

Generalizing Banking and Spatial Data to promote Transparent Property Valuation



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Rooms

5,5

Living area

180
m²

Coop in

15
min

Childcare in

7
min

School in

10
min

Lake view

180
hectare

Street Noise nighttime

56
decibel

Mountain view

15

mountain peaks

Noise daytime

64
decibel

Medical office in

20
min

Secondary residence ratio

3,8 %

Median taxable income

82'000

Tax burden

Medium

Environment

Expensive

Value

2,68

Million CHF

Neighborhood

Good

Raiffeisen is a Leading Bank for Real-Estate Financing

RAIFFEISEN

Cooperative Banks

219

Locations

784

Mortgages Volume

211

Billion CHF

Customers

3,69

Million

Cooperative Members

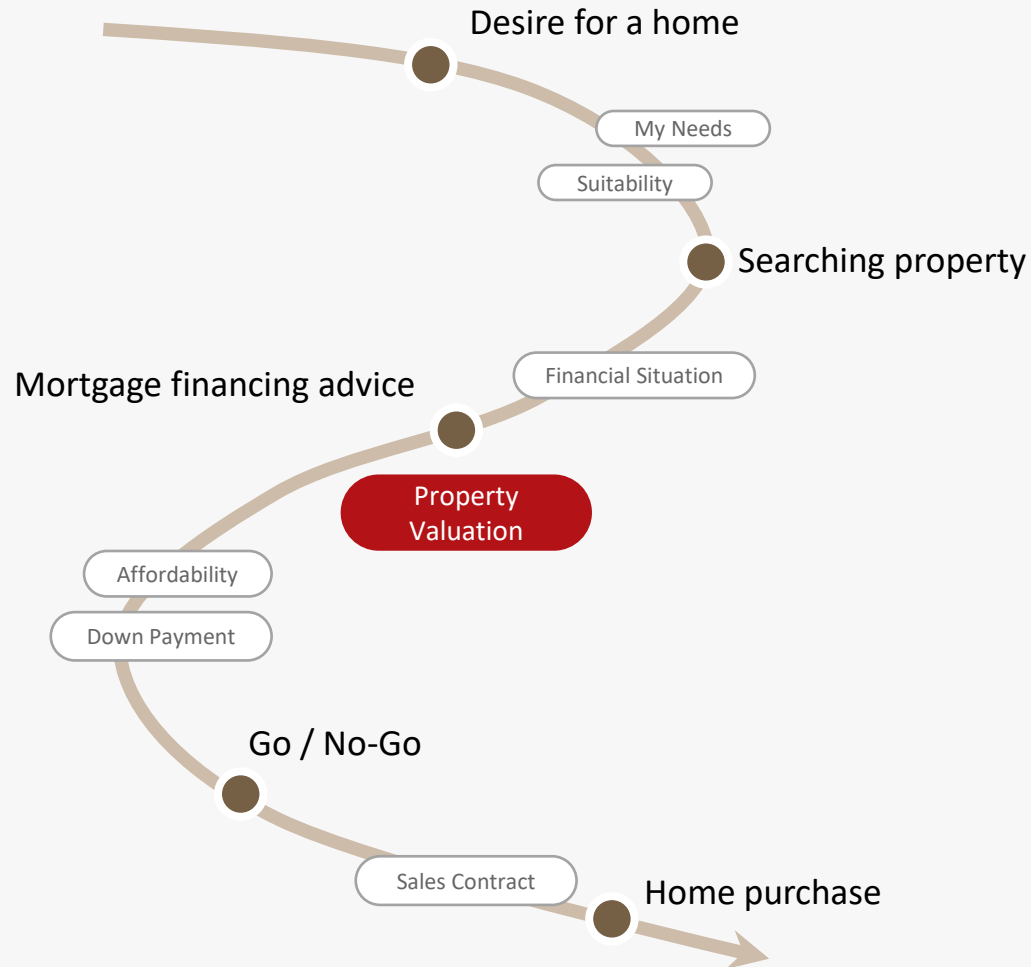
2,06

Million

Employees

12'328

Our Goal



Increase Transparency in the Property Valuation



Enable our clients to make better informed decisions to buy or sell a property

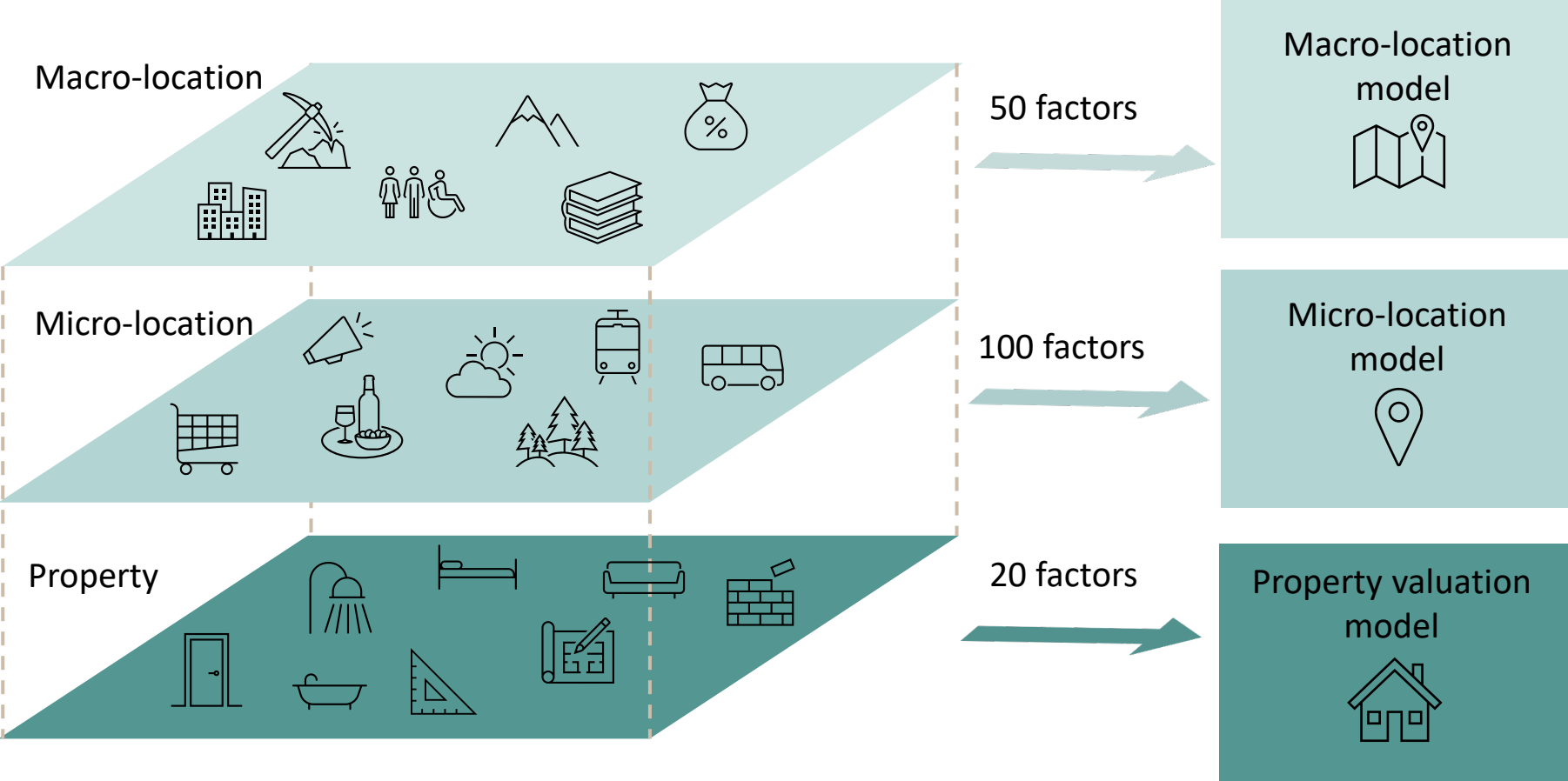


Support clients during the mortgage process by acting as a competent third party for homebuyers



Allow Raiffeisen to better manage their mortgage credit risks

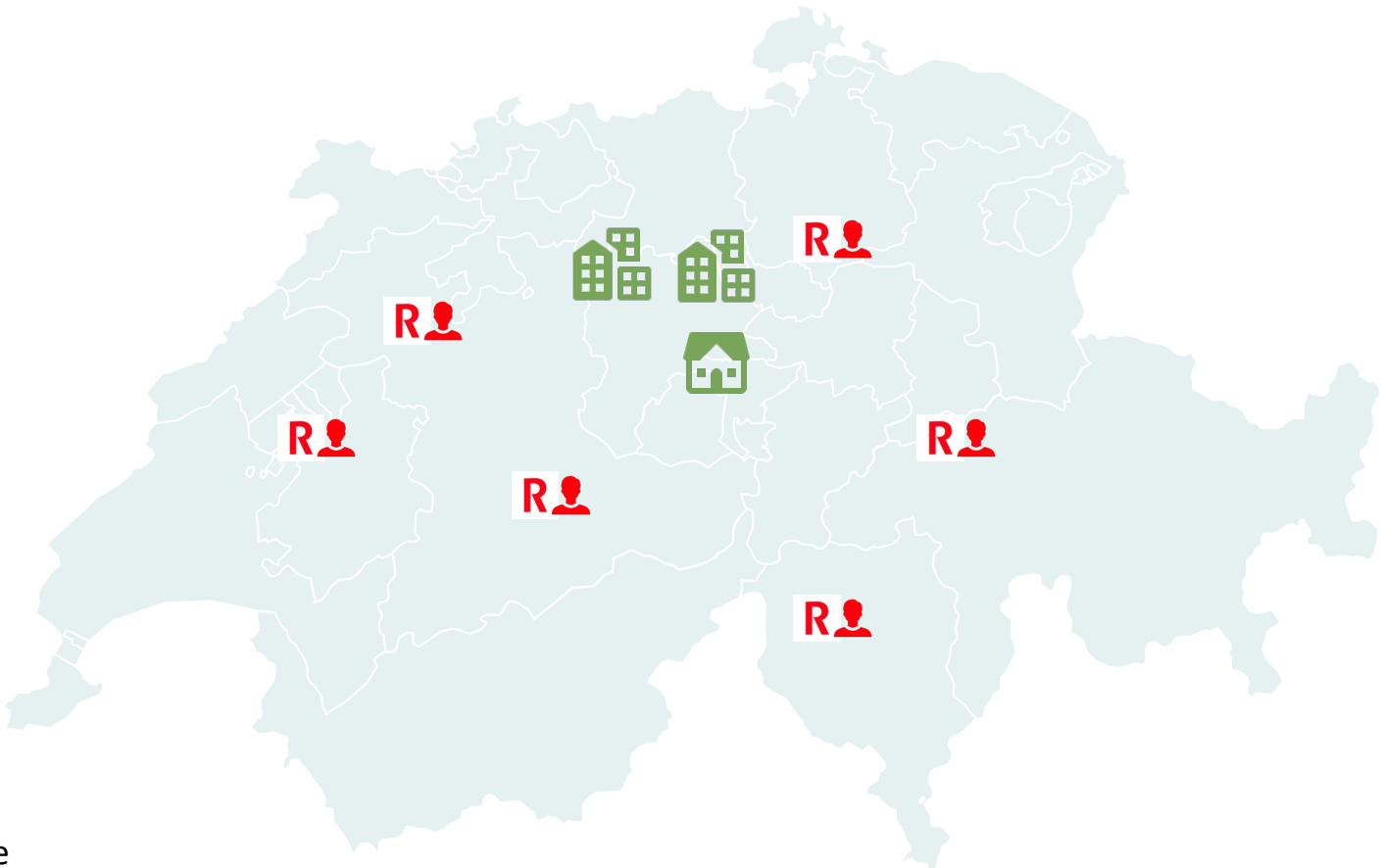
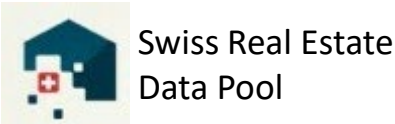
Our Approach to the Challenging Task of Property Valuation

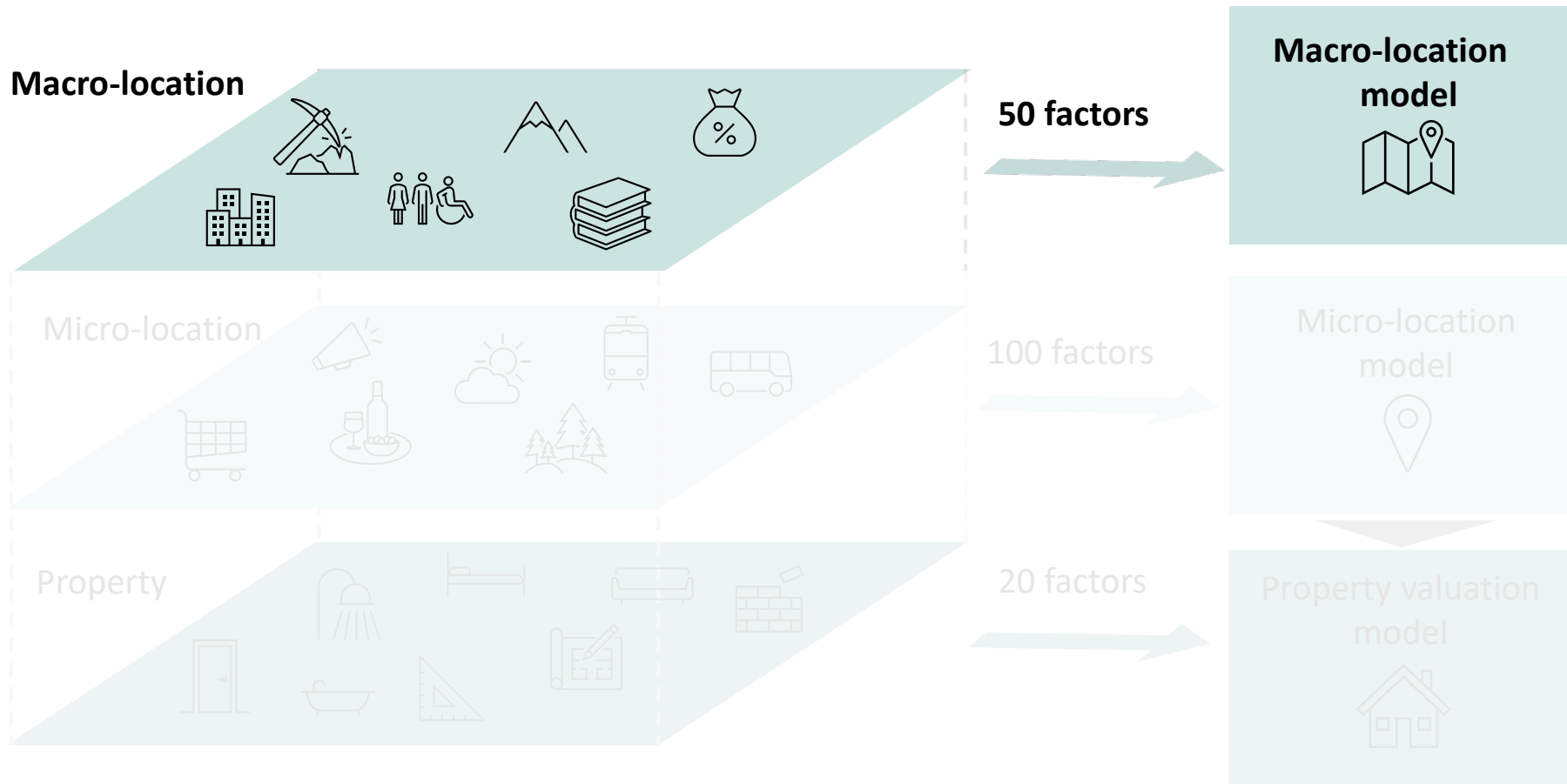


We combine Data from Public Sources with Banking Data



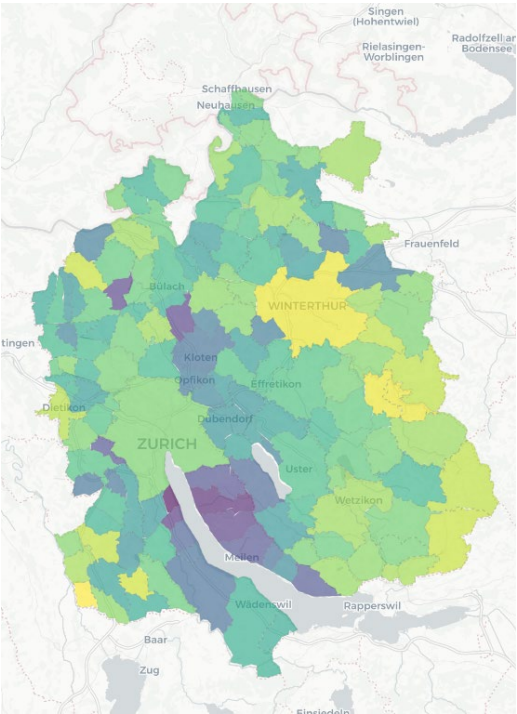
geodienste.ch





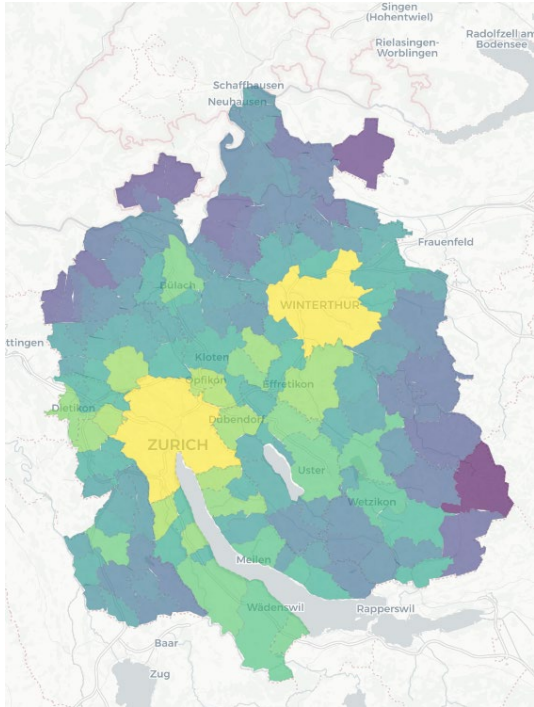
Factors influencing the Macro-Location on Municipality Level

Tax burden



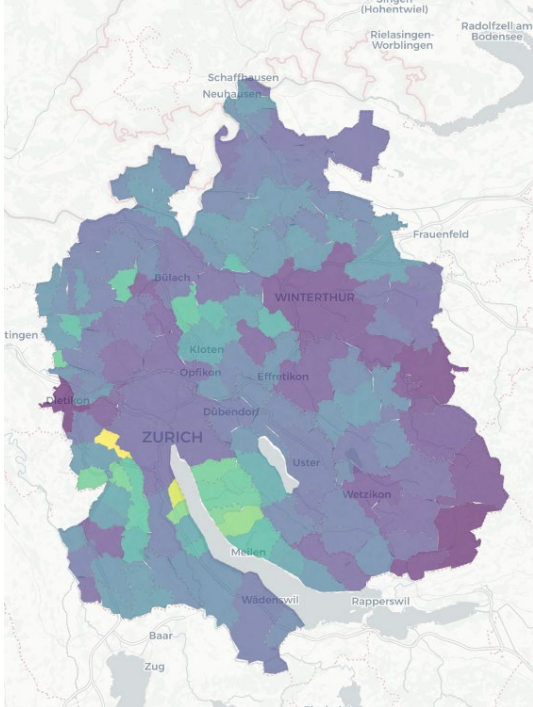
● High Taxes ● Low Taxes

Public transport accessibility of the nearest larger city



● Good ● Bad

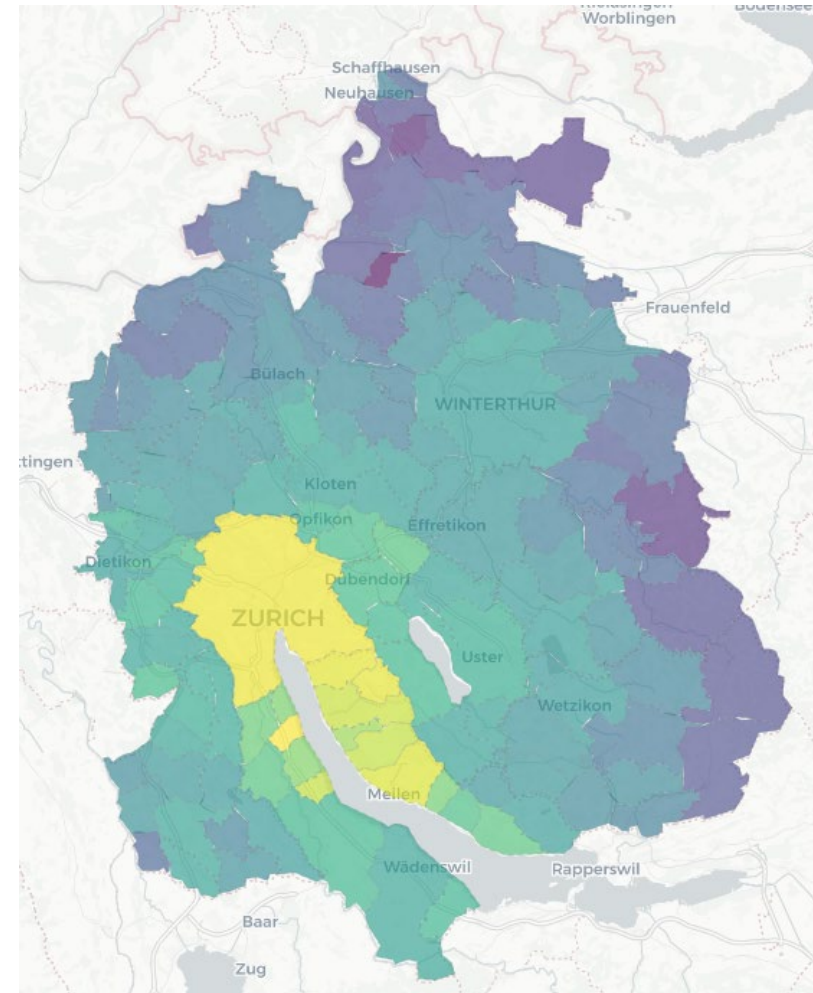
Median taxable income as a proxy for expensive locations



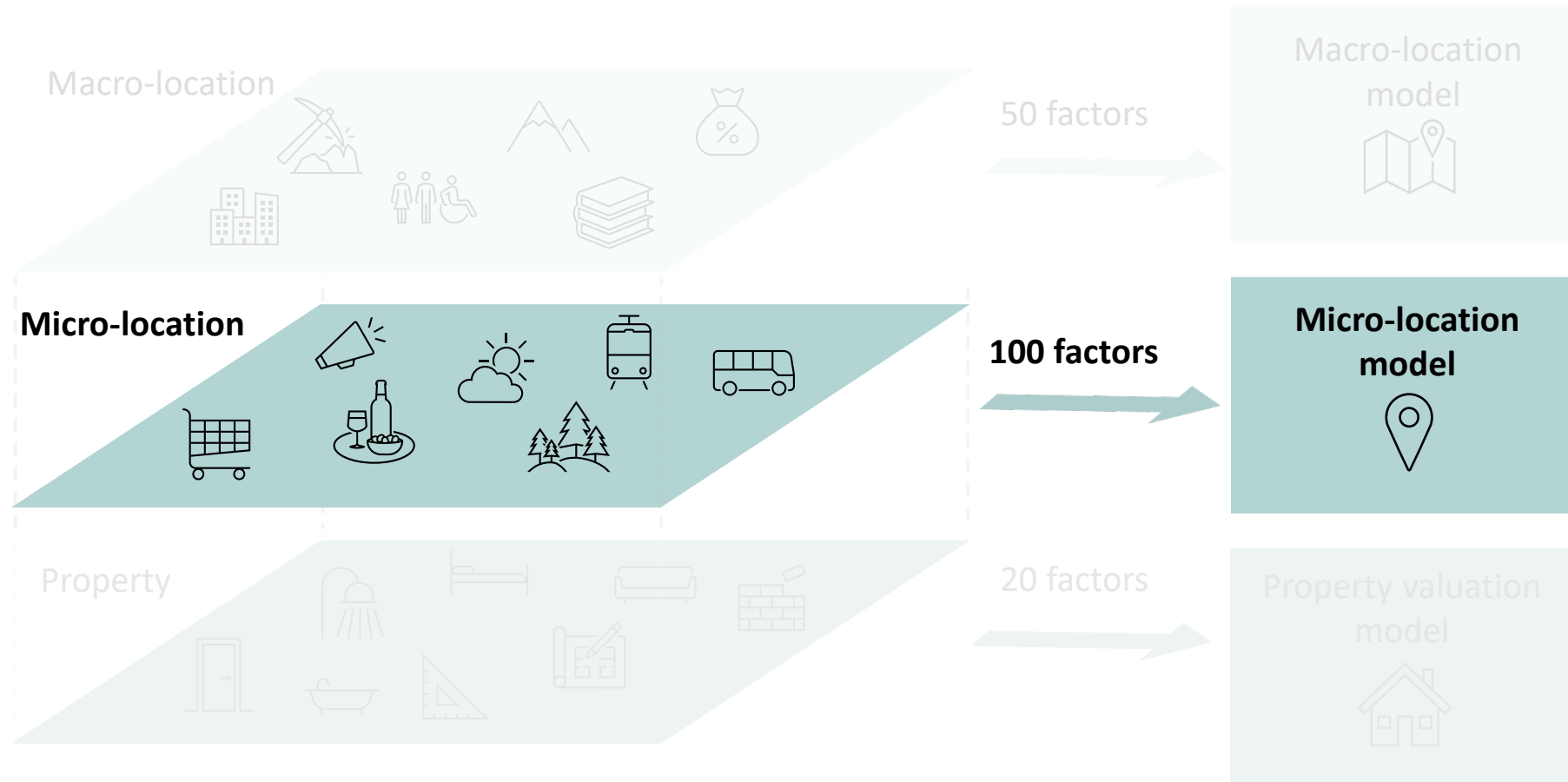
● High Income ● Low Income

The Macro-Location Model

- We use **real estate market transactions** to calculate the price level per municipality.
- In municipalities where we have enough transactions, we calculate the price level directly as **a fixed effect from a hedonic regression model**.
- In municipalities where we do not have enough transactions, we use a **spatial generalization model** and geo data to predict an adequate price level.



● High Prices ● Low Prices



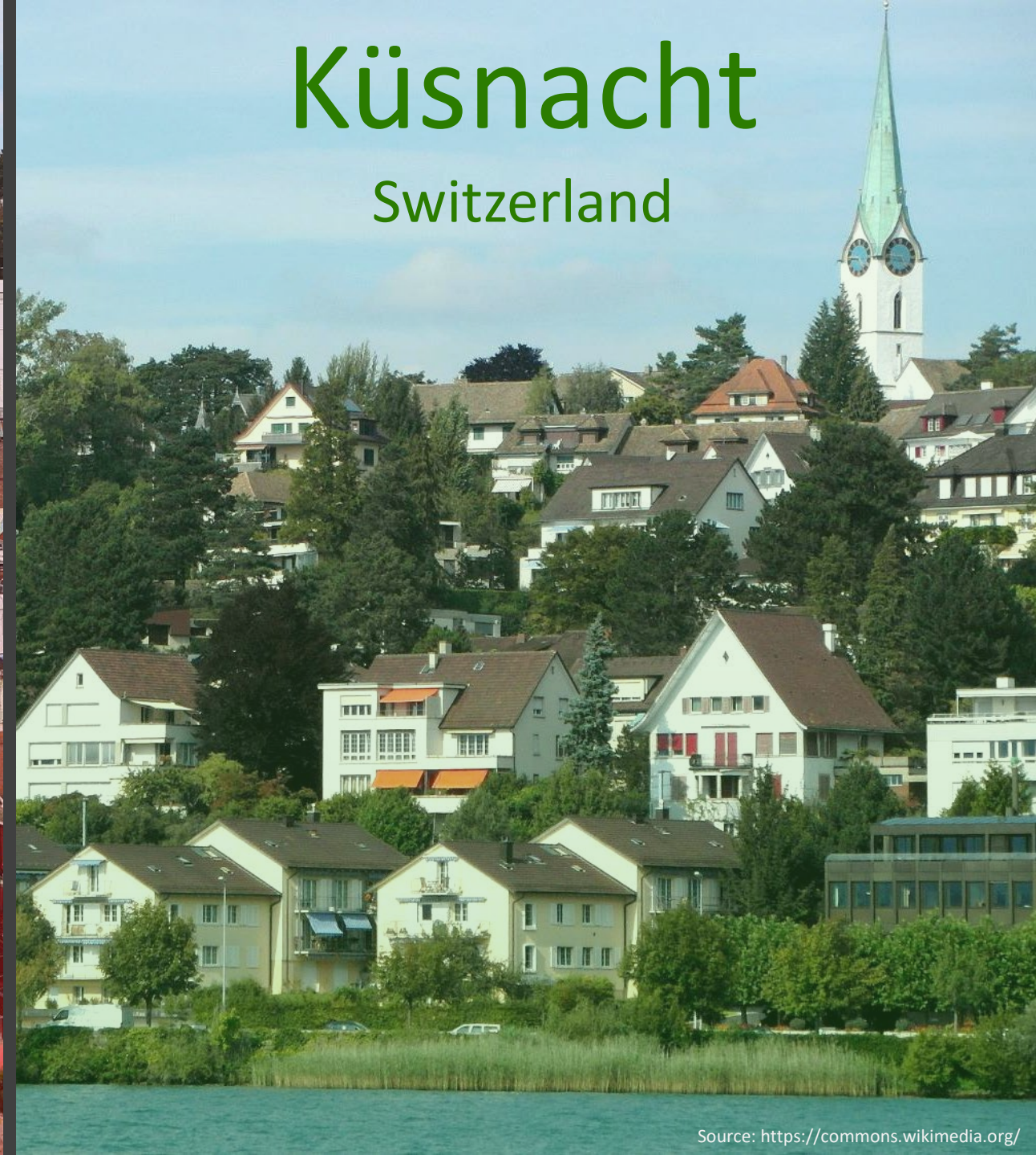
Gamcheon

South Korea



Küsnacht

Switzerland



Factors influencing the Micro-Location

Lake View



● Good view ● Limited view

Street Noise



● Quiet ● Loud

Accessibility of nearby Shops



● Close ● Far



The Micro-Location Model

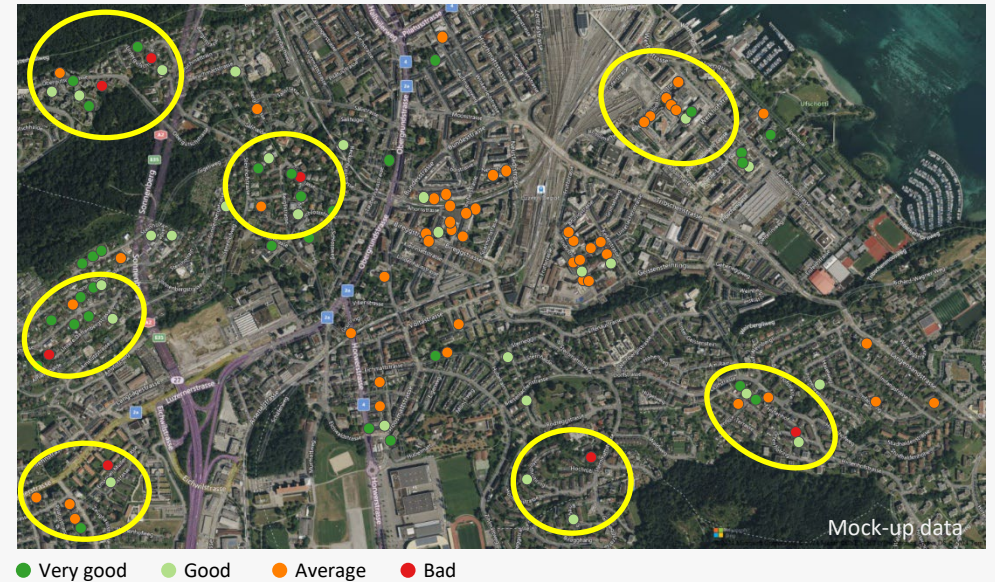
- Leveraging the **regional expertise** of Raiffeisen client advisors in the real estate sector
- More flexibility in **supervised modeling with actual location assessments** than with standard rule-based micro-location methods
- **Light gradient boosting** as a top-performing ML model for the micro-location modelling



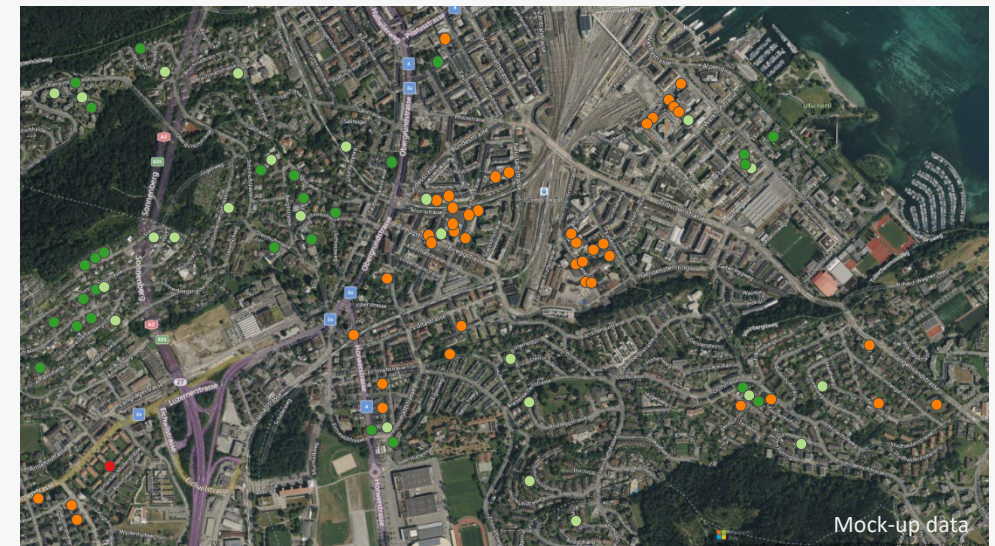
Location Assessment of Client Advisors

- Over **250k** location assessments from client advisors for micro-location modeling
- Using **subjective location assessments** as a basis for modeling is a challenge
- **Remove outliers** in labels with spatial autocorrelation

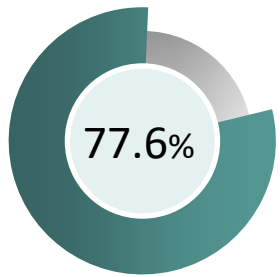
Noisy labels



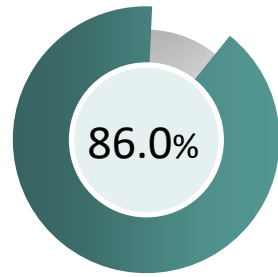
Filtered labels



Model Performance: Light Gradient Boosting



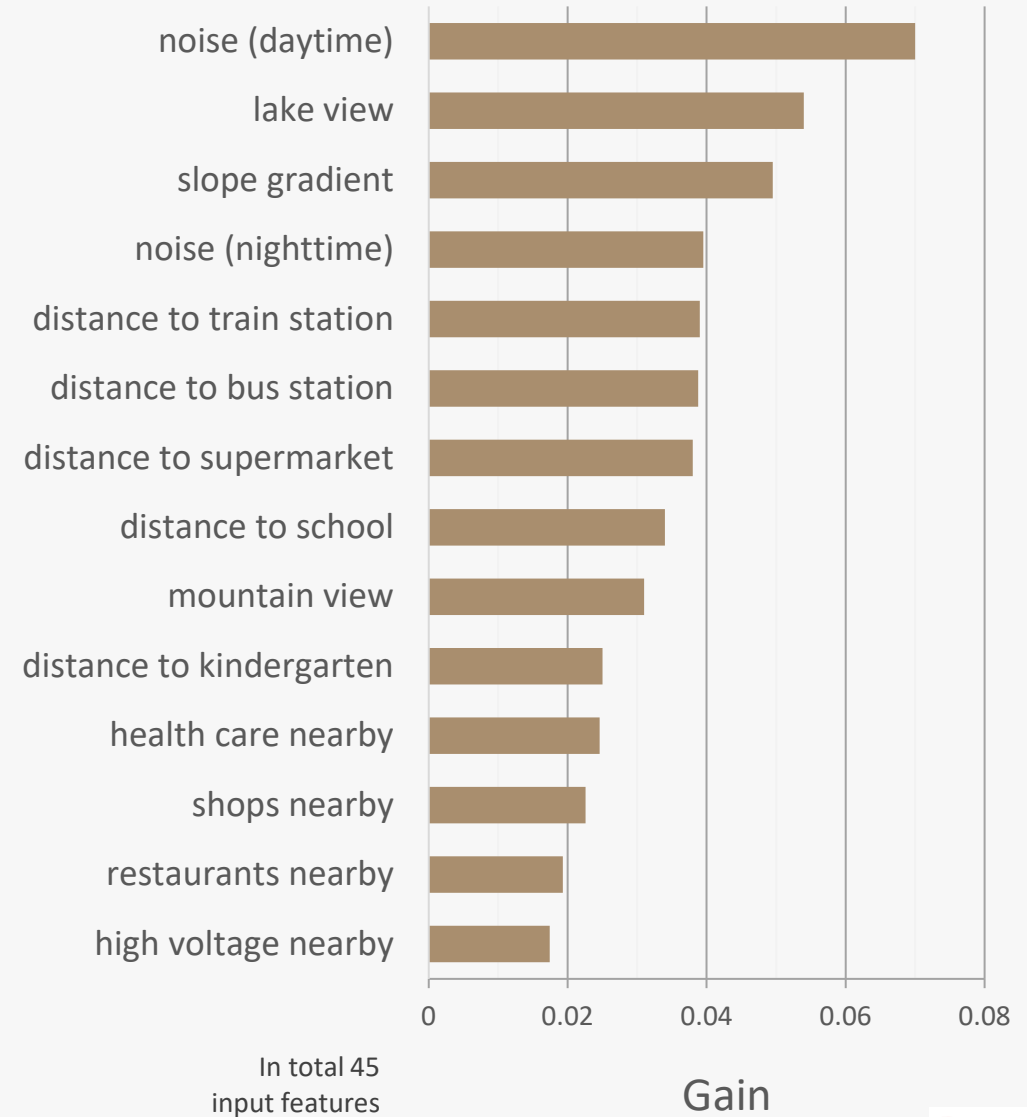
Accuracy



Kappa

Actual	Bad	0.1%	0.5%	1.2%	14.9%
	Moderate	0.5%	5.4%	17.8%	1.1%
	Good	3.8%	25.0%	3.7%	0.3%
	Very good	19.8%	5.1%	0.7%	0.1%
		Very good	Good	Moderate	Bad
		Predicted			

Feature Importance



Spatial Smoothing of Predicted Micro-Location Ratings

Not smoothed



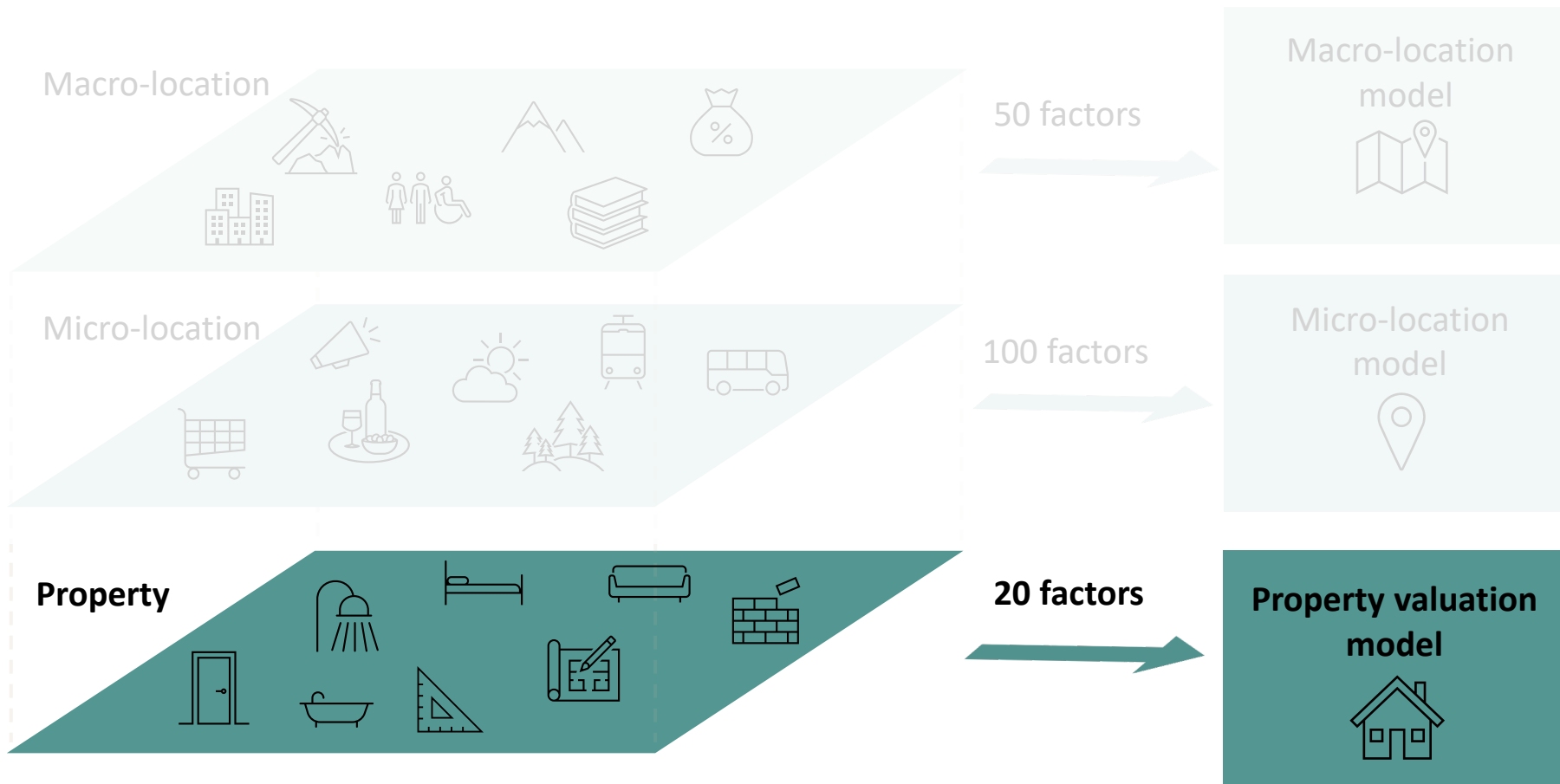
Smoothed (k = 3)



Smoothed (k = 10)

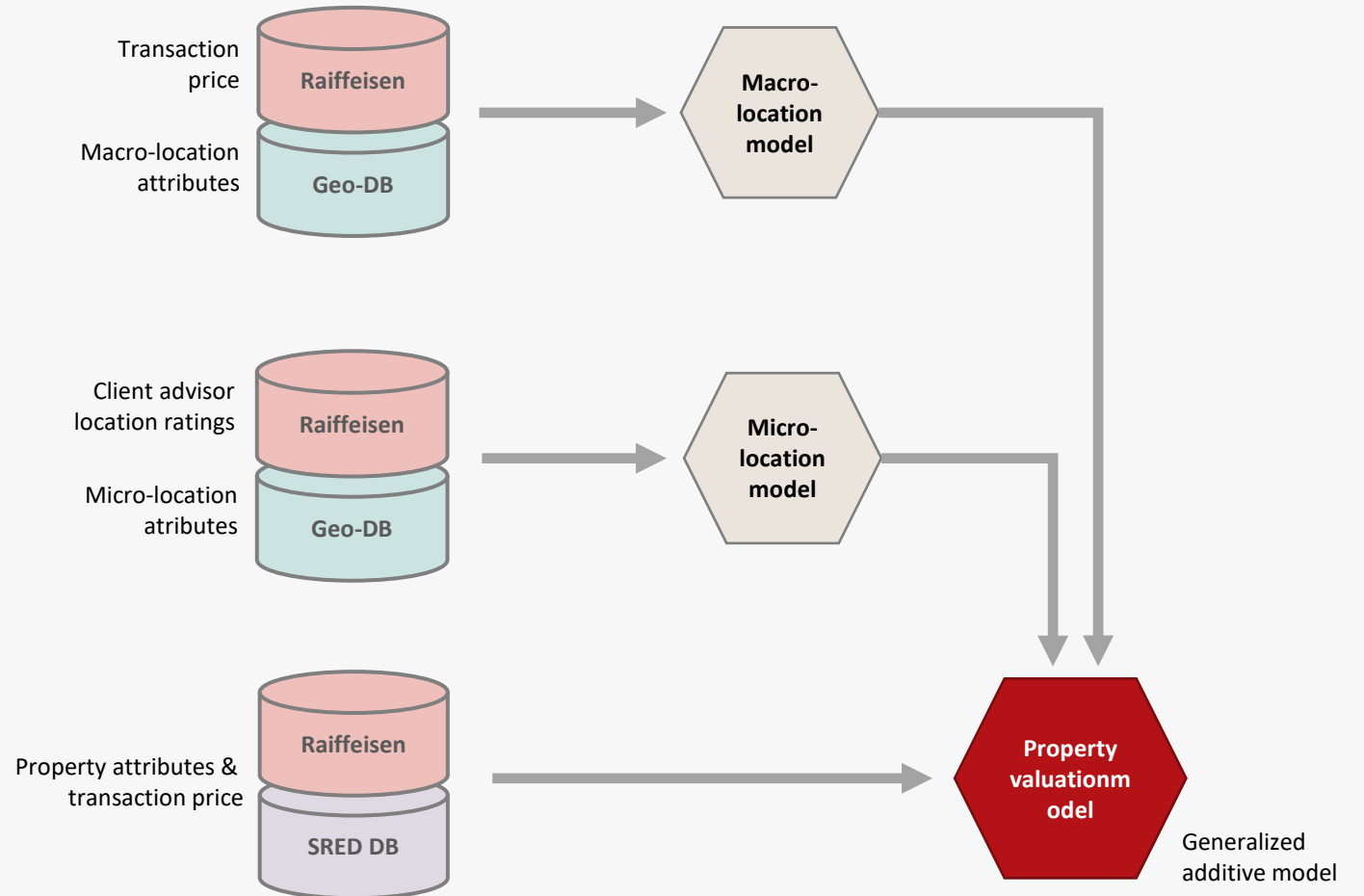
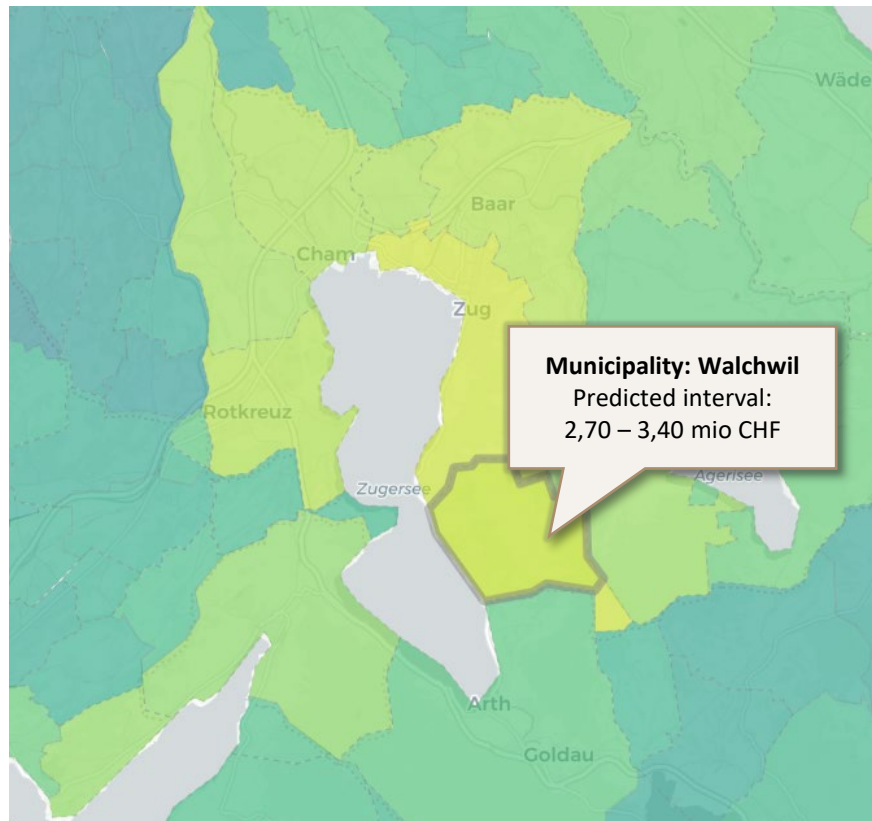


● Very good ● Good ● Average ● Bad



Property Valuation Overview

Estimated single-family house transaction prices for a medium-sized property aggregated per municipality



Summary

- Combining a variety of public and internal data sources increases the **360° view of a property**.
- Modelling of **subjective client advisor ratings** on micro-locations together with spatial smoothing leads to a well-fitted model.
- **Macro- and micro-location** are important input factors for the property valuation model and contribute to a better understanding of the predictions.