



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

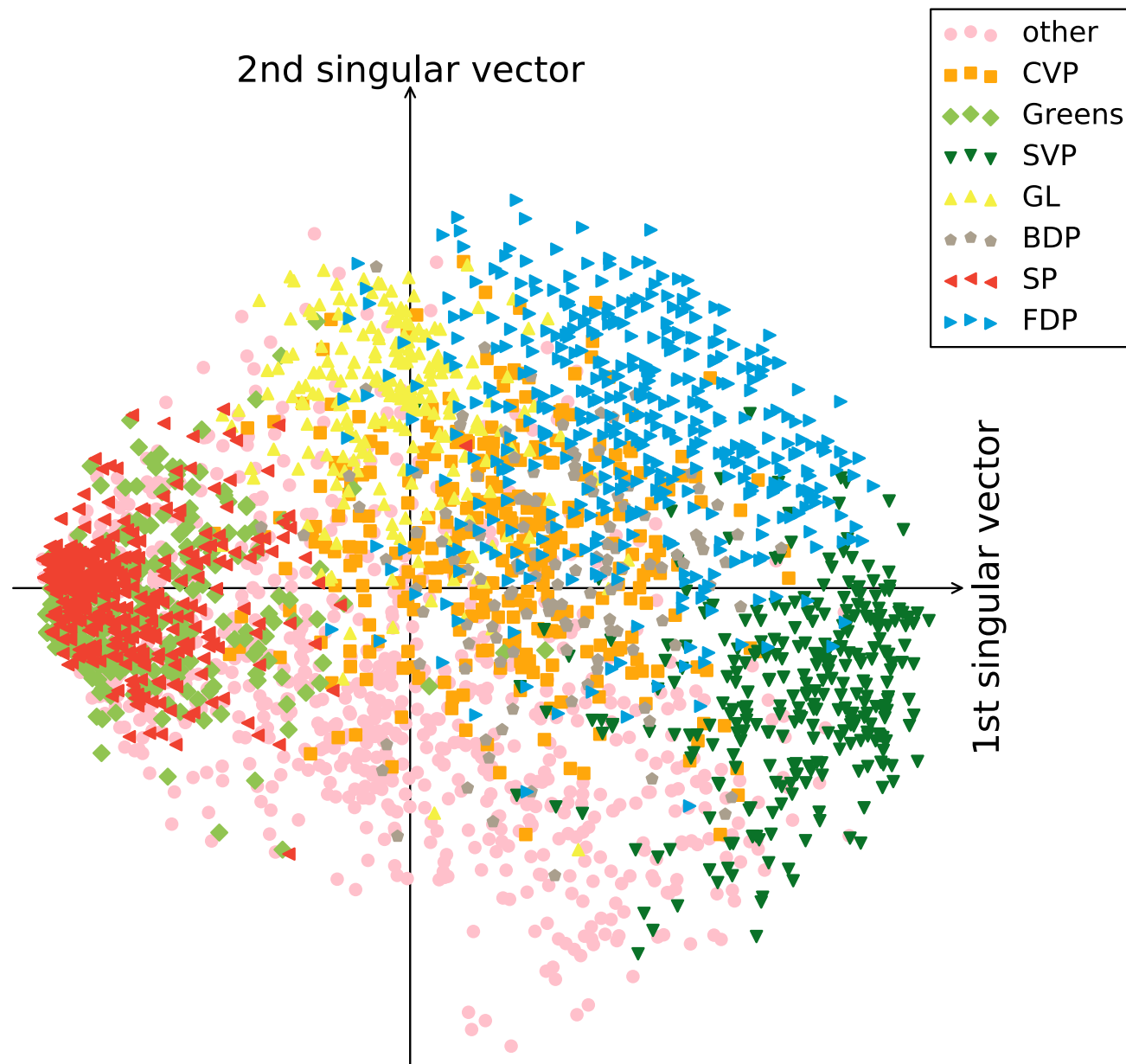
- **smartvote pre-electoral opinions** of the 2011 parliamentary elections
 - 2,985 candidates (82.4% of all candidates)
 - 229,133 citizens (~9% of total turnout)
- **Examples** of questions:
 - Should Switzerland embark on negotiations in the next four years to join the EU?
 - How much should the public 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 C

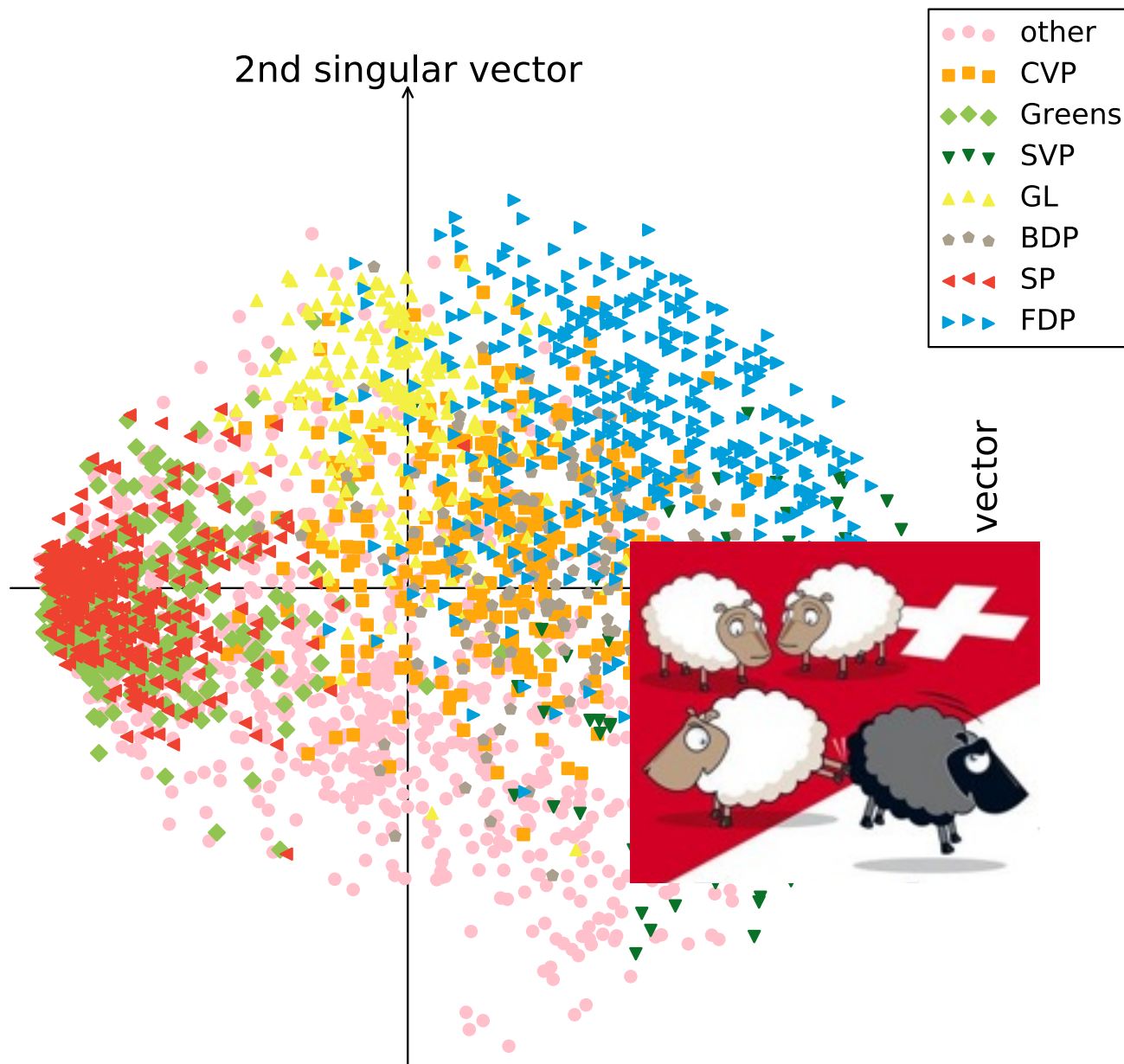
$$\begin{array}{c} C \text{ candidates} \end{array} \left\{ \begin{array}{c} \overbrace{\begin{pmatrix} 0.5 & 0.25 & \dots & 0.0 \\ 0.75 & 0.5 & \dots & 1.0 \\ \vdots & \vdots & \ddots & \vdots \\ 1.0 & 0.25 & \dots & 0.75 \end{pmatrix}}^{n \text{ questions}} \end{array} \right.$$

Ideological space of candidates



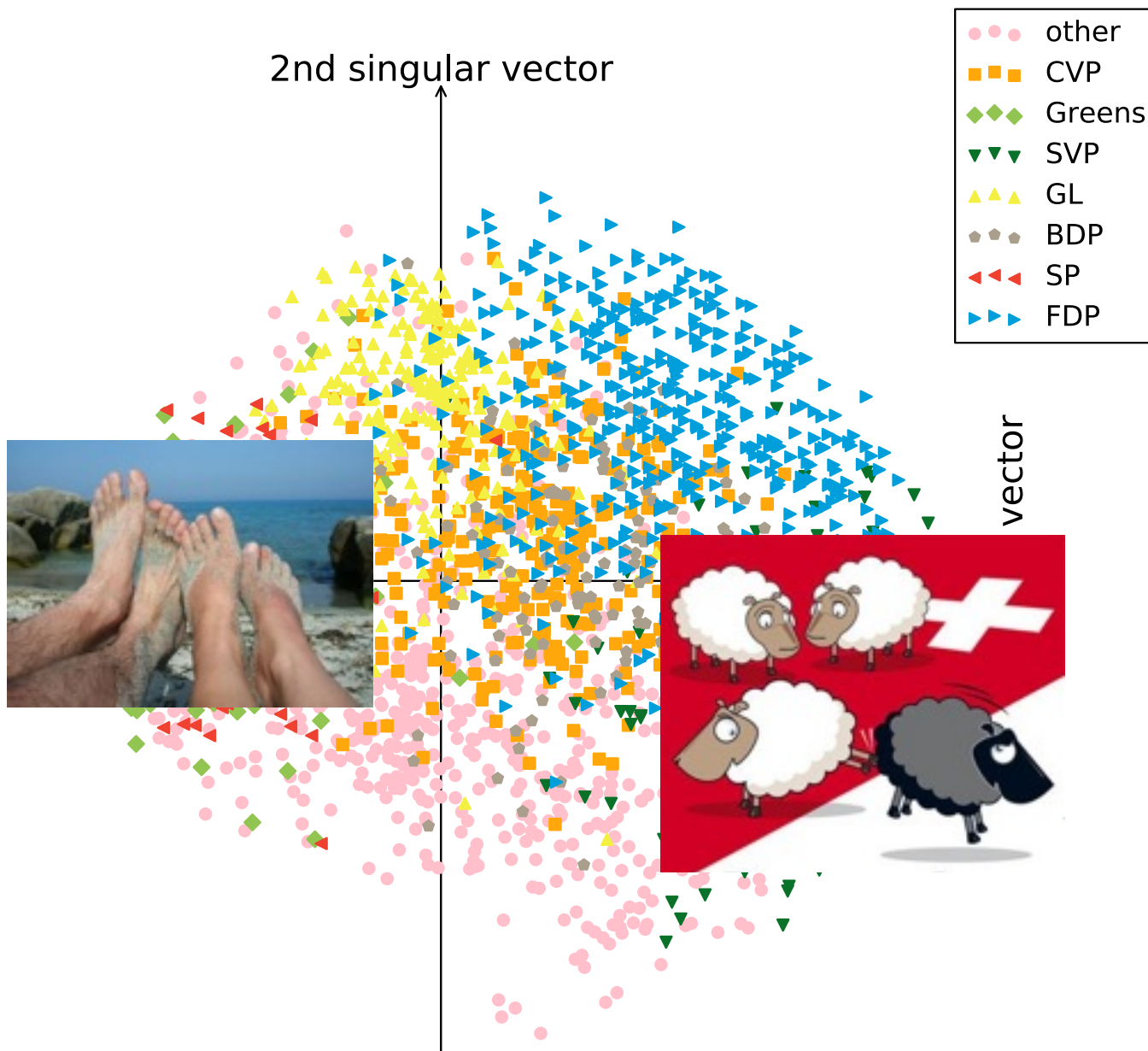
Singular vector	First two questions
1st	1. Would you support foreigners who have lived for at least ten years in Switzerland being given voting and electoral rights at municipal level? 2. Are you in favour of legalizing the status of illegal immigrants?
2nd	1. Are you in favour of the complete liberalization of shop opening times? 2. Should Switzerland conclude an agricultural free trade agreement with the EU?
3rd	1. Should Switzerland legalize the consumption of hard and soft drugs? 2. Should same-sex couples who have registered their partnership be able to adopt children?

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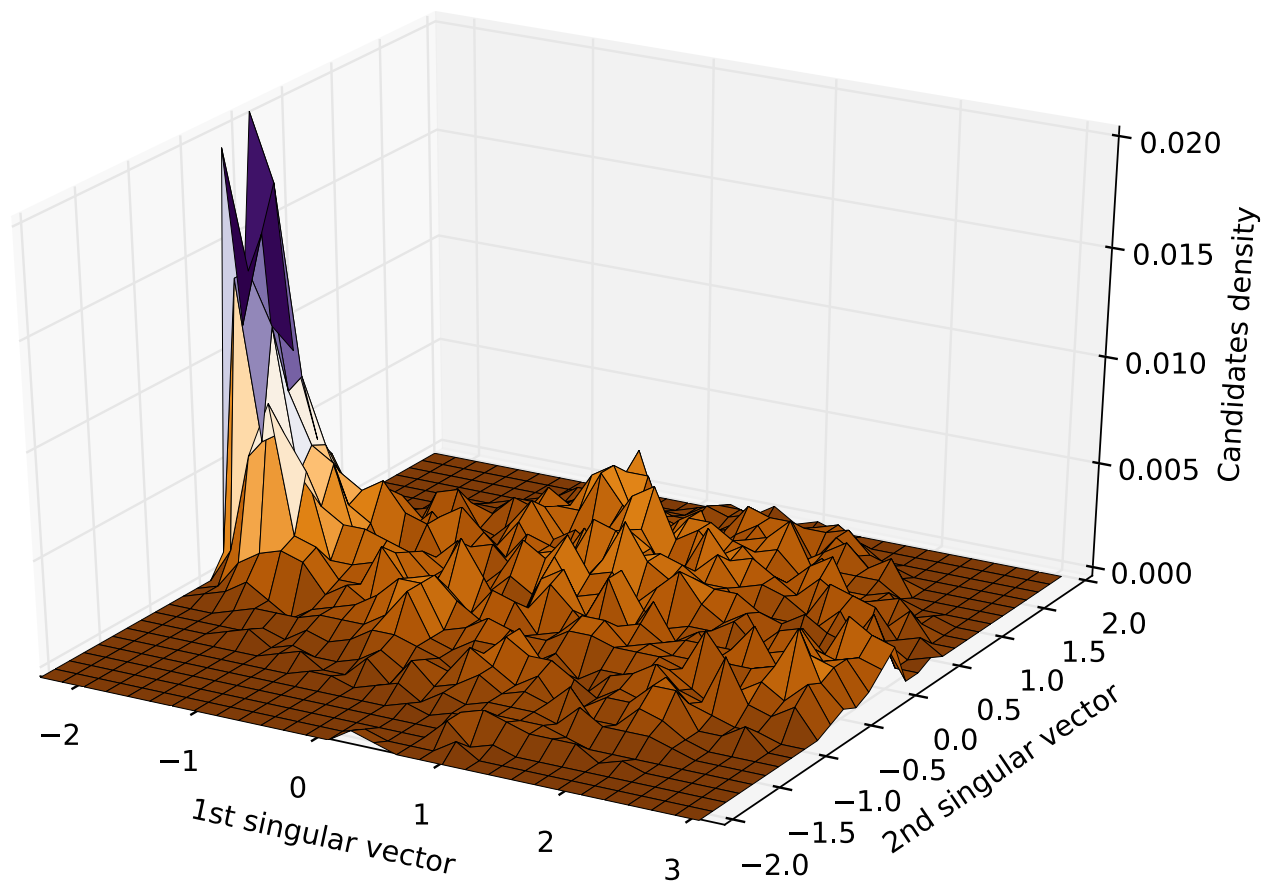
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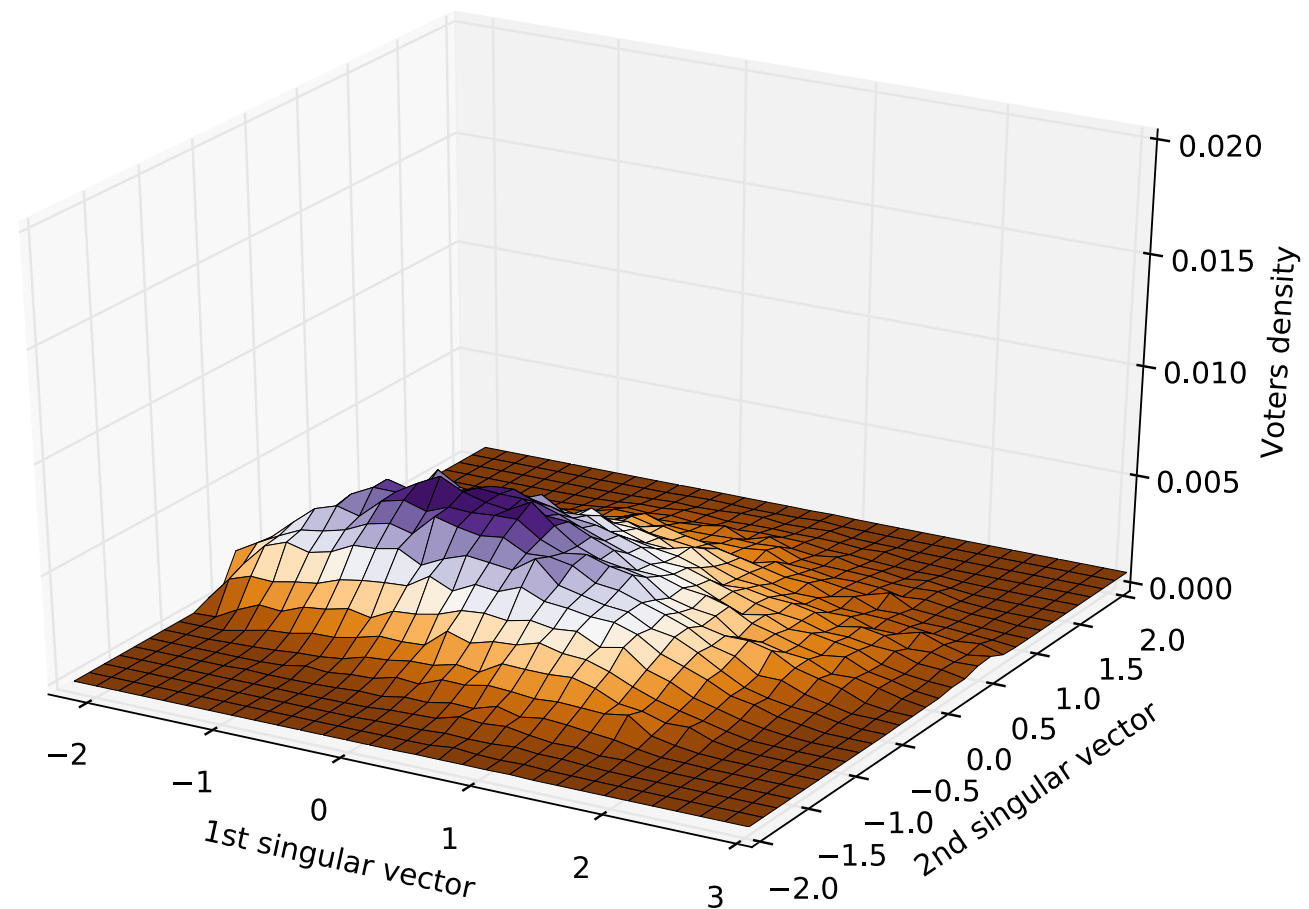
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Densities

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



Candidates



Citizens

Abusing VAAs

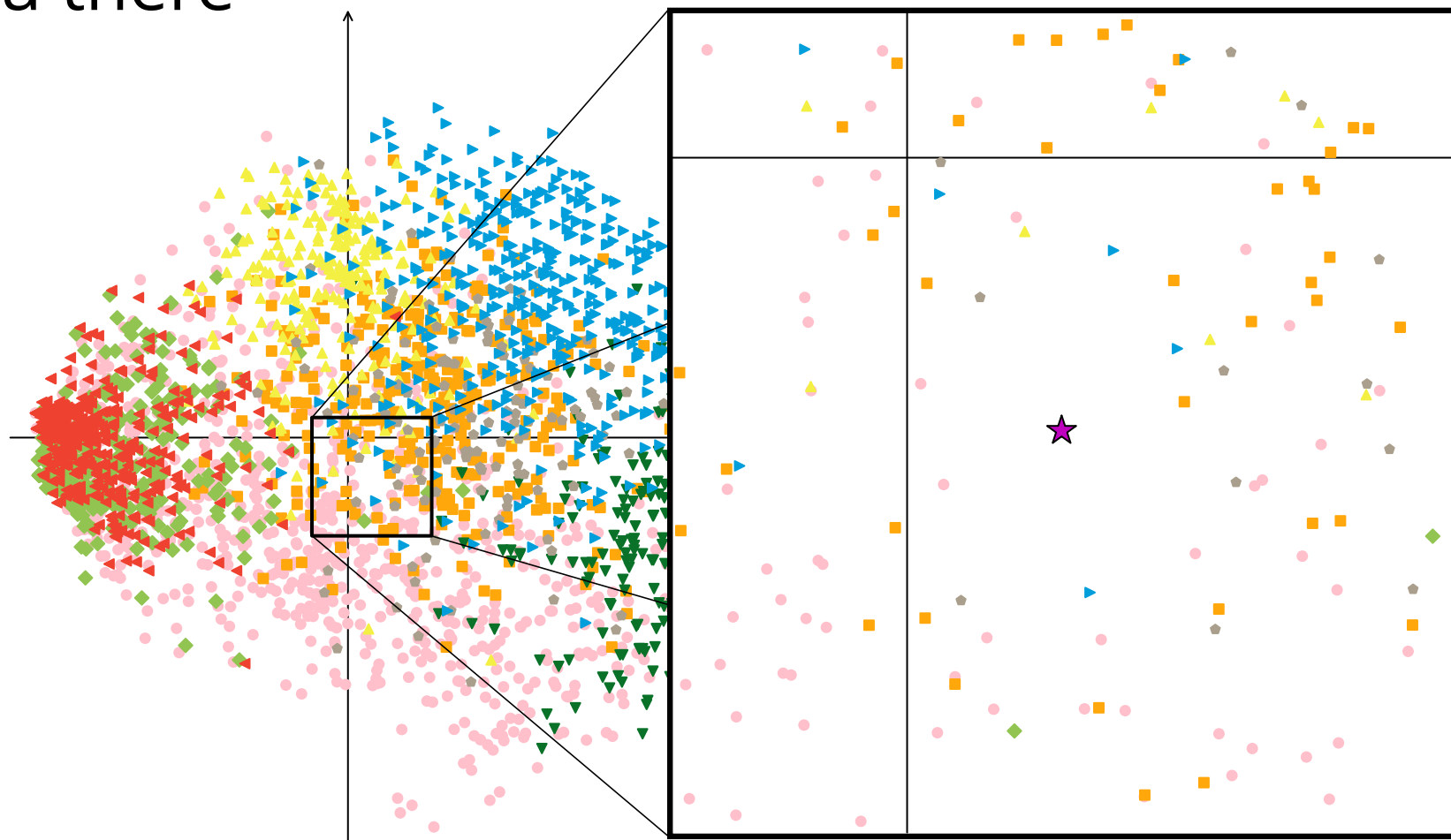
- VAAs are **beneficial** on several aspects
 - Citizens can get **personalized recommendations**, and get to know candidates better
 - Data extracted from VAAs give **great insights** on the political landscape of a country
- Could this data be **misused**?
 - Candidate profiles are public, and used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

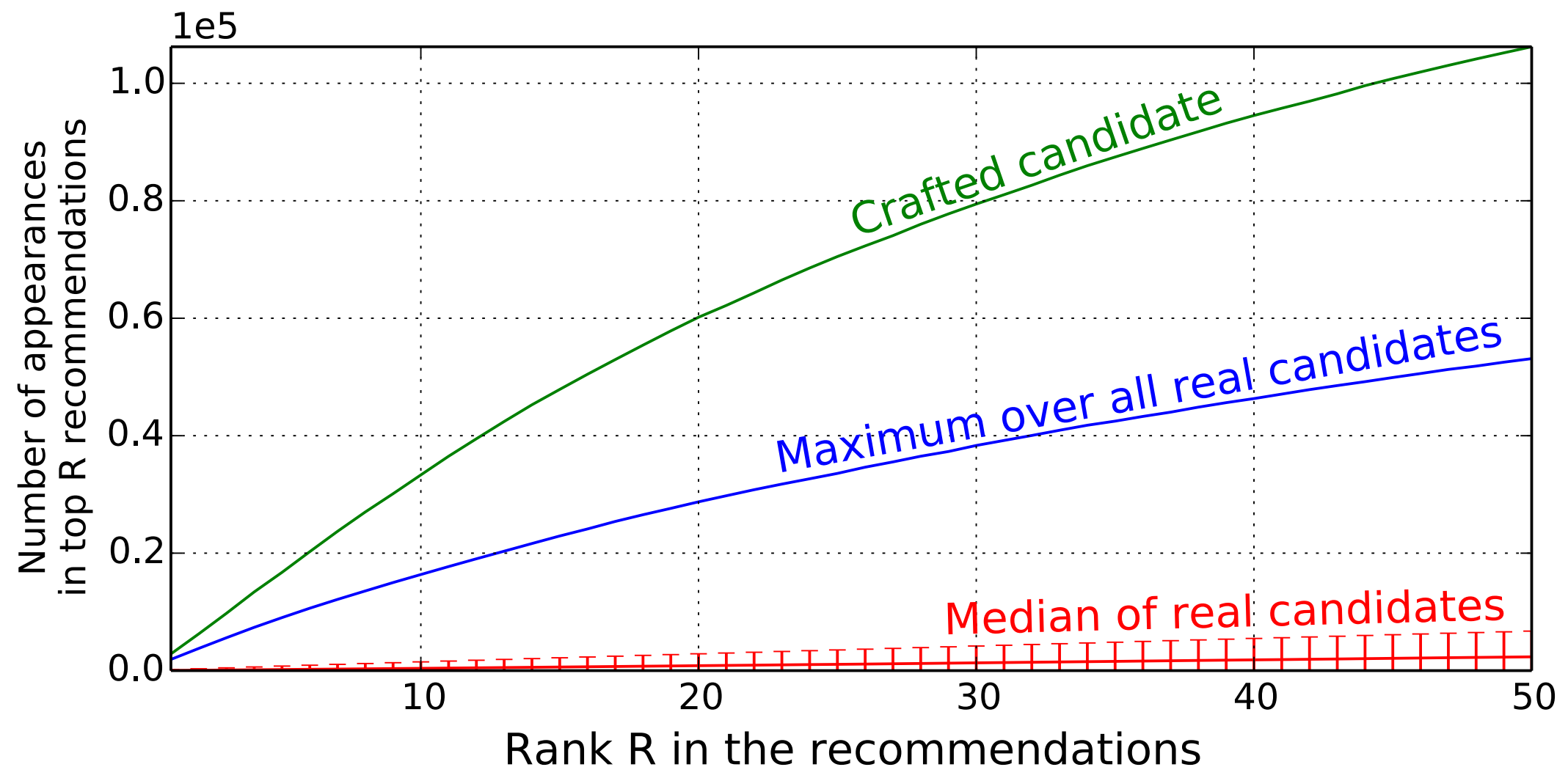


Effect of crafted profile

- 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

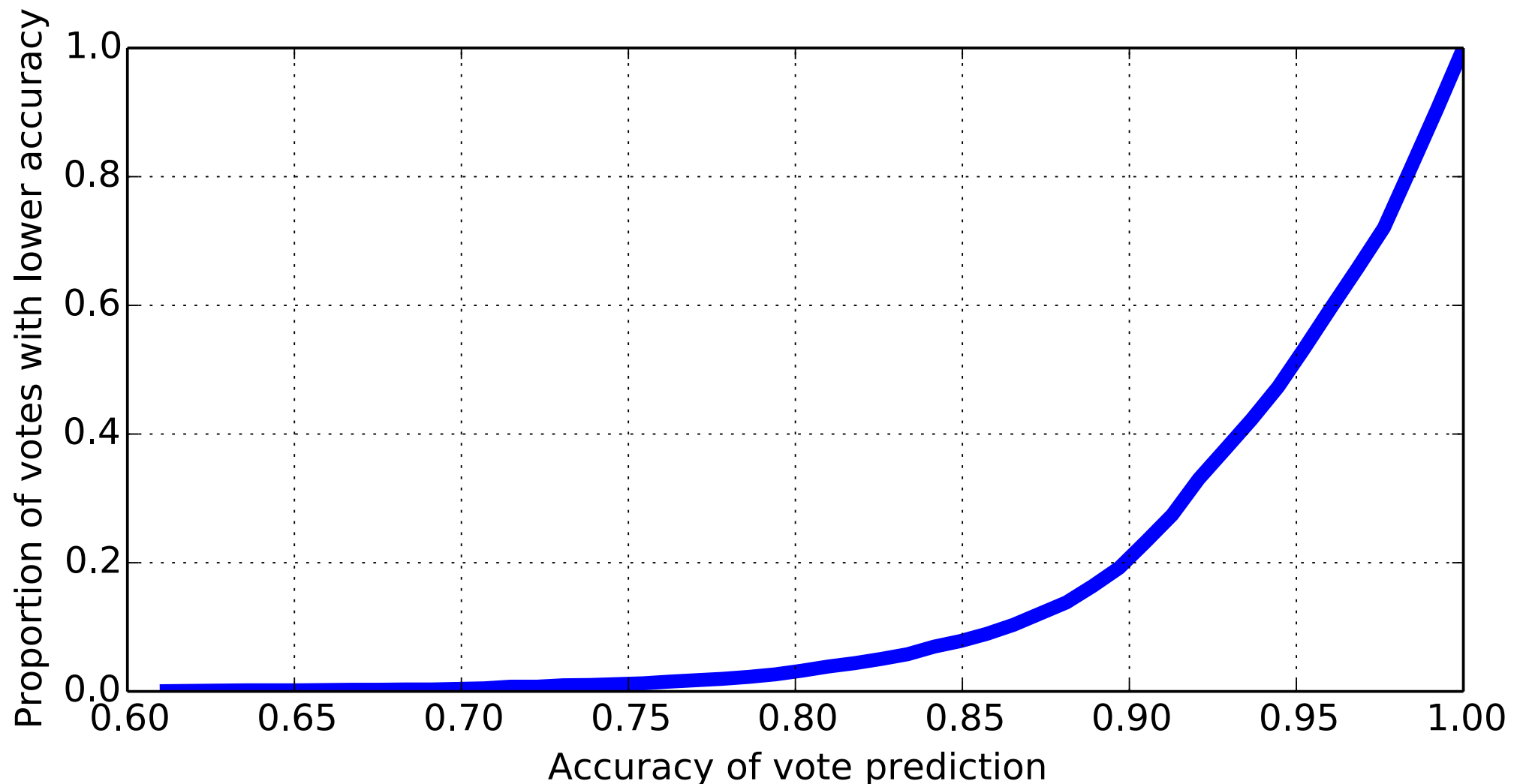
- Is it possible to **detect** whether a politician crafted his profile, **given the way he votes once elected** ?
- **Parliament votes** (2,494 since the 2011 elections) are public
- Requires a mapping **VAA answers** $\longleftrightarrow$ **parliament votes**
- Learning problem:

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

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

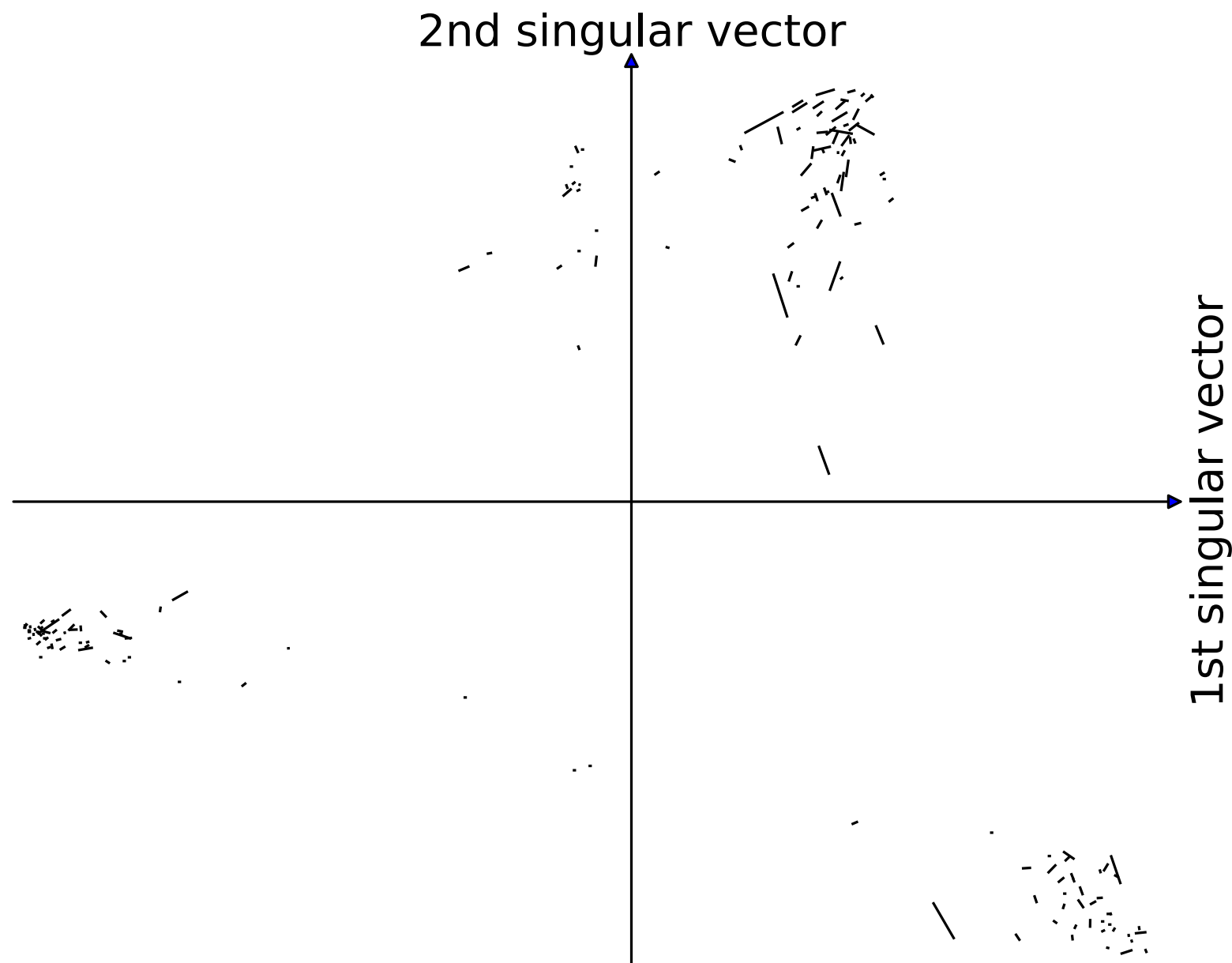
VAA responses can be used to predict parliament votes

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



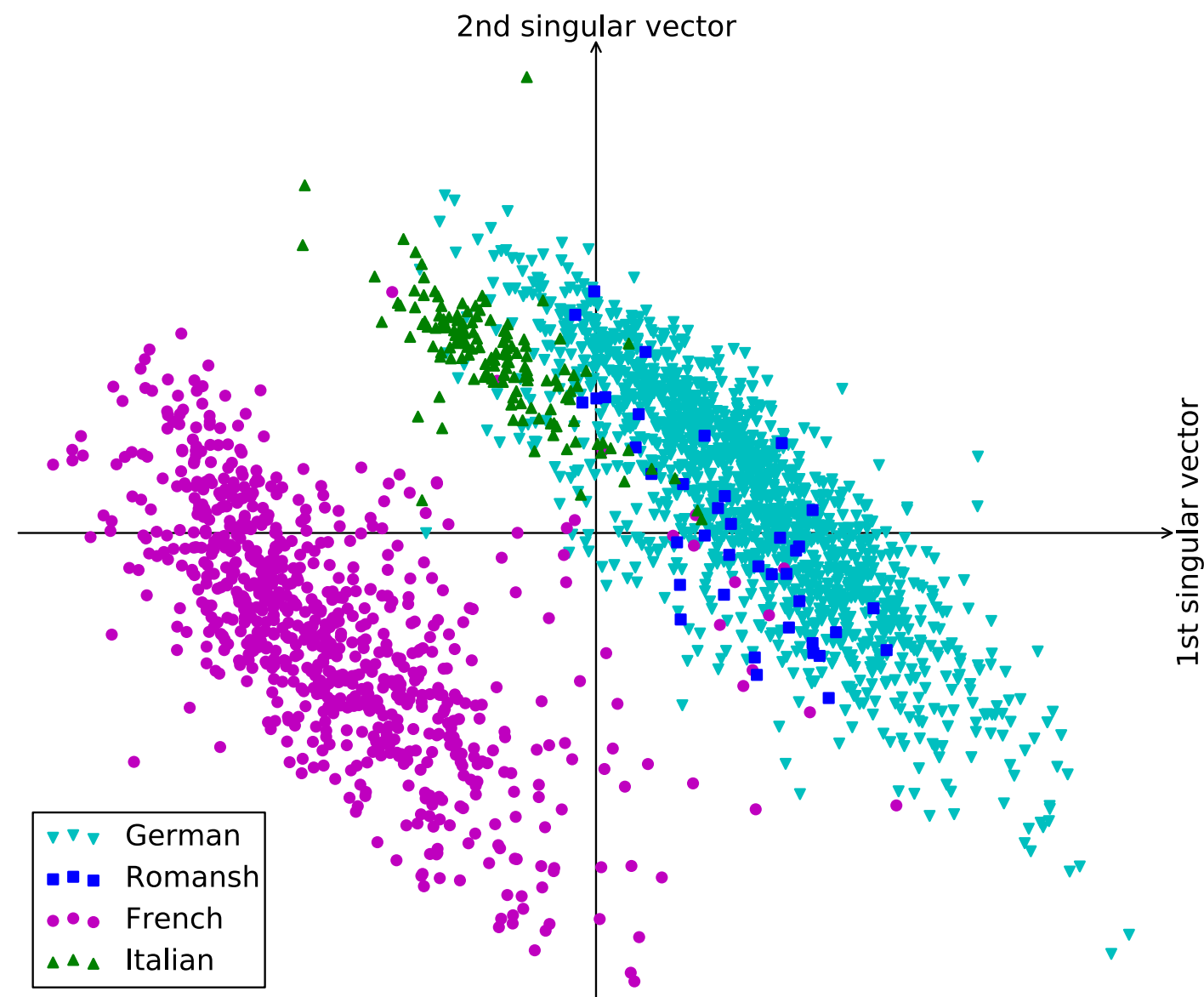
Opinions shifts

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



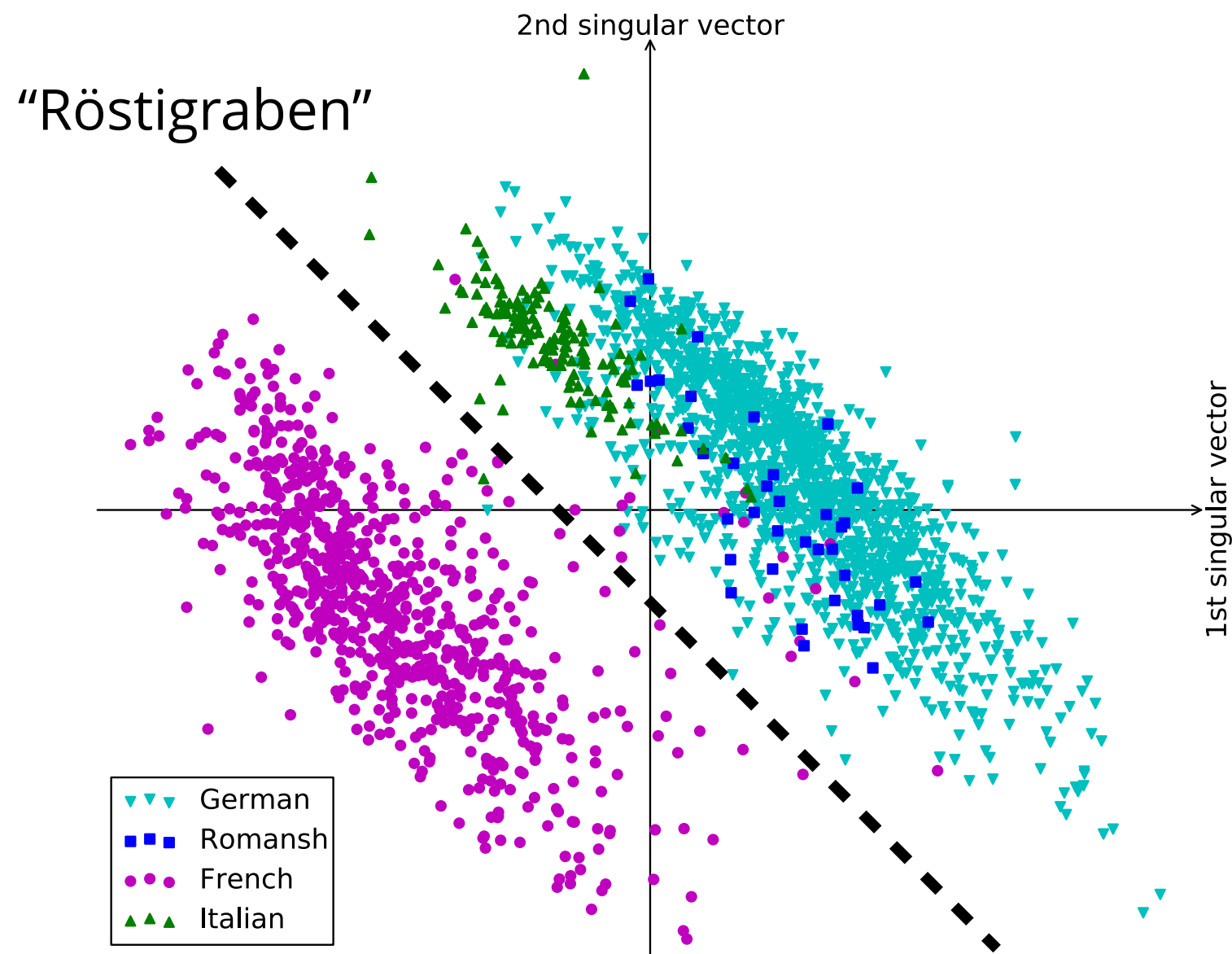
Voting patterns at municipality level

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



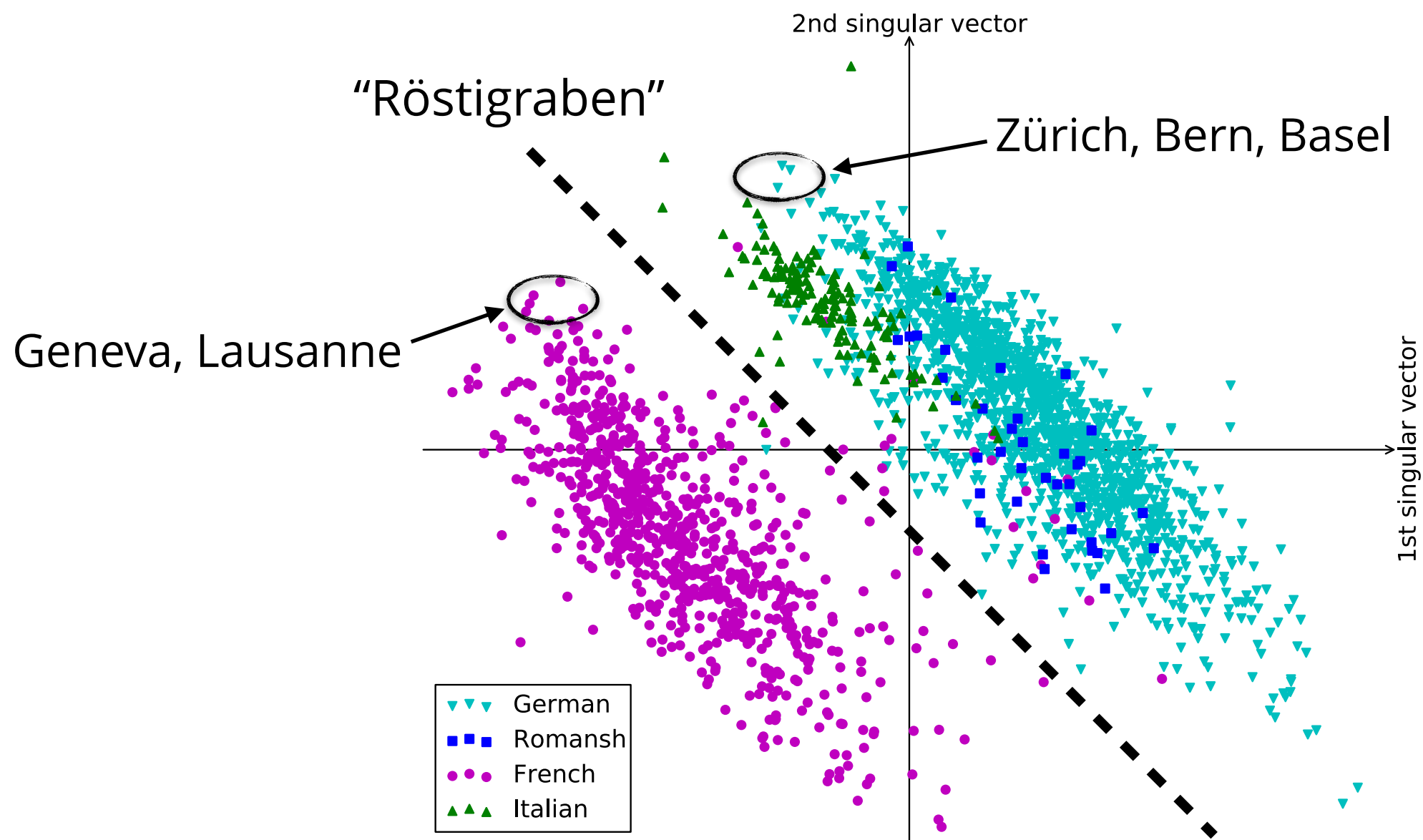
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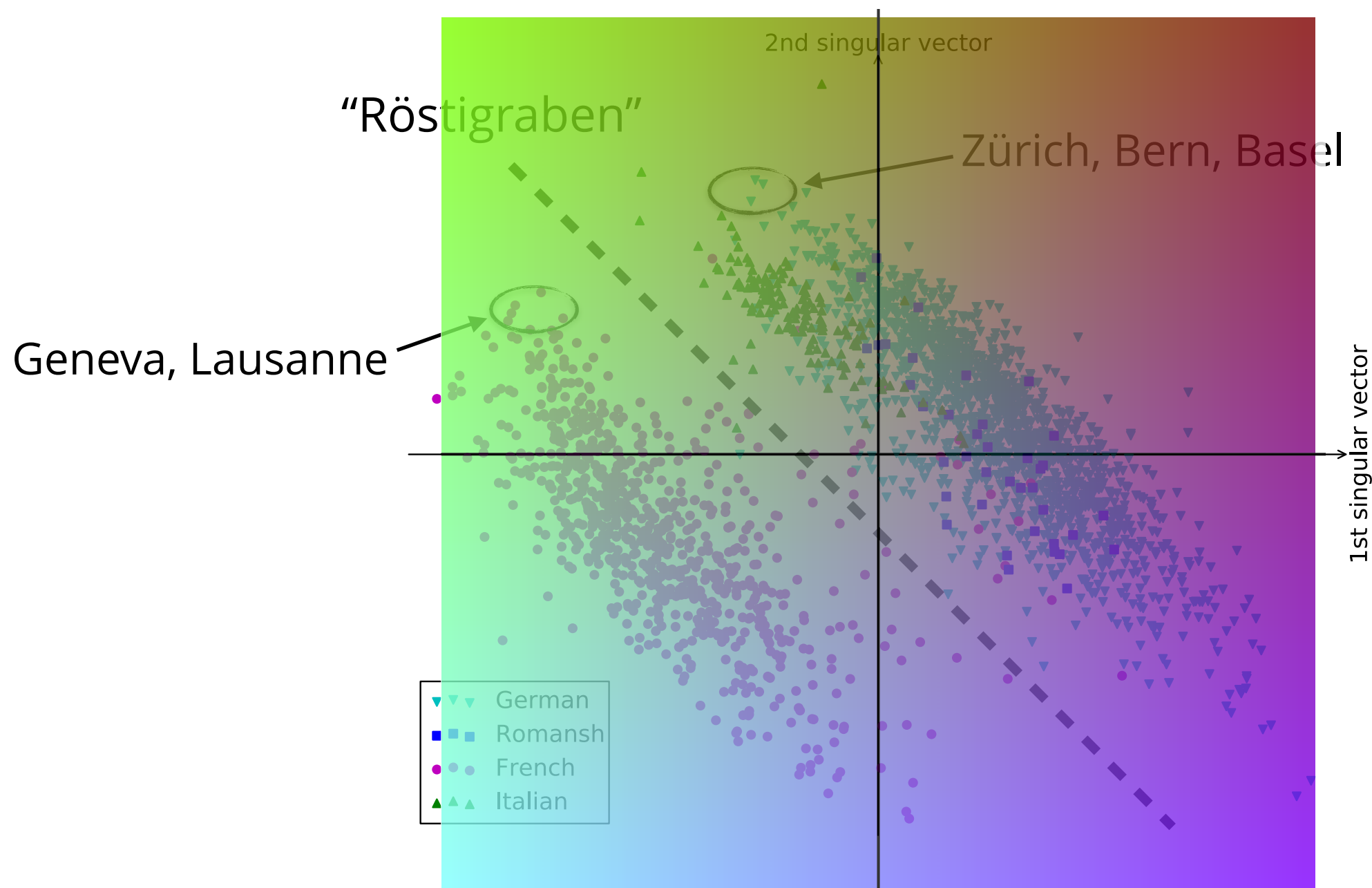
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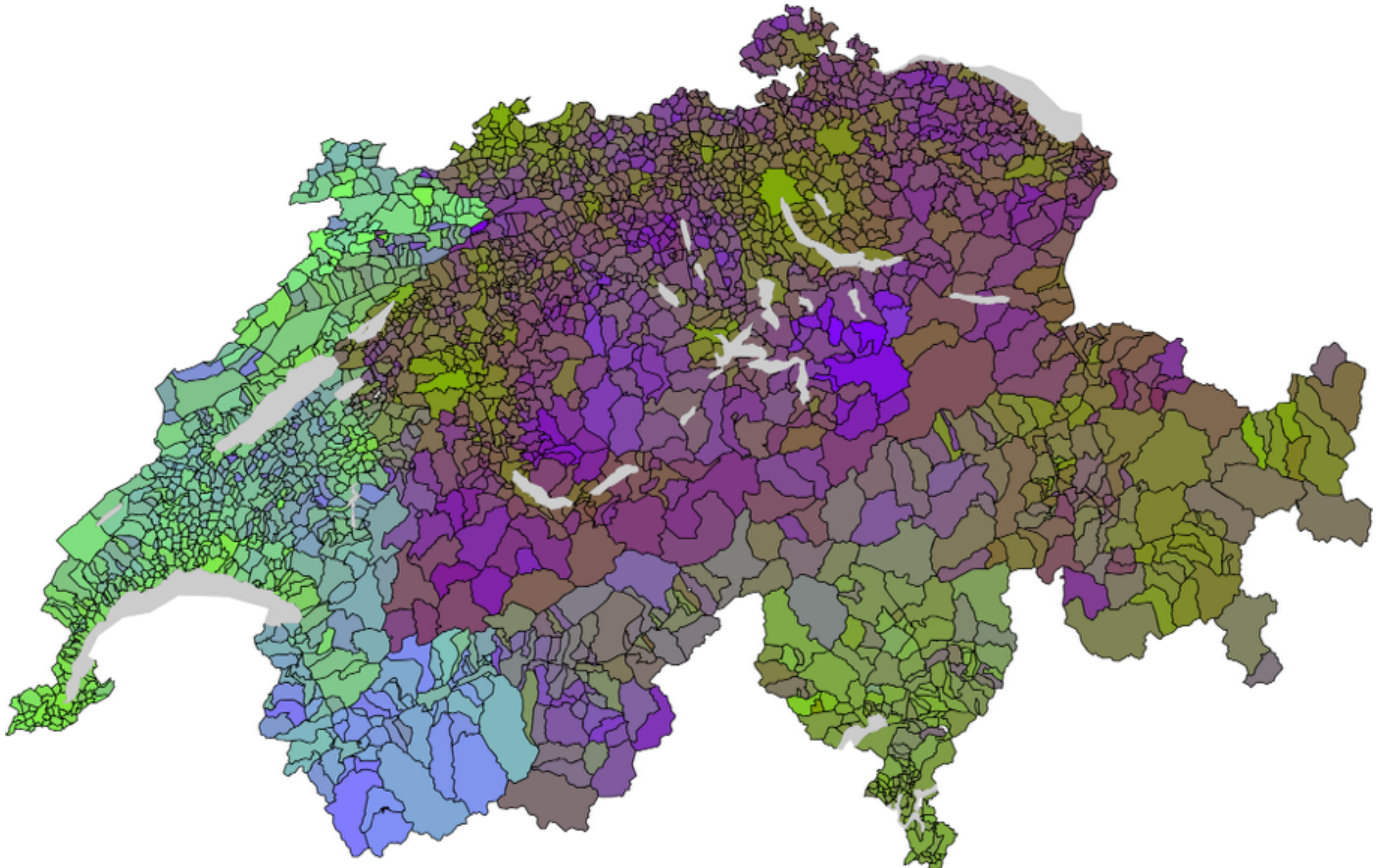


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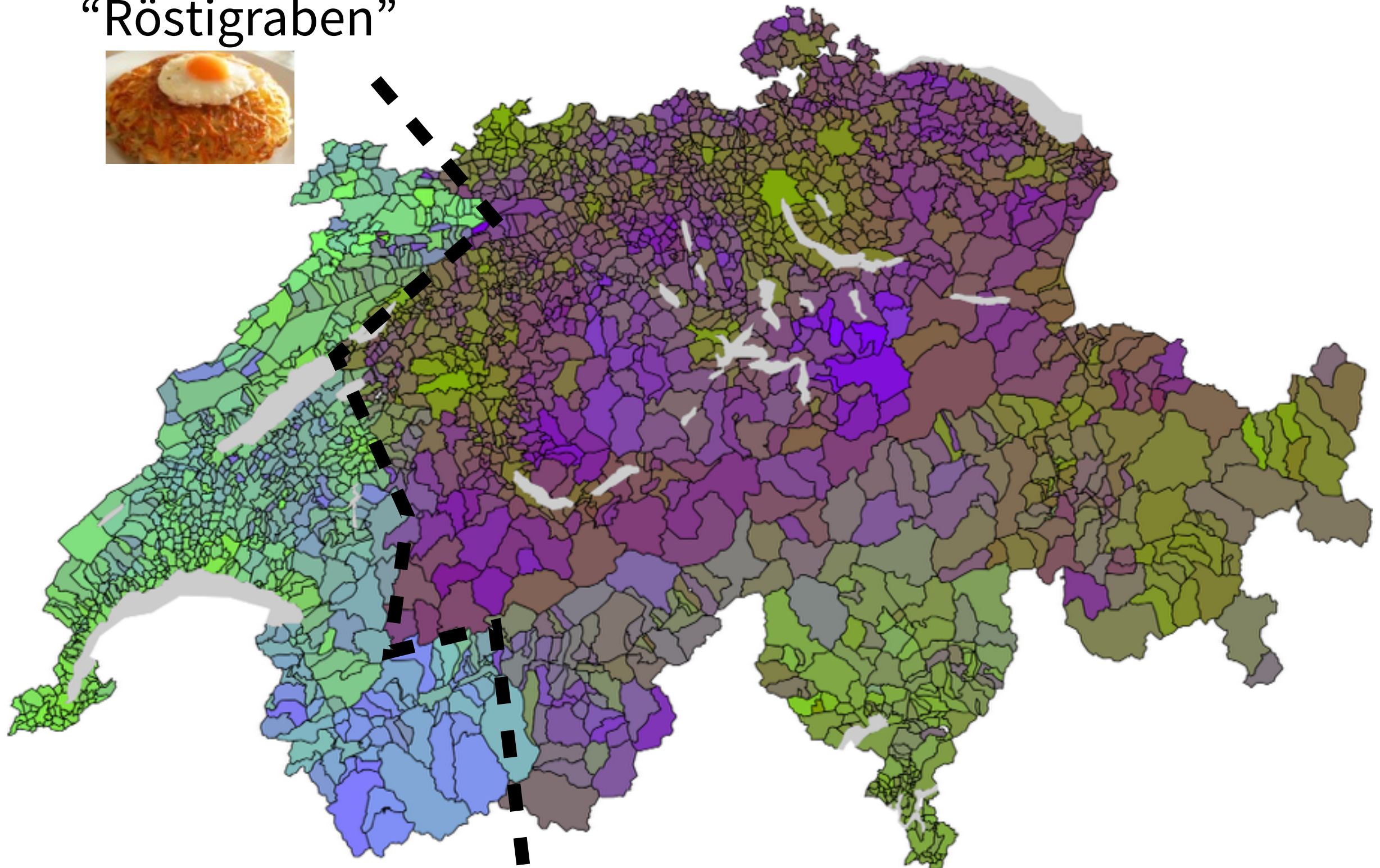


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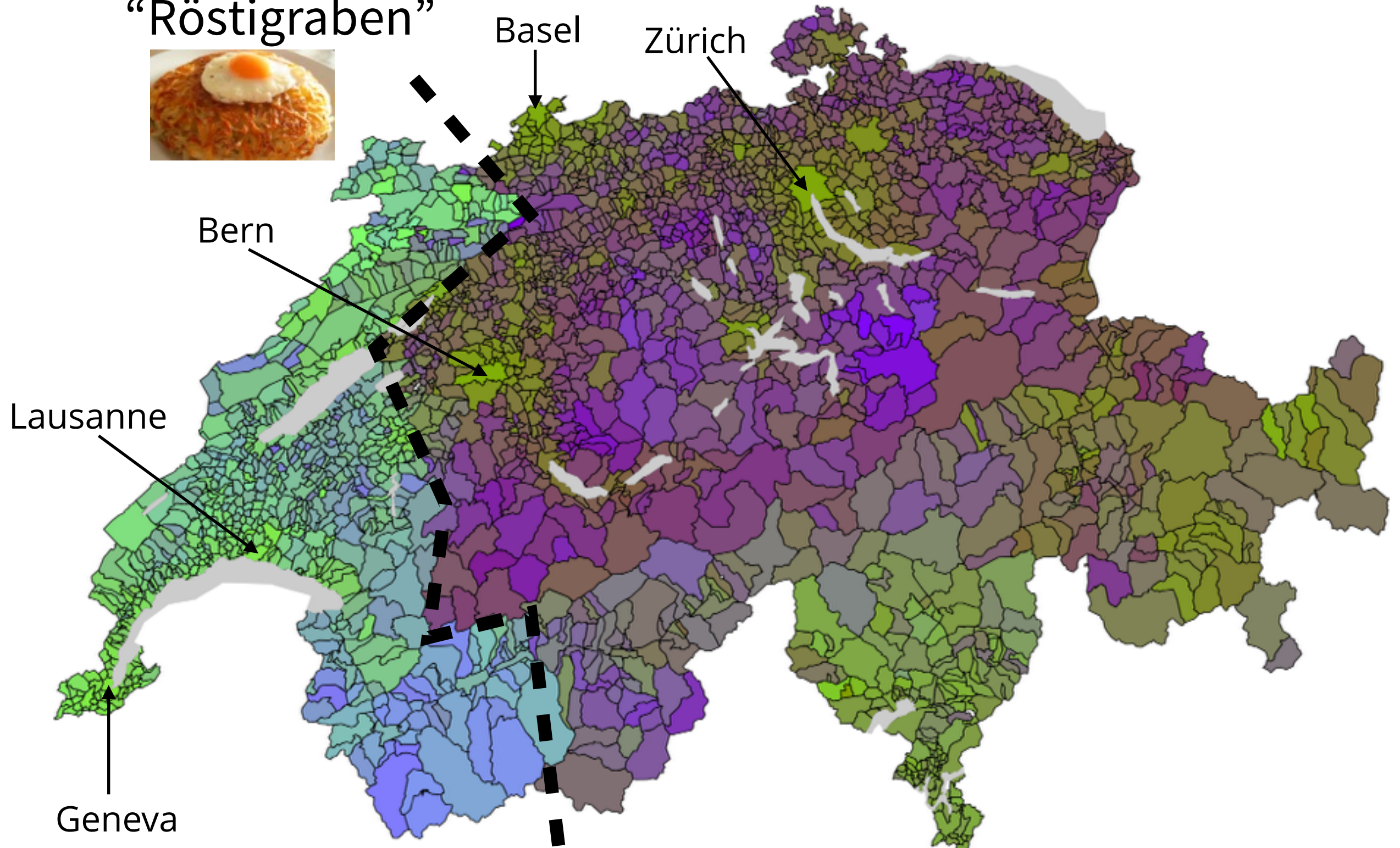
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“Röstigraben”



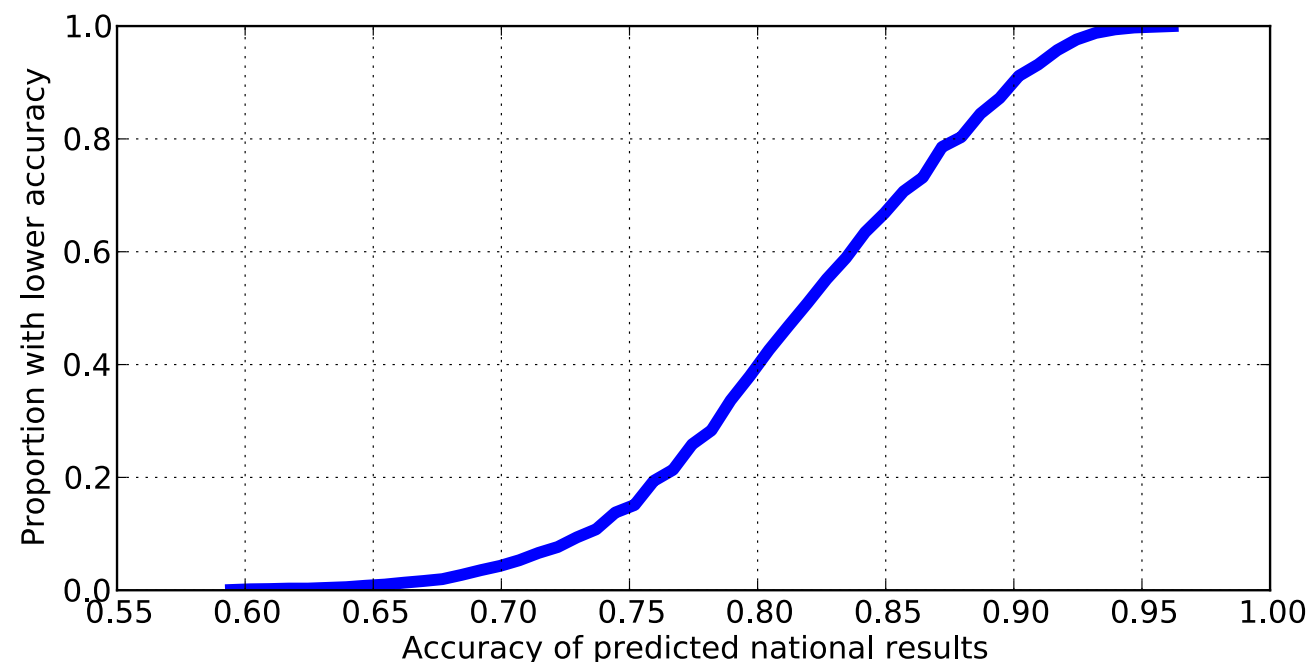
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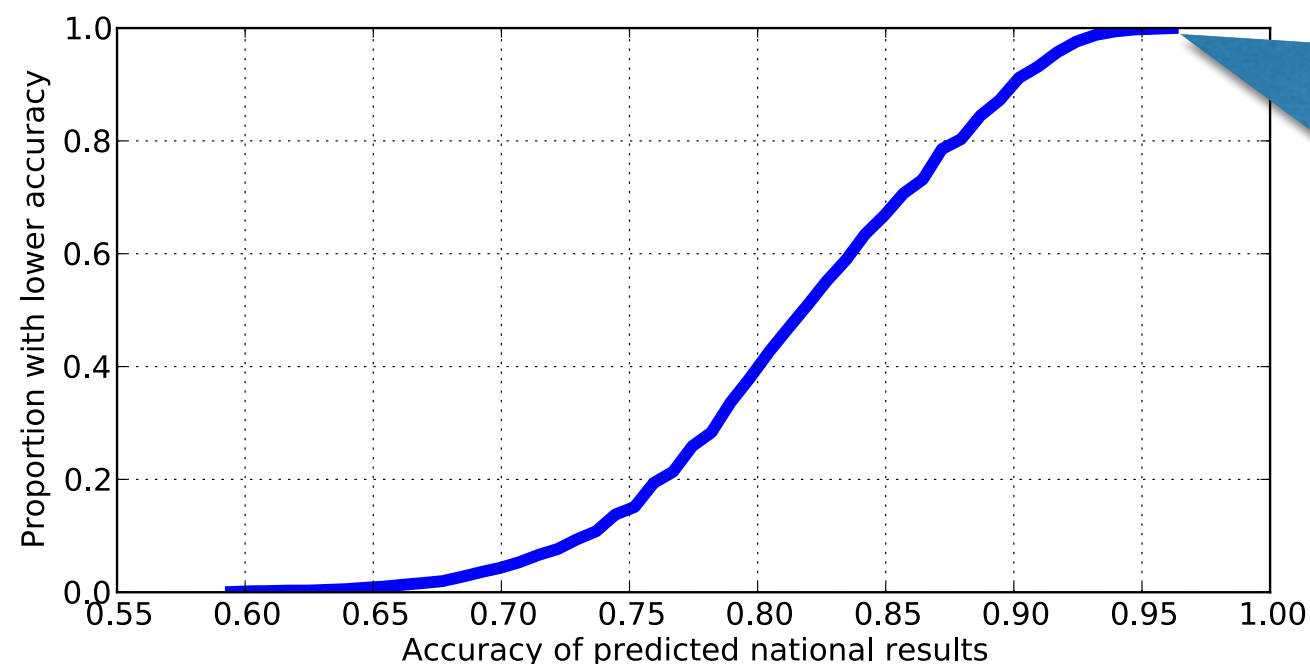
Prediction of national results

- 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!

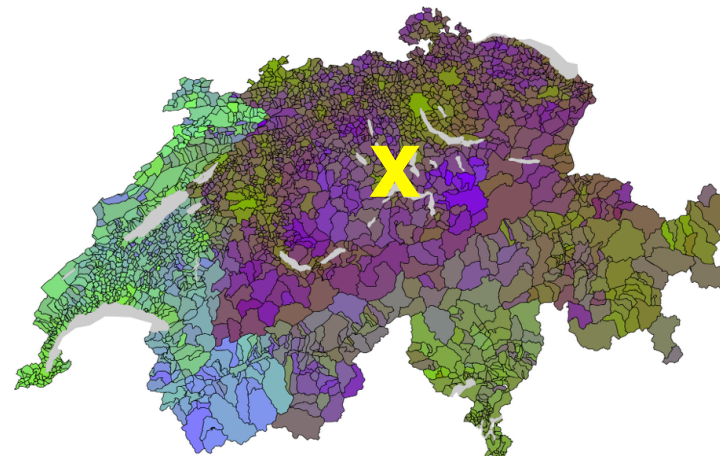


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Ebikon (accuracy 95.9% on test set)



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

