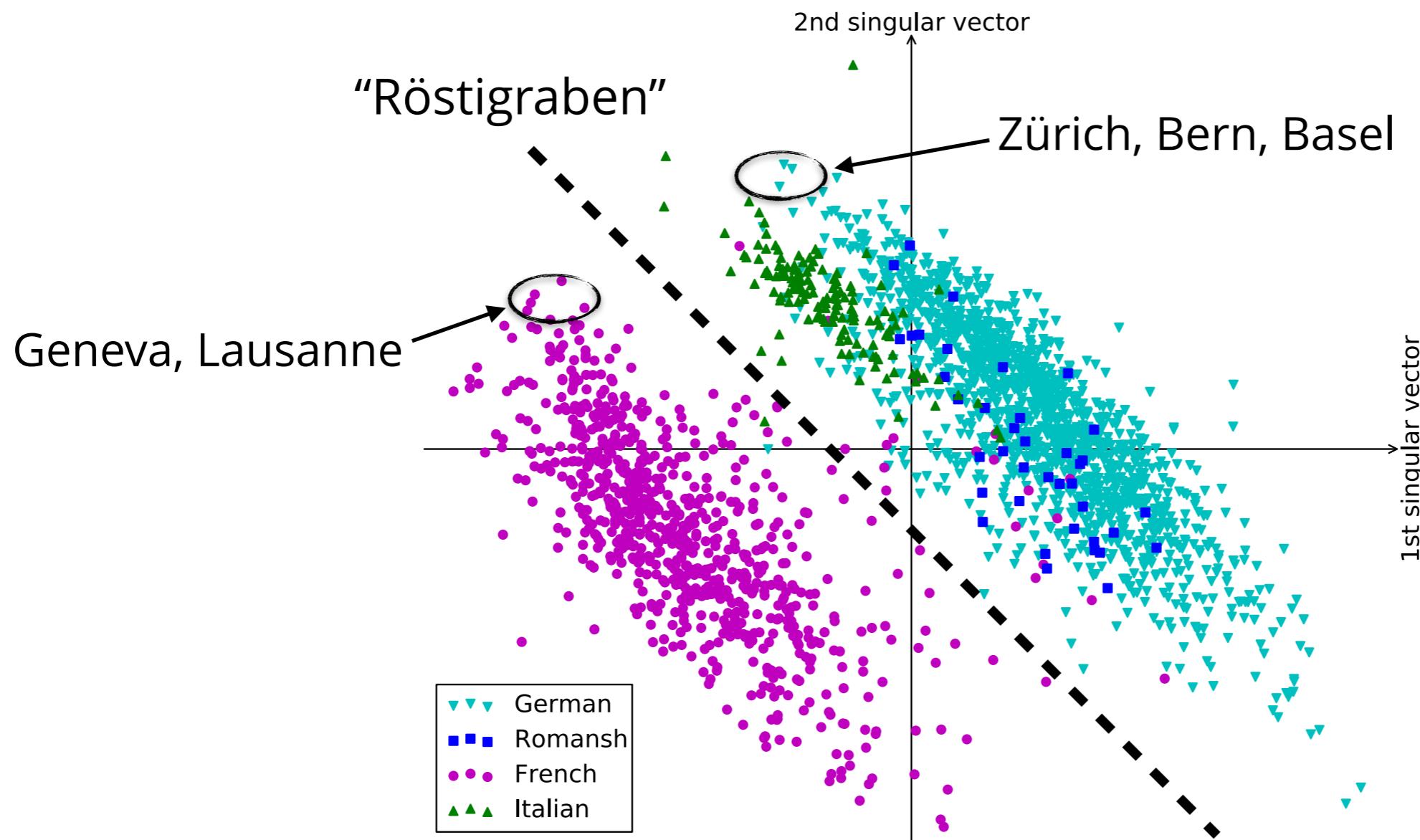
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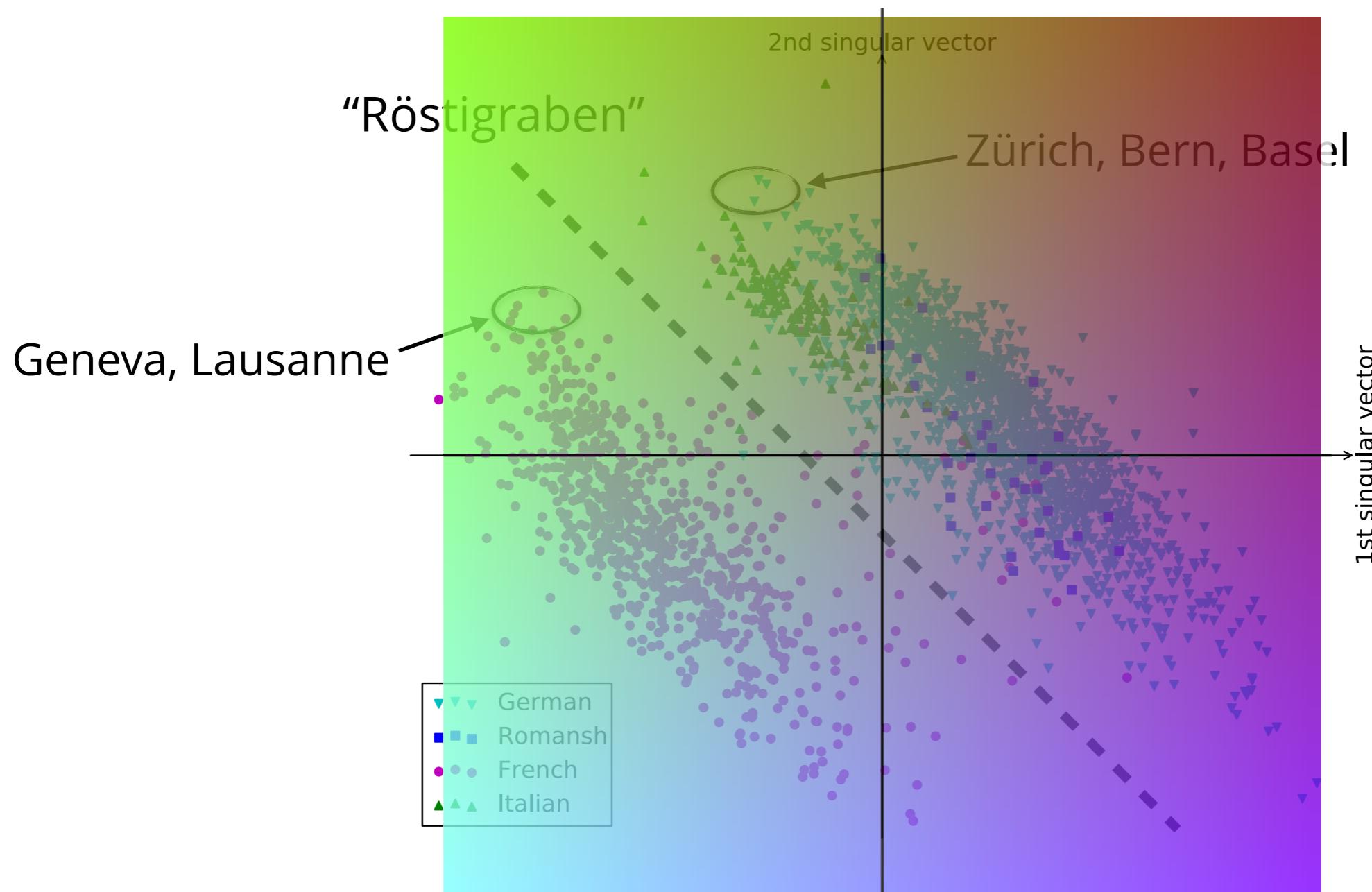
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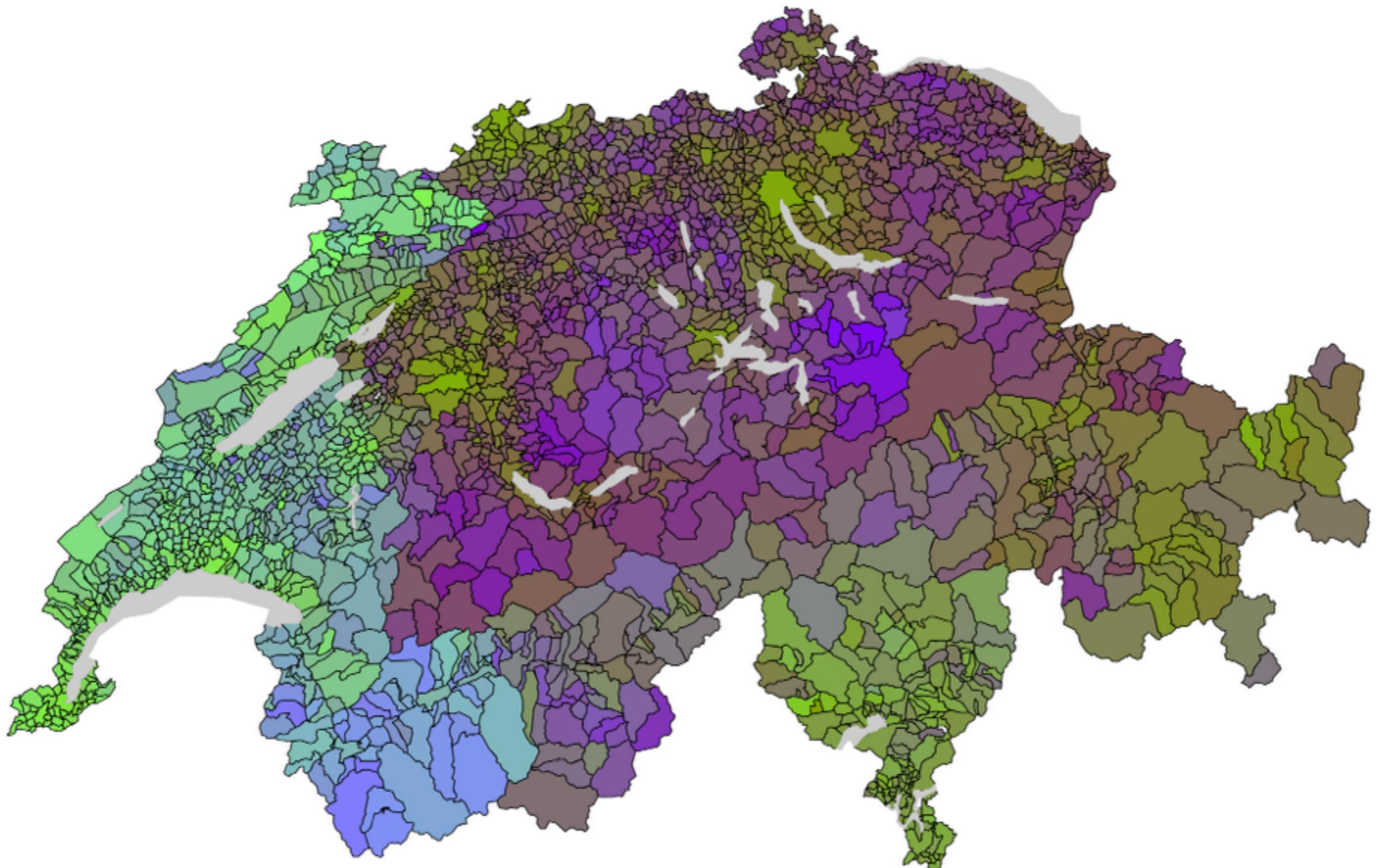


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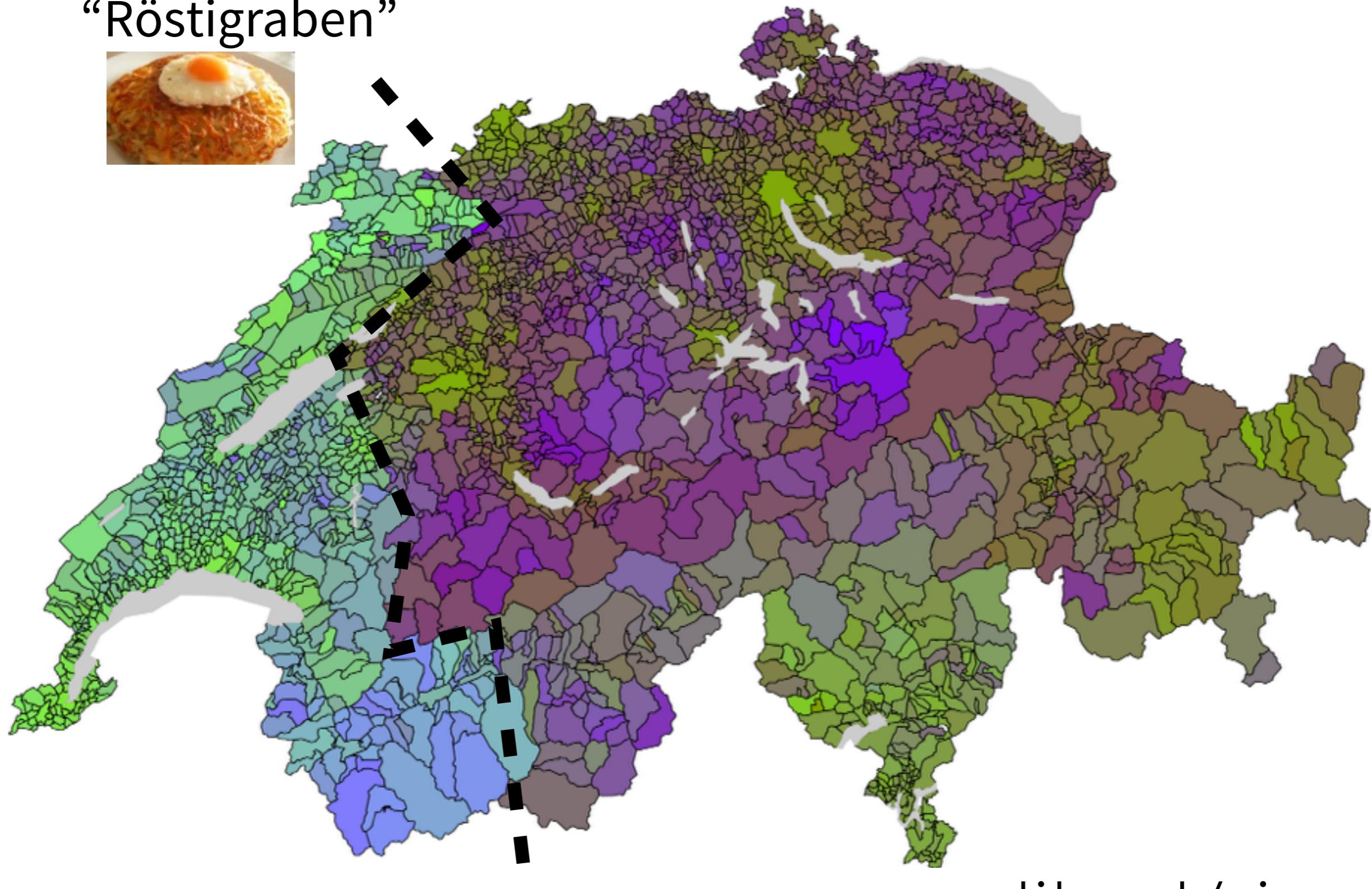


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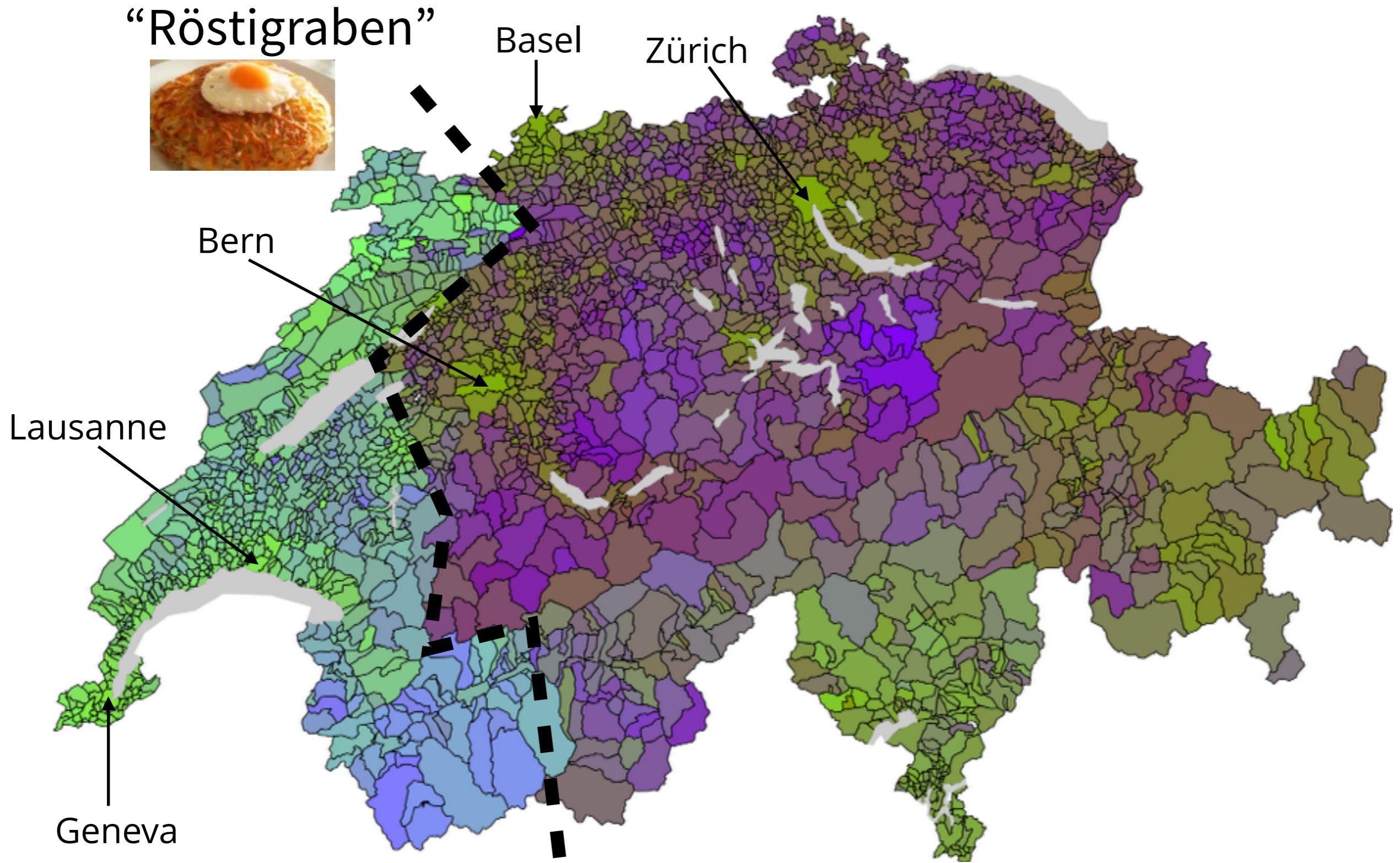


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“Röstigraben”

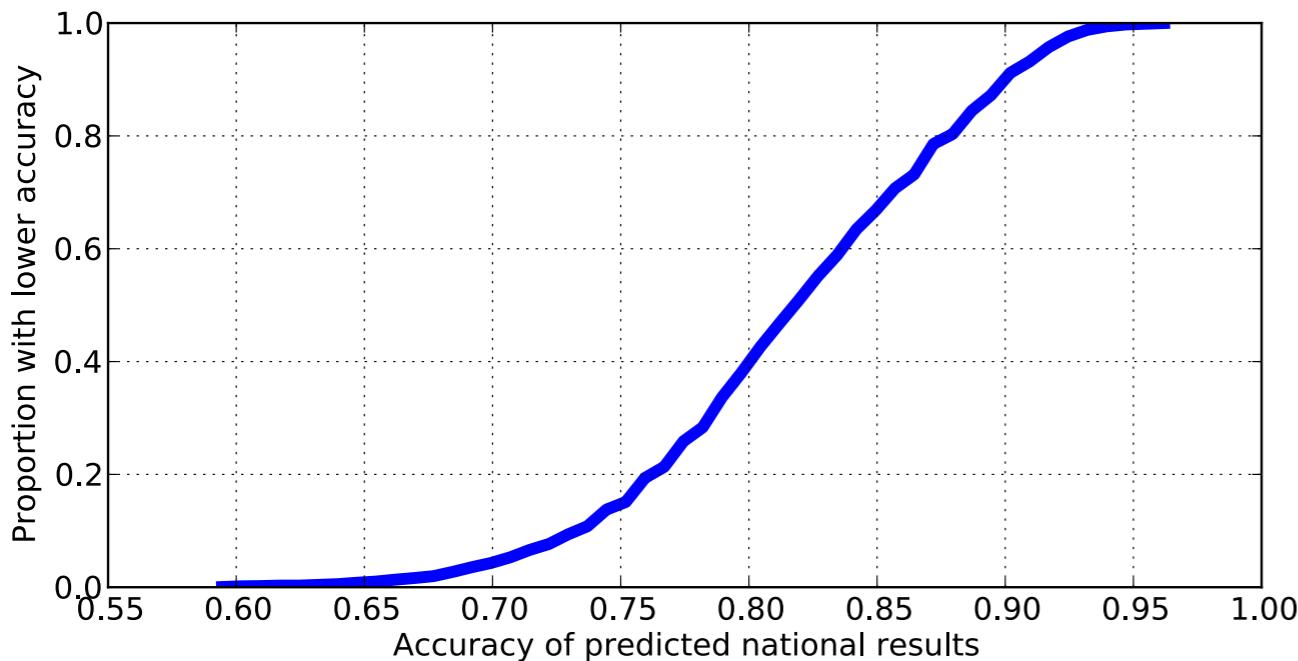


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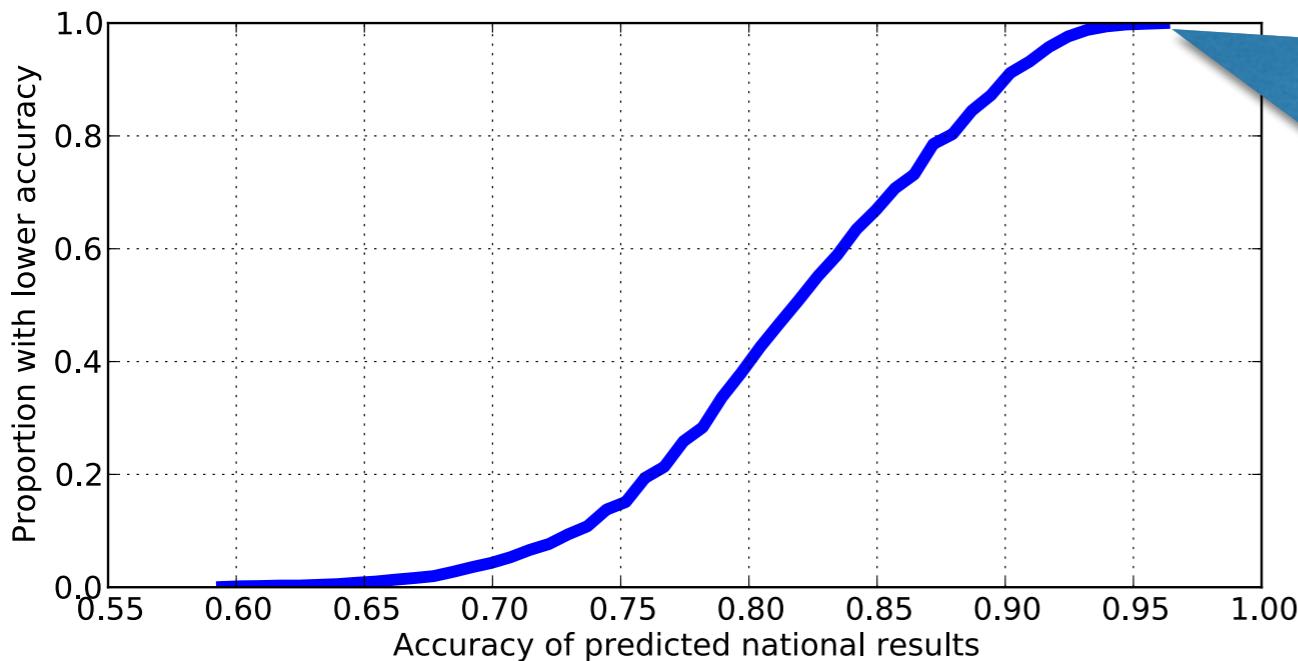
# Prediction of national results

- Knowing the result of **one** municipality in advance (e.g., from polling/survey), can we predict the **final result**?
- Answer: Yes, but it depends on which municipality!

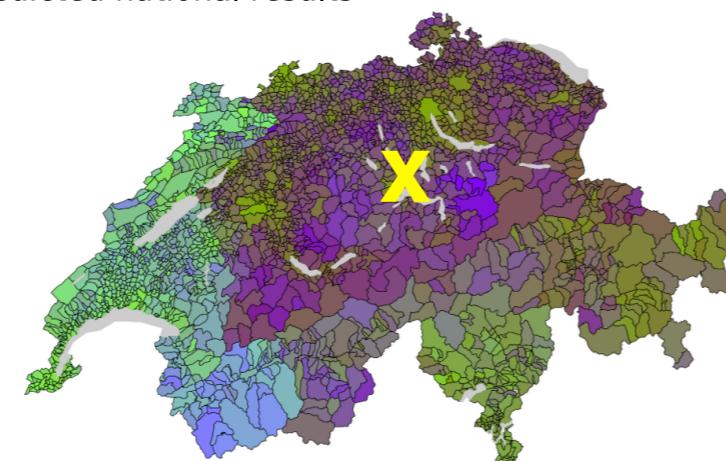


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Ebikon (accuracy 95.9% on test set)



# Conclusions

- New massive VAA / open government **datasets**
- Systematic data-mining highlights **ideological/cultural** idiosyncrasies
- VAAs can be significantly **abused** by candidates
- Municipality results allow to uncover **interesting patterns** and are useful to **predict national outcomes**
- **Future/ongoing work:**
  - Predict vote results for **all** municipalities
  - Formalize/optimize candidate **placement in VAAs**

# Thank you for listening!

[www.predikon.ch](http://www.predikon.ch)

