Swiss Politics and Demographics

An analysis of how demography, society and economy are related to results of votations across Swiss cantons

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

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ADA APPLIED DATA ANALYSIS

Abstract

Swiss politics are steered by regular federal votations that take place several times a year. As a swiss citizen, it might be difficult to keep track of the many results of votations and be aware of how deep economic, social and cultural differences may lead to considerable geographical differences in the votation tendencies. In this context, we explored the relationship between cantonal characteristics and votation outcomes and developed a tool to interactively visualize them. 17 social, economic and demographic features were found to significantly correlate with votation outcomes. Out of these, six were selected for display in a map where the orientation of the results of votations (right/left) can be optionally overlayed for several votation categories, including economy, health, immigration and more. Overall, this tool allows to intuitively identify the factors affecting swiss votation outcomes, and gain insights about swiss society.

Data Acquisition

Three major types of data were acquired and treated:

A) Demographic, social and economic

	Population résidante permanente de 15 ans et plus, selon la formation achevée, 2014					
	Total		Sans formation postobligatoire		Degré secondaire II professionnel	
	Nombres absolus	Intervalle de confiance: ± (en %)	Nombres absolus	Intervalle de confiance: ± (en %)	Nombres absolus	Intervalle de confiance: ± (en %)
Total	6.829.610	-	1.706.547	0,7%	2.384.675	0,5%
Zürich	1.203.038	0,1%	246.513	2,1%	402.821	1,4%
Bern / Berne	847.849	0,1%	190.718	2,2%	339.839	1,4%
Luzern	327.990	0,1%	79.746	2,4%	126.949	1,7%

- Initially > 300 features per canton
- Features averaged across 2011-2014
- 82 final features

B) Results of Federal Votations

Initiative populaire du 18.12.2007 'pour en finir avec les constructions envahissantes de résidences secondaires'

Canton	Electeurs	Votants	% Particip.	Oui	Non	% Oui	% Non
Zurich	881'041	372'874	42.32%	192'685	174'421	52.5%	47.5%
Berne	717'009	294'425	41.06%	159'106	130'503	54.9%	45.1%
Lucerne	261'034	119'349	45.72%	55'272	61'693	47.3%	52.7%
Uri	26'106	12'999	49.79%	4'895	7'775	38.6%	61.4%

- 51 votations (2011-2015)
- Results by canton

C) Votations Recommendations

Parti 1)	28 février 2)			
	no 596	no 597	no 598	no 599
PLR	non	non	non	oui
PDC	oui	non	non	oui
PS	non	non	oui	non
UDC	oui	oui	non	oui
PEV	oui	non	oui	non
PVL	non	non	non	non
PBD	non	non	non	oui

- 42 recommendations (2011-2014)
- Recommendation of 11 parties

Methods

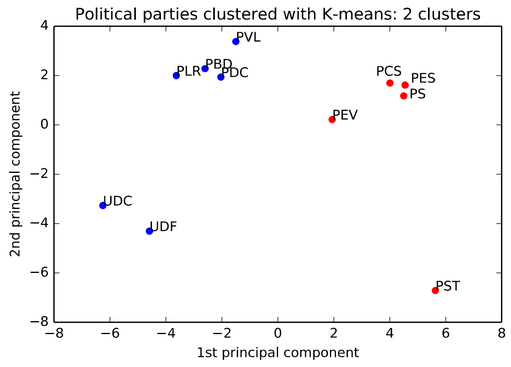
Data scraped with BeautifulSoup and Requests python libraries using jupyter notebooks

python jupyter Requests BeautifulSoup

Data Analysis

1) Political Orientation of Parties

Same classification (left/right) using 2 methods:
- Manual classification based on prior knowledge
- K-means clustering with 2 classes of parties based on votations' recommendations

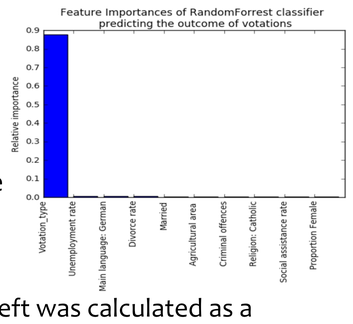


8 parties (5 right, 3 left) representing a total of 95% of votes at national council were kept for further analysis.

	Party	Group	Vote at national council 2015
PLR	Parti Libéral Radical	Right	16.4%
PDC	Parti Démocratique Chrétien	Right	11.6%
PS	Parti Socialiste	Left	18.8%
UDC	Union Démocratique du Centre	Right	29.4%
PEV	Parti Evangélique	Left	2.1%
PCS	Parti Chrétien Social	Left	N/A
PVL	Parti Vert'libéraux	Right	4.6%
PBD	Parti Bourgeois Démocratique	Right	4.1%
PST	Parti du Travail	Left	0.9%
PES	Parti Ecologiste	Left	7.1%
DS	Démocrate Suisse	Left	N/A
UDF	Union Démocratique Fédérale	Right	N/A
Lega	Ligue des Tessinois	Right	N/A
MCR	Mouvement Citoyens Romand	Right	N/A

2) Outcomes of Votations

Due to cantonal feature redundancy across votations, votation type seems to be the most important characteristic to determine the orientation of the result. Votations were thus combined into 8 categories.



Score Calculation:
- The overall recommendation of the right/left was calculated as a weighted average based on the parties' weight in the national council
- Yes/No votation outcomes were translated into right/left victories

$$score = \frac{victoriesRight - victoriesLeft}{numberVotations}$$

>0: right won more often
<0: left won more often

Average orientation of the results for each votation category per canton

	All votations	Economy	Education	Environment	Immigration	Health	Security	Social	Work
ZH	Right	Right	Right	Left	Right	Right	Equality	Left	Right
BE	Right	Right	Right	Left	Right	Right	Right	Left	Right
LU	Right	Right	Right	Equality	Right	Right	Right	Left	Right
UR	Right	Right	Right	Equality	Right	Right	Right	Left	Right
SZ	Right	Right	Right	Equality	Right	Right	Right	Left	Right
OW	Right	Right	Right	Equality	Right	Right	Right	Left	Right
NW	Right	Right	Right	Equality	Right	Right	Right	Left	Right
GL	Right	Right	Right	Equality	Right	Right	Right	Left	Right
ZG	Right	Right	Right	Equality	Right	Right	Right	Left	Right
FR	Left	Right	Left	Left	Right	Right	Right	Left	Right
SO	Right	Right	Right	Left	Right	Right	Right	Left	Right
BS	Right	Right	Right	Left	Right	Right	Equality	Left	Right
BL	Right	Right	Right	Equality	Right	Right	Right	Left	Right
SH	Right	Left	Right	Left	Right	Right	Right	Left	Right
AR	Right	Right	Right	Left	Right	Right	Right	Left	Right
AI	Right	Right	Right	Equality	Right	Right	Right	Left	Right
SG	Right	Right	Right	Left	Right	Right	Right	Left	Right
GR	Right	Right	Right	Left	Right	Right	Right	Left	Right
AG	Right	Right	Right	Left	Right	Right	Right	Left	Right
TG	Right	Right	Right	Left	Right	Right	Right	Left	Right
TI	Right	Right	Right	Right	Right	Right	Right	Left	Right
VD	Left	Right	Left	Left	Right	Equality	Equality	Left	Right
VS	Right	Right	Left	Right	Right	Right	Right	Left	Right
NE	Left	Right	Left	Left	Right	Equality	Equality	Left	Right
GE	Left	Right	Left	Left	Right	Left	Equality	Left	Right
JU	Left	Right	Left	Left	Right	Equality	Equality	Left	Right

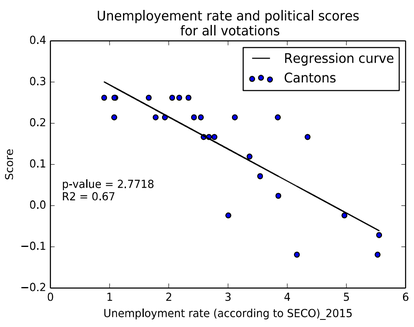
Despite canton-specific trends, major similarities across the country exist.

3) Influence of Demographics in the results of votations

We studied the cross-correlation between cantonal features and votation scores. 17 features (see table below) showed a statistically significant correlation with the orientation of the results' outcome.

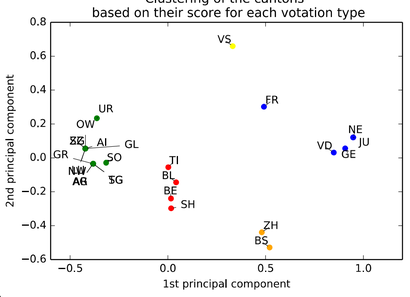
Demographic parameters	p-value	Correlation coefficient
Utilised agricultural area per farm in ha	4.73E-09	-0.88
Main language French	6.55E-08	-0.84
Unemployment rate	2.77E-07	-0.82
Social assistance rate	6.61E-06	-0.76
Crude divorce rate	1.37E-05	-0.74
Criminal offences under the Swiss Criminal Code	6.49E-05	-0.70
Proportion female	2.33E-04	-0.66
Religious affiliation: No affiliation	1.25E-03	-0.60
Divorced	1.39E-03	-0.59
Criminal offences under the Narcotics Act	1.74E-03	-0.58
Criminal offences under the Foreign Nationals Act	2.45E-03	-0.57
Education expense (per habitant)	7.45E-03	-0.51
Net activity rate (15-64 years)	6.54E-03	0.52
Married	1.60E-03	0.59
Average per capita living space	5.66E-04	0.63
Upper secondary education (aged 25 or over)	3.62E-05	0.72
Main language German	5.81E-06	0.76

Example: significant correlation between demographics and votation results



4) Canton Classification

We classified cantons based on the orientation of the results of each votation category. French-speaking cantons were clustered together by k-means, reflecting swiss cultural differences.

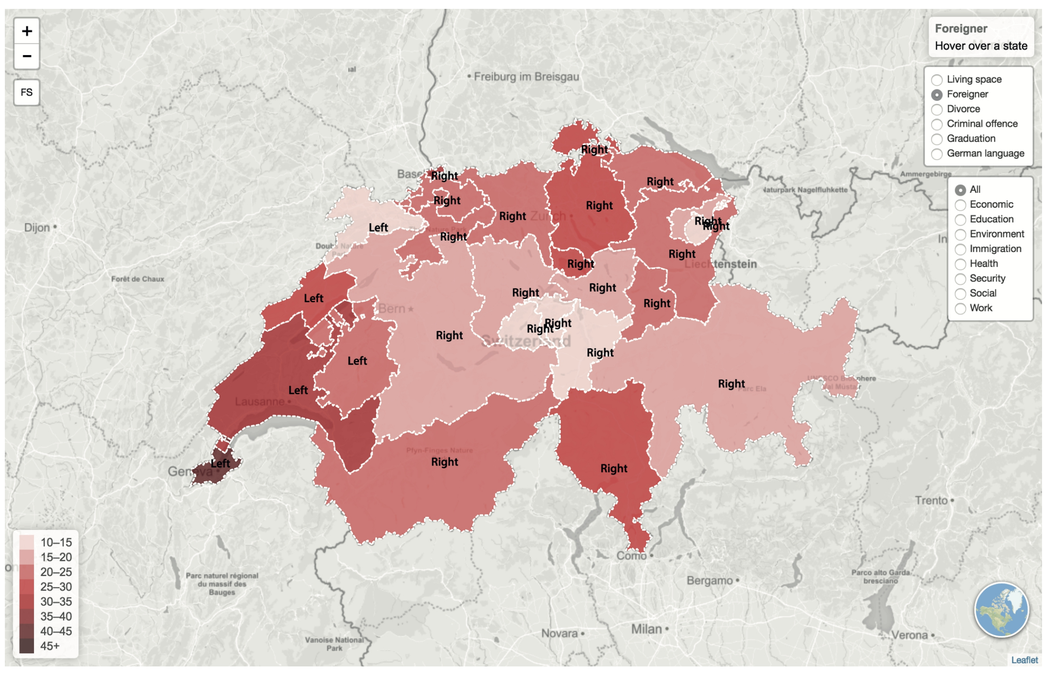


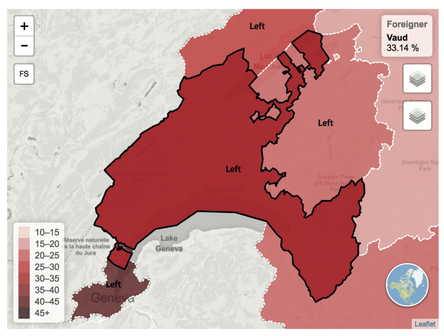
5) Prediction of Votation Outcomes

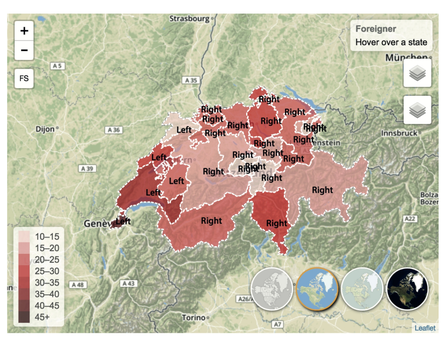
Random forest classifier (100 trees) to predict binary (right/left) outcome of each votation category per canton. Based on the combined data, the accuracy ranged from 64% to 99%.

pandas scikit learn

Interactive Visualization







Aim

Develop an easy and intuitive way to interactively visualize possible correlations between demographic, social or economic data and voting results

Map Functionality
- Choose demographic, social and economic properties → Color base per canton
- Choose votation type → Averaged votation results per canton (right or left wins)
- Select background

Methods
- Webpage creation using HTML5 and CSS3
- Interactive map display using Javasript Leaflet library
- Canton boundaries adapted from topojson to geojson

HTML CSS JS Leaflet

Future Development

- Find a more intuitive way to display the voting results
- Add further demographic, social and economic features to represent on the map
- Add the option to either display voting results grouped by thematics or outcomes of individual votations
- Put the map on the web making it publicly available to everyone
- Automatically updated the map after each voting or when new demographic data are accessible
- Extend the project to other countries

Personal Achievement

- Handle large dimensional data and combine them to obtain less but more relevant features
- Develop a basis webpage with HTML and CSS
- Create an interactive visualizable representation of data using JavaScript and Leaflet
- Get insights about swiss political tendencies

Sources

- **Portail of Swiss goverment**
- https://www.admin.ch/gov/de/start.html
- **Leaflet webpage** http://leafletjs.com/
- **OpenClassrooms on HTML5 and CSS3:** https://openclassrooms.com/courses

More details on
https://github.com/MariaCervera/ADA_Project