GeoAviation

Prof. Dr. Martin Raubal

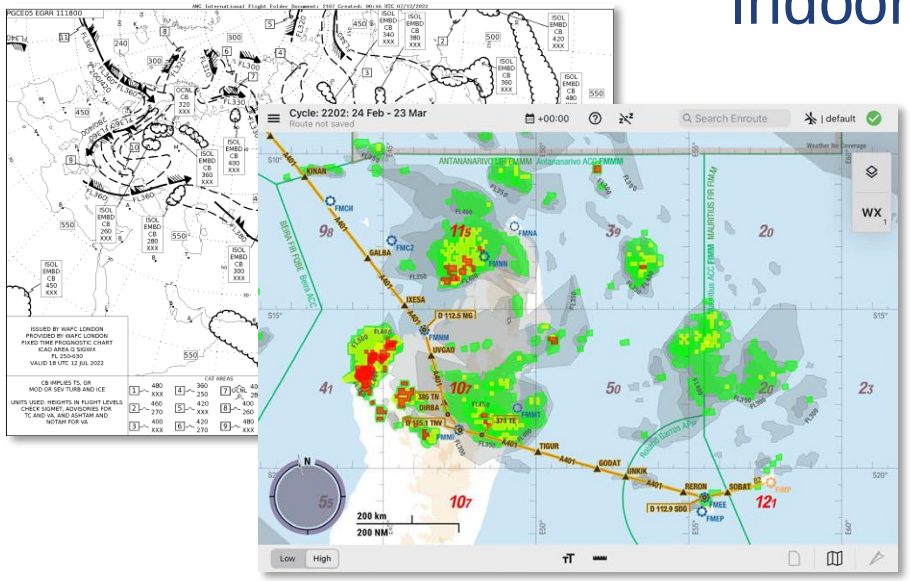
Inst. of Cartography & Geoinformation

5 February 2025

GeoHCI

3D Models

Indoor – Outdoor



Spatial cognition

Spatial awareness

Maps

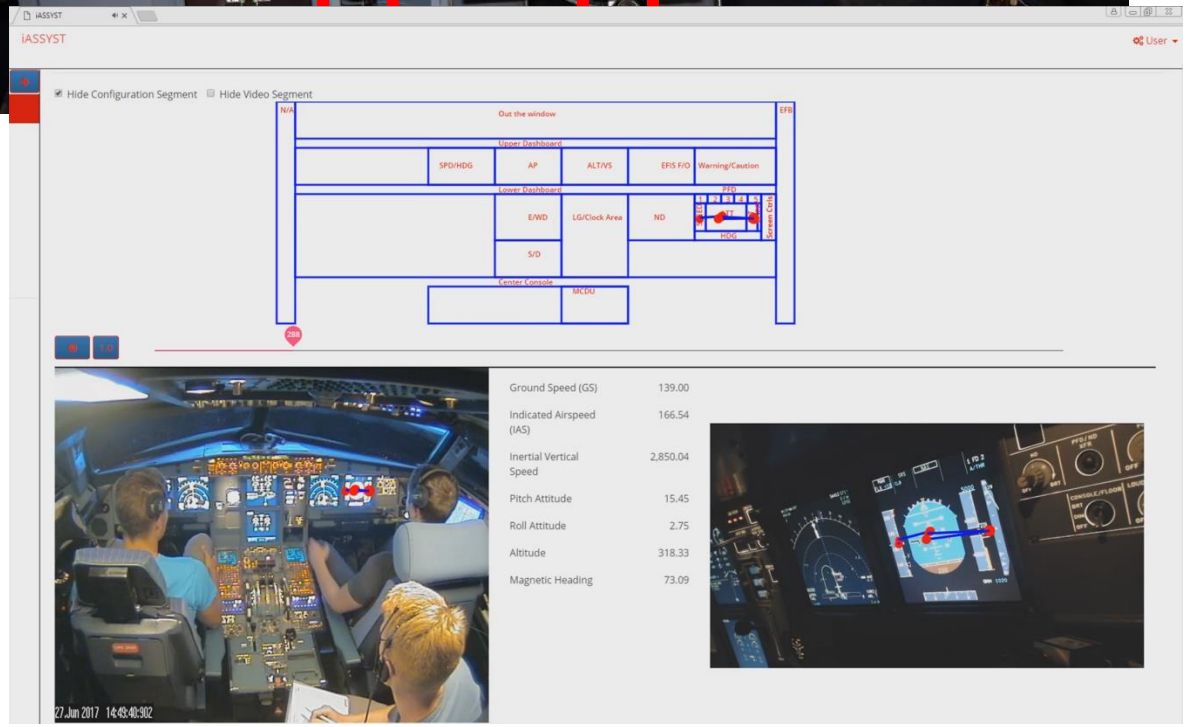
Orientation

Eye-tracking for pilot training

- What potential is there in gaze for pilot training, and how can we make use of it?
- How can we visualise gaze in a meaningful manner for flight instructors?

SWISS
Lufthansa Aviation Training
NASA
DECISION RESEARCH
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Eidgenössisches Departement für
Umwelt, Verkehr, Energie und Kommunikation UVEK
Bundesamt für Zivilluftfahrt BAZL

Eye-tracking for pilot training – automation monitoring



- 43 pilots (all First Officers)
- 2 similar flight sessions, 2 groups
- Intervention: Computer based training utilizing videos with pilot gaze

=> Improved pilot performance

Instructor assistant system (iASSYST)

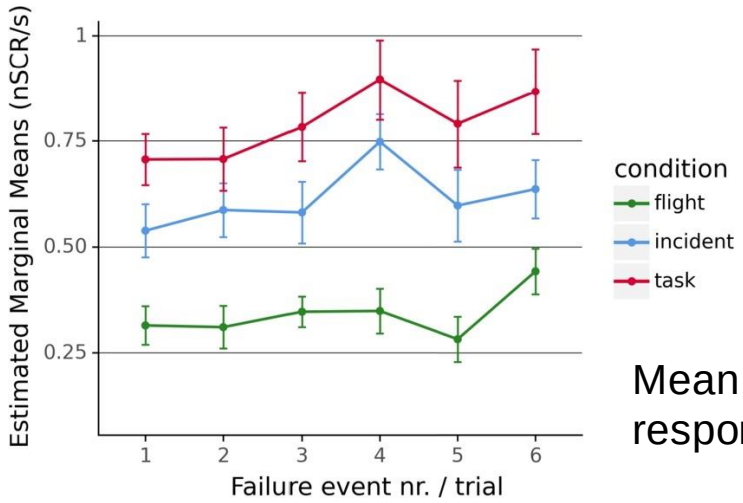
Combining video, audio, simulator, and eye-tracking data of a training session for instructors.

Pilot State Supervision Systems

- Can psychophysiological measures be used to evaluate the state of pilots using ML?

⇒ distinguish between normal and abnormal patterns

⇒ “pilot aware” cockpit may help to improve situation awareness



Mean skin conductance response

Bundesministerium für Digitales und Verkehr

ETH zürich

VR HUB

Lufthansa Aviation Training

How effective is XR/digital twin-based training (D-CEET) compared to conventional training (CEET)?

Competencies

Cognitive Load

- Behavior Observation
- Assessment
- Questionnaires
- Interviews

De-escalation training (MR)

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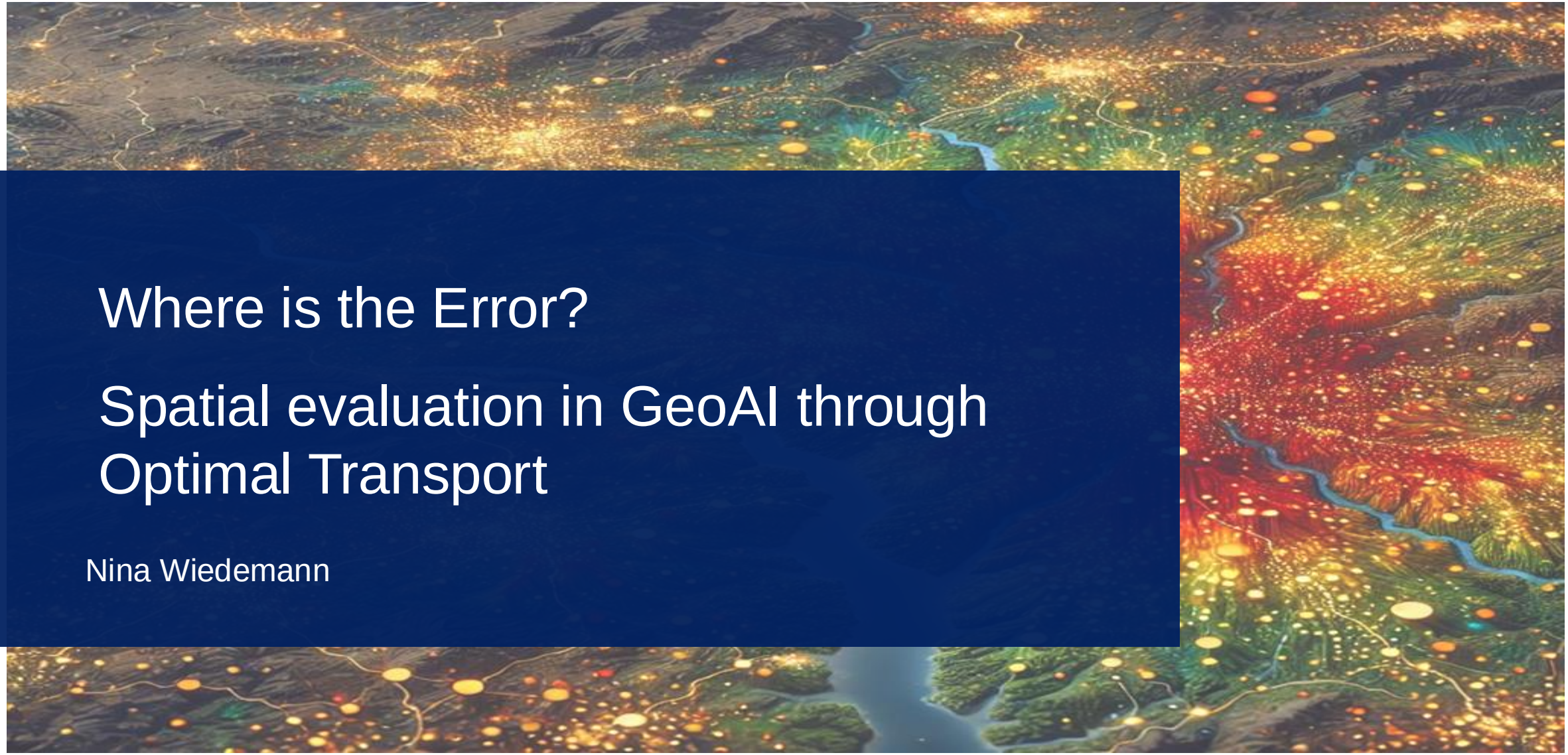
mie-lab.ethz.ch
www.geogaze.org

geoinformation engineering
ikg eth zurich

ETH zürich

MIE lab



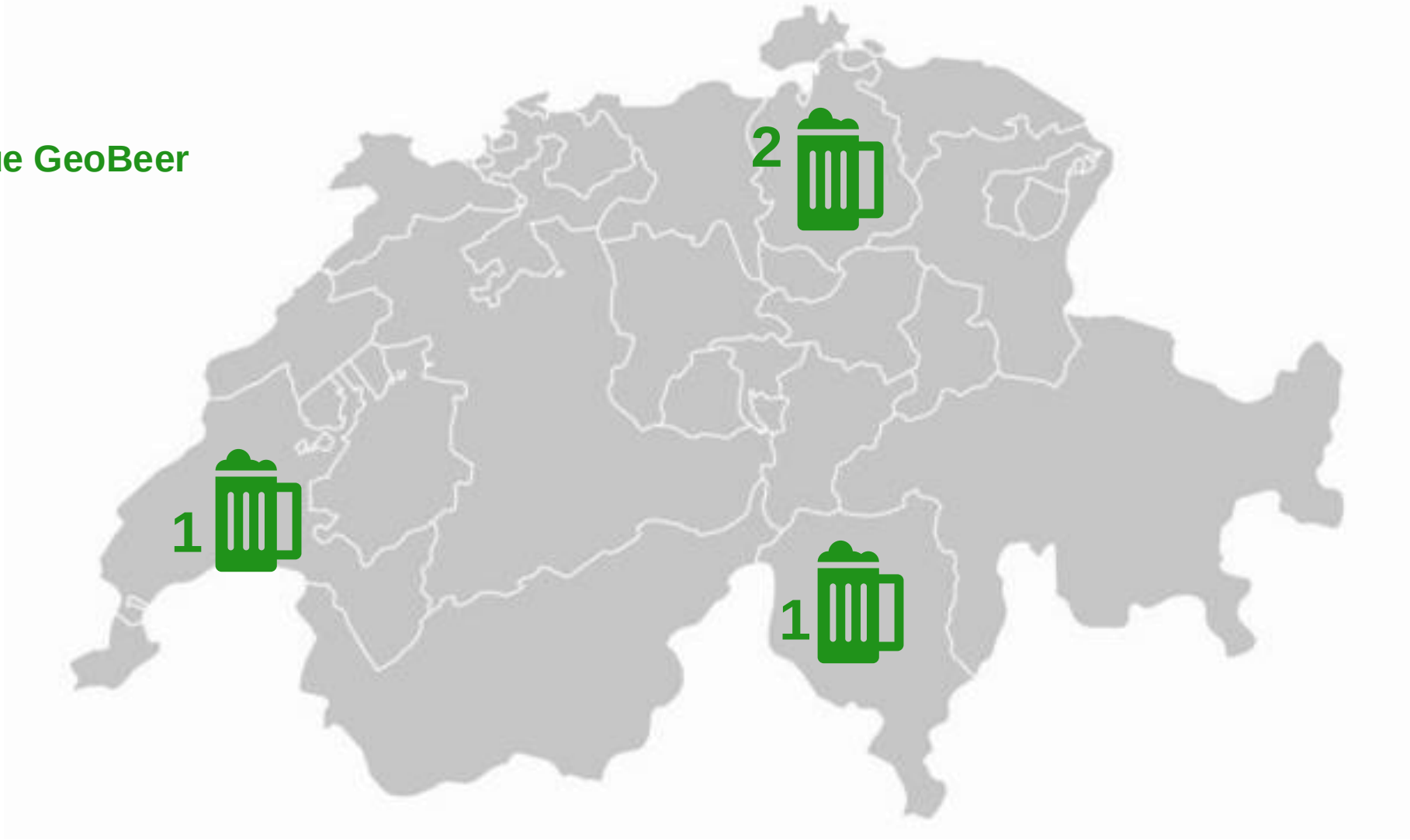
Where is the Error?

Spatial evaluation in GeoAI through Optimal Transport

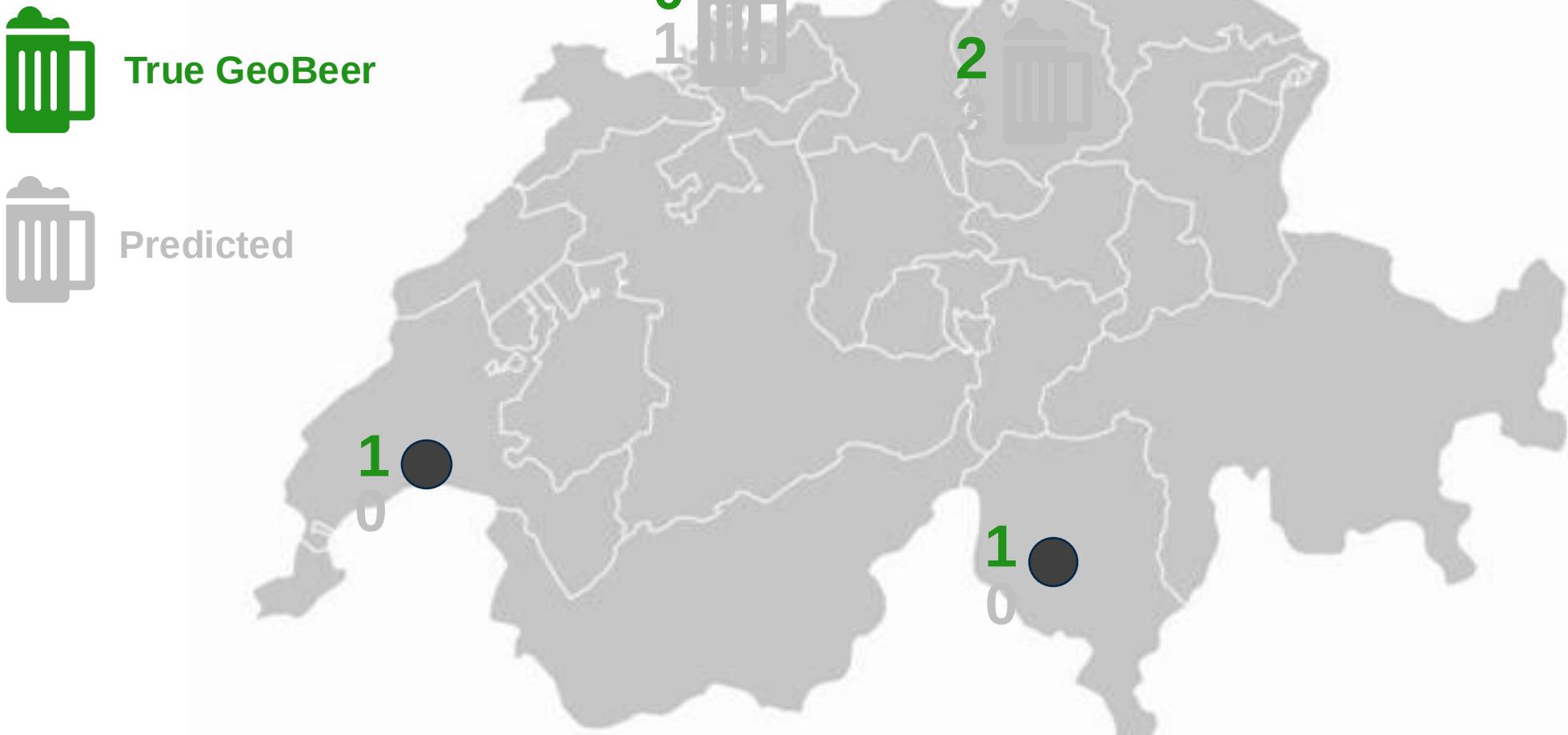
Nina Wiedemann

Predicting GeoBeer events

True GeoBeer

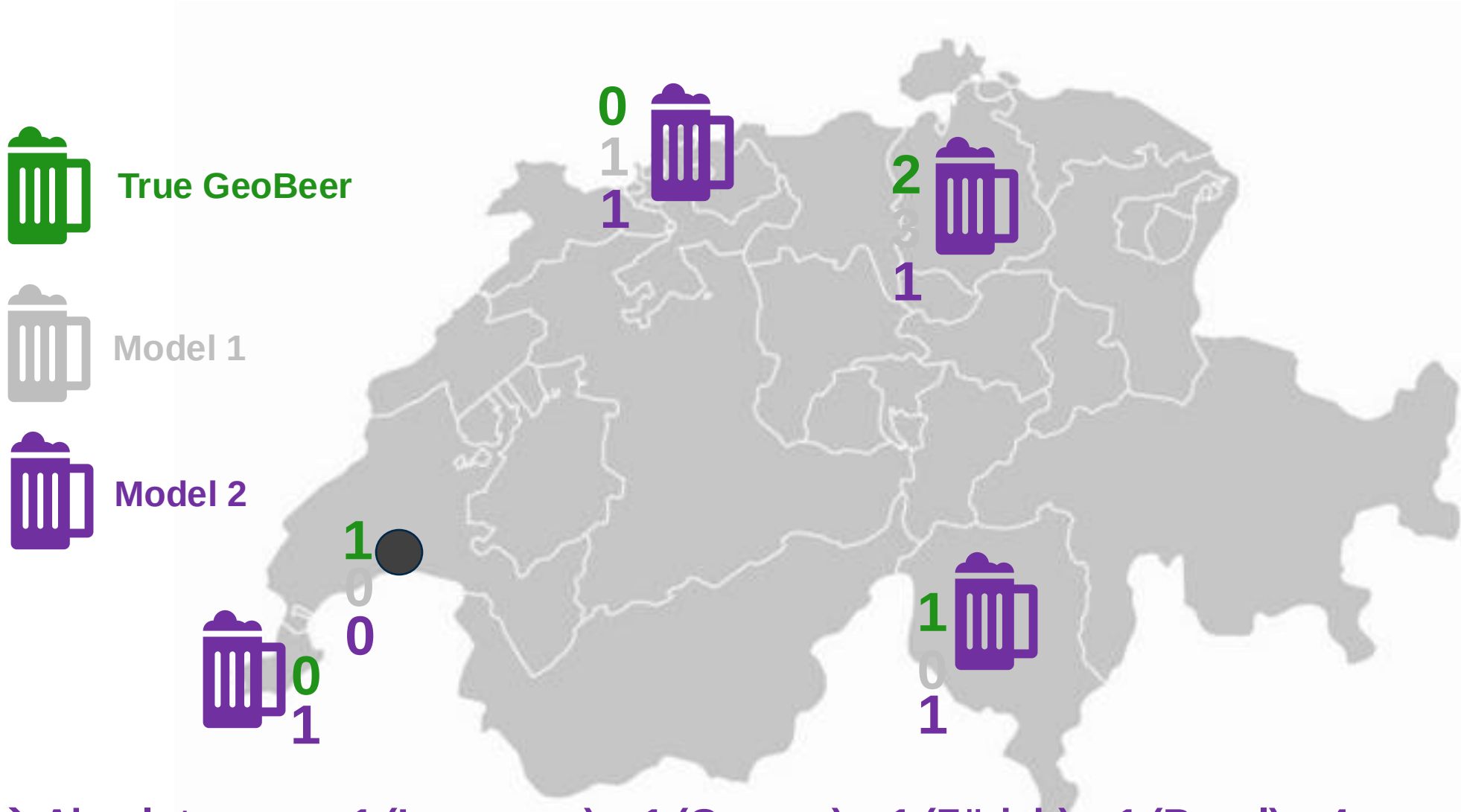


Predicting GeoBeer events



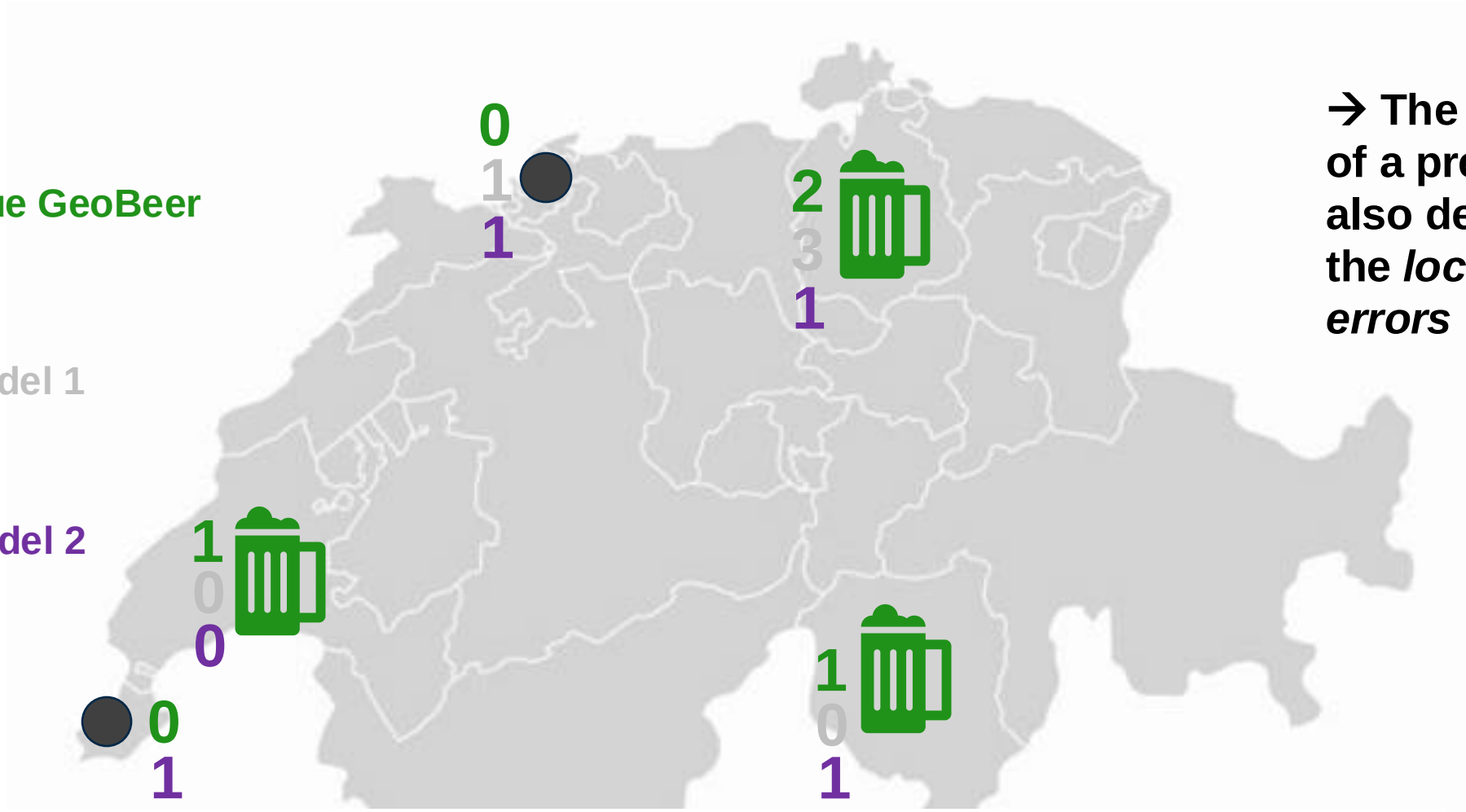
→ Absolute error: 1 (Lausanne) + 1 (Locarno) + 1 (Zürich) + 1 (Basel) = 4

Predicting GeoBeer events



→ **Absolute error: 1 (Lausanne) + 1 (Geneva) + 1 (Zürich) + 1 (Basel) = 4**

Predicting GeoBeer events



→ **The goodness of a prediction also depends on the *location of the errors***

→ Absolute error: 1 (Lausanne) + 1 (Locarno) + 1 (Zürich) + 1 (Basel) = 4

→ **Absolute error: 1 (Lausanne) + 1 (Geneva) + 1 (Zürich) + 1 (Basel) = 4**

Location matters

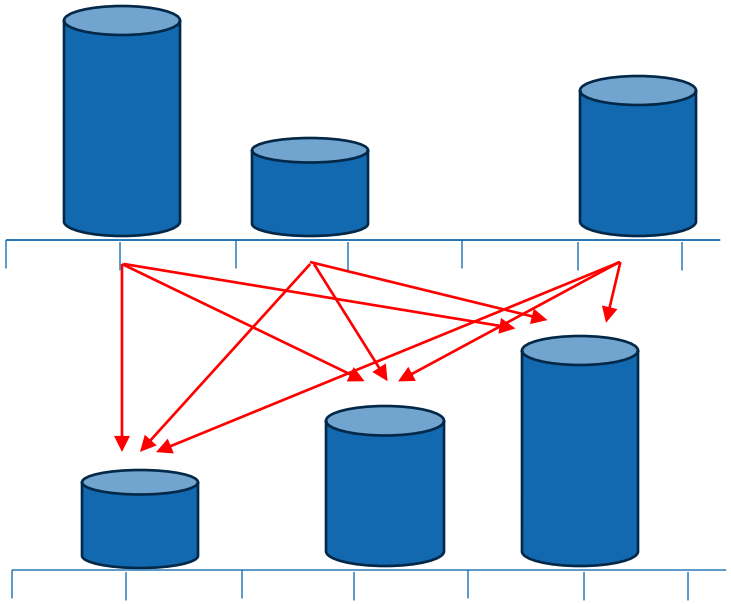
Weather forecasting

Bike sharing demand prediction

How to evaluate the distribution of the errors?

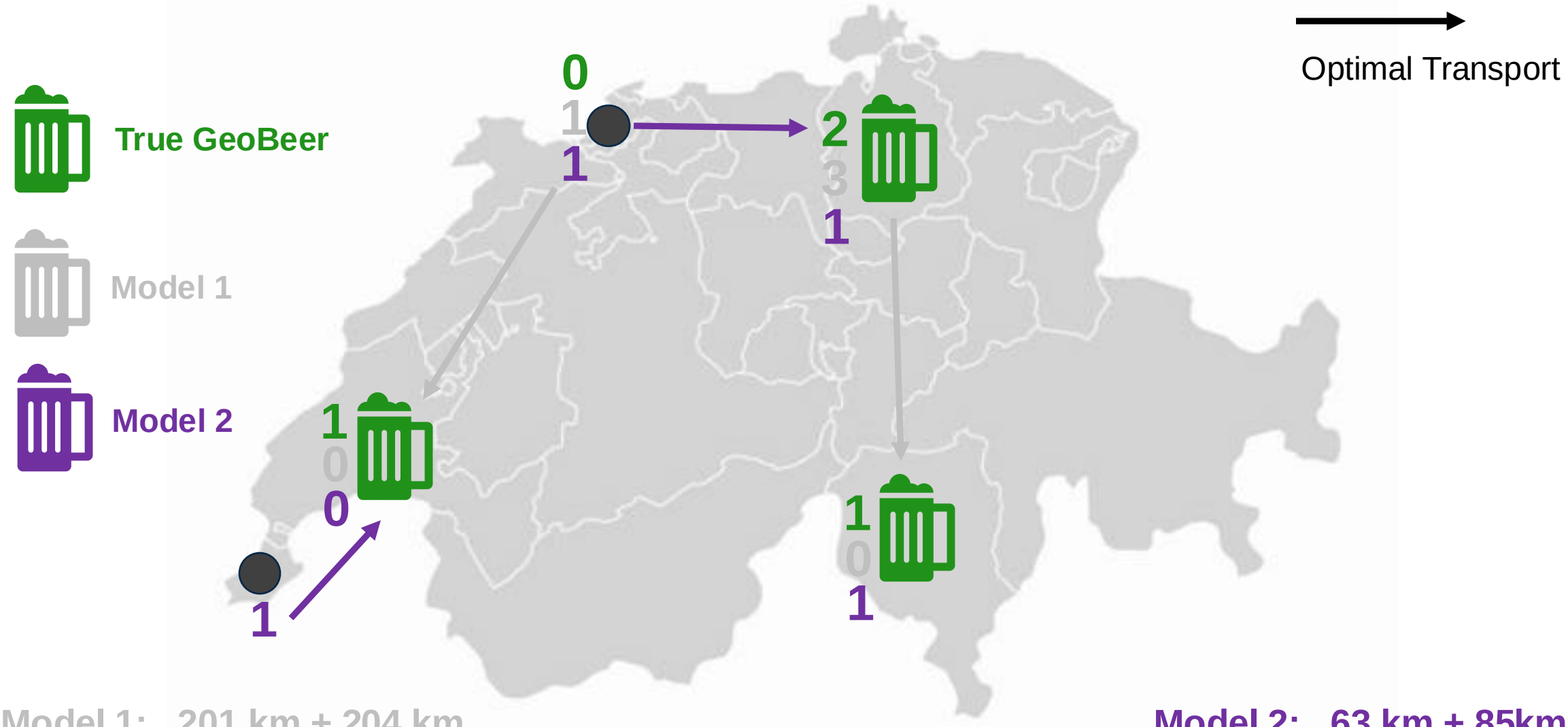
→ Optimal Transport

1. Aka the Earth Mover's Distance



- EMD: Minimal transport cost to align one distribution with another
- Spatial error = EMD between predicted and true spatial distribution

Predicting GeoBeer events



Model 1: 201 km + 204 km

Model 2: 63 km + 85km

Conclusion & Outlook

- OT as an evaluation metric in GeoAI
- OT for model selection
- OT as a loss function

CODE

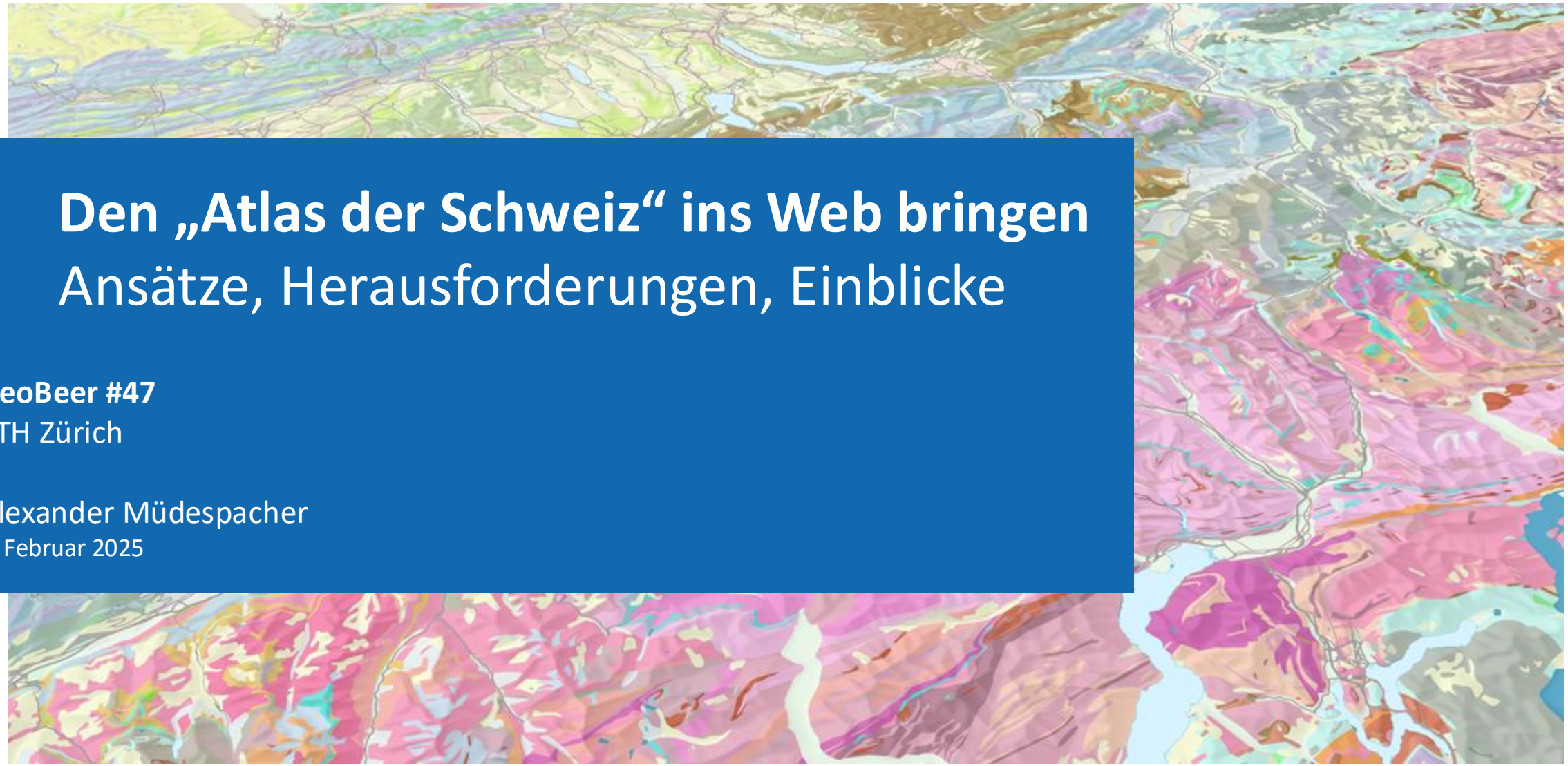
PAPER

Sources

1. Publibike image: https://www.velojournal.ch/fileadmin/_processed_/6/e/csm_Publibike_neue_besitzer_ac7bb6fece.jpg

ETH zürich

ATLAS DER SCHWEIZ
ATLAS DE LA SUISSE
ATLANTE DELLA SVIZZERA
ATLAS OF SWITZERLAND



Den „Atlas der Schweiz“ ins Web bringen

Ansätze, Herausforderungen, Einblicke

GeoBeer #47
ETH Zürich

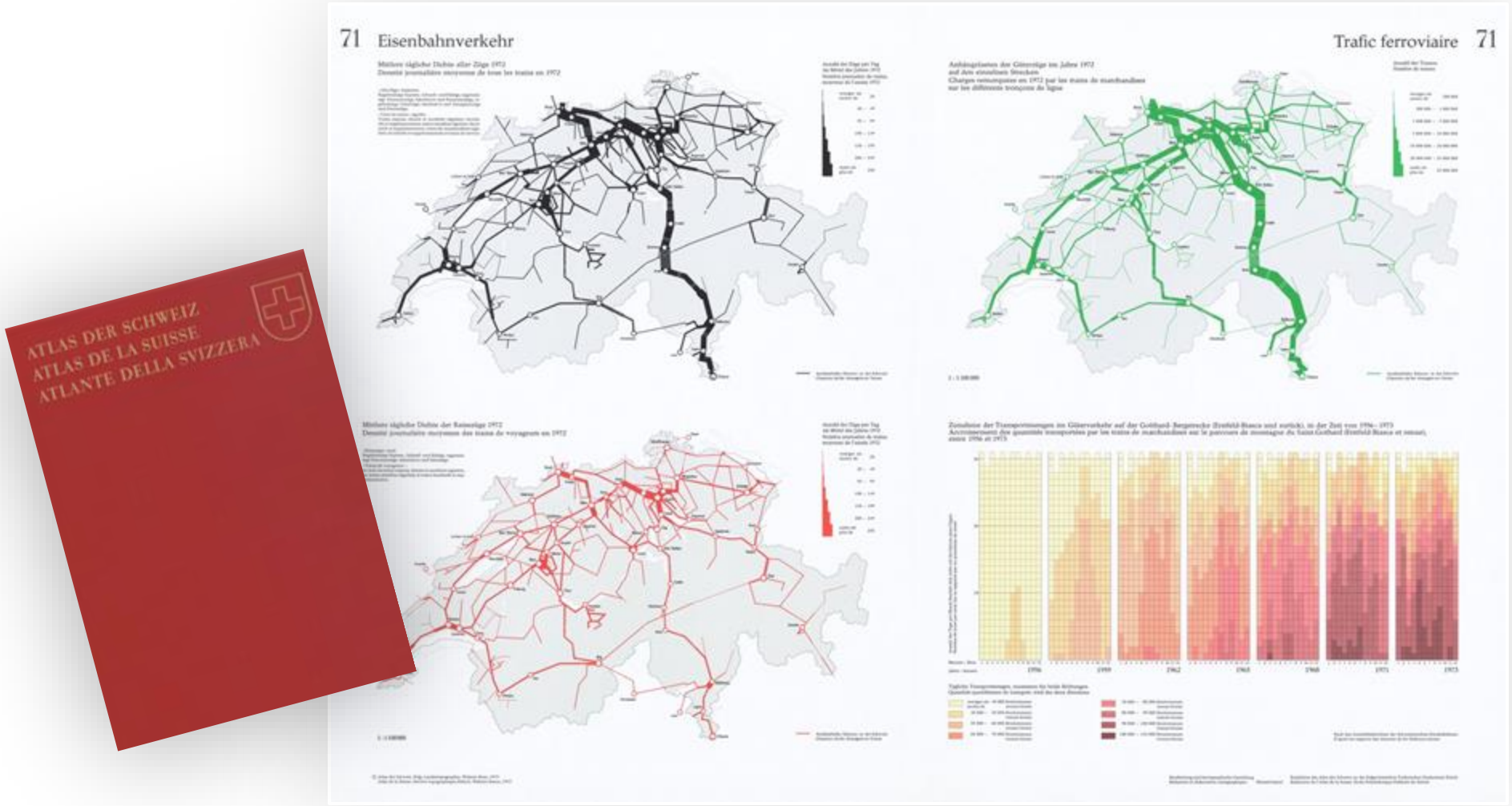
Alexander Müdespacher
5. Februar 2025

Wer von euch kennt den
Atlas der Schweiz?

Wer hat den **Atlas der Schweiz** schon einmal **genutzt**?

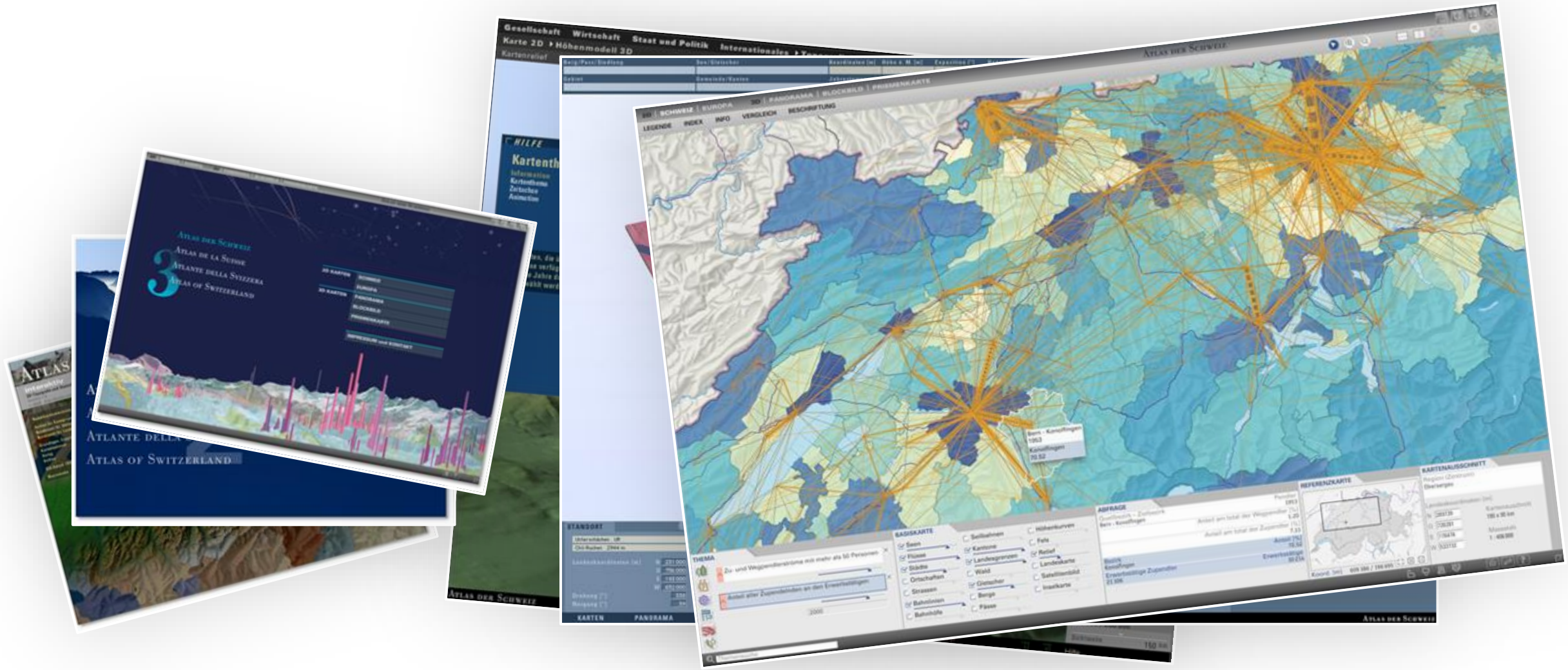
Atlas der Schweiz - der Schweizer Nationalatlas

Gedruckte Version; 1965 - 1997



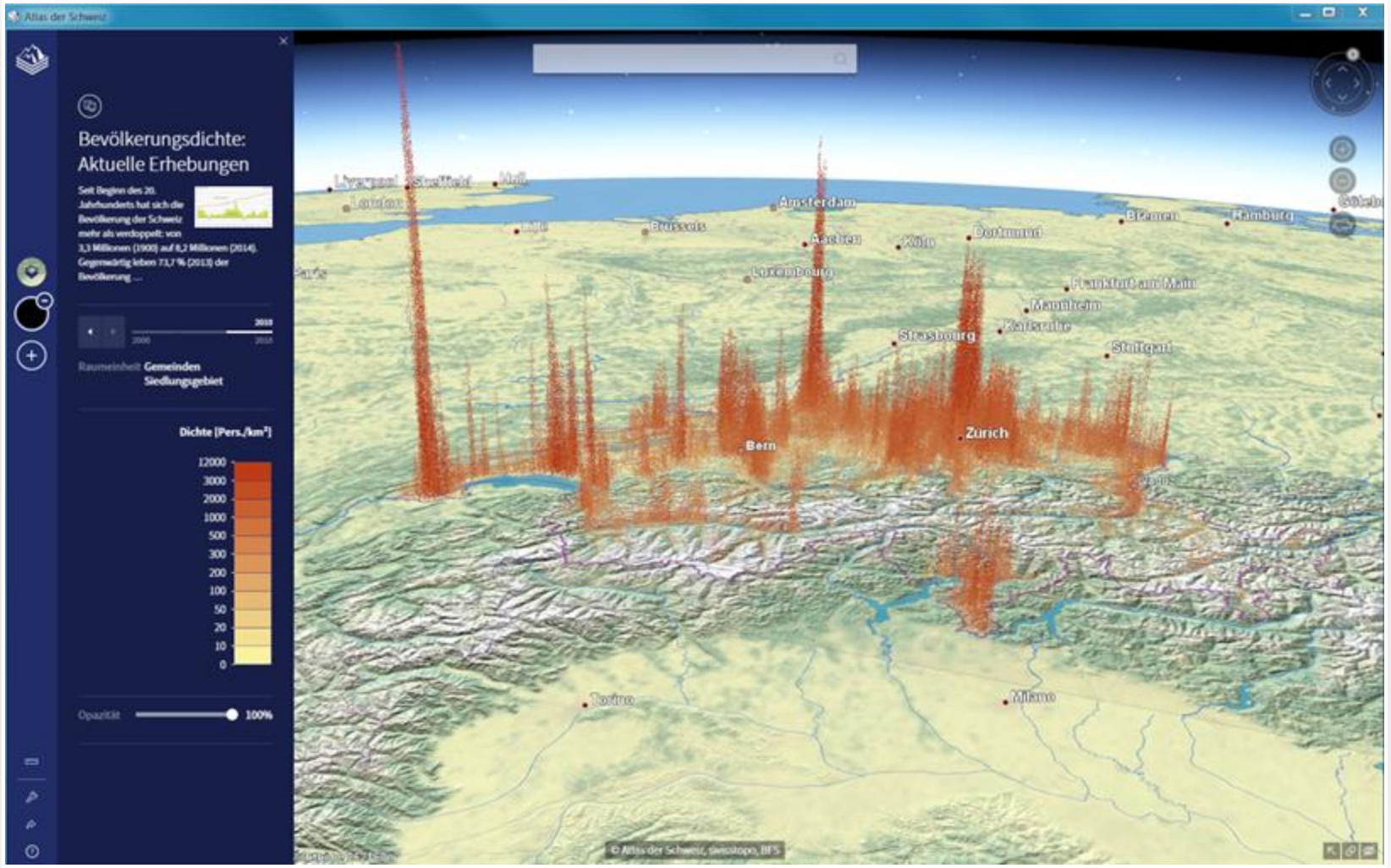
Atlas der Schweiz - der Schweizer Nationalatlas

Digital auf CD-ROM/DVD; 2000 - 2016



Atlas der Schweiz - der Schweizer Nationalatlas

Desktop-Applikation mit Online-Backend; seit 2016



Der neue, webbasierte Atlas der Schweiz
Das wollen wir erreichen

📣 Reichweite vergrössern

🗺️ Über 400 thematische Karten ins Web migrieren

🚀 Grundlage für zukünftige Innovationen bauen

💡 Differenzierung gegenüber anderen Produkten erreichen

Welche **Nutzergruppen**
nutzen den Atlas?

Für welche **Zwecke** wird der Atlas genutzt?

Welche **Funktionalitäten** werden von einem **Nationalatlas** erwartet?

Der neue, webbasierte Atlas der Schweiz
Unsere Arbeitshypothesen

🙂 Benutzeroberfläche muss intuitiv sein - breite Allgemeinheit im Blick

🗺️ Klarheit statt Komplexität - 2D-Karten decken viele Use Cases gut ab

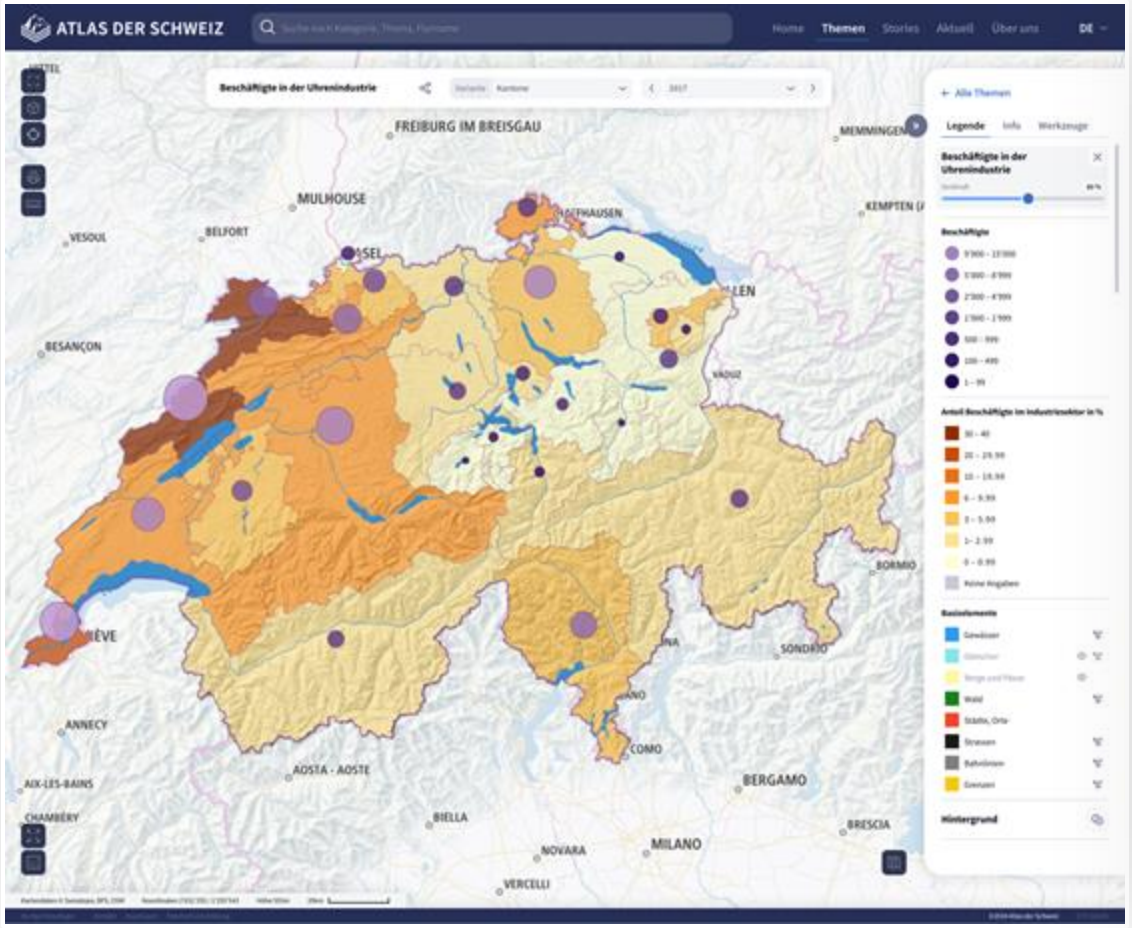
⚡ Performance ist entscheidend - Karte ist in <1 Sekunde geladen & interaktiv

📊 Qualität vor Quantität - bestehende Karten überprüfen

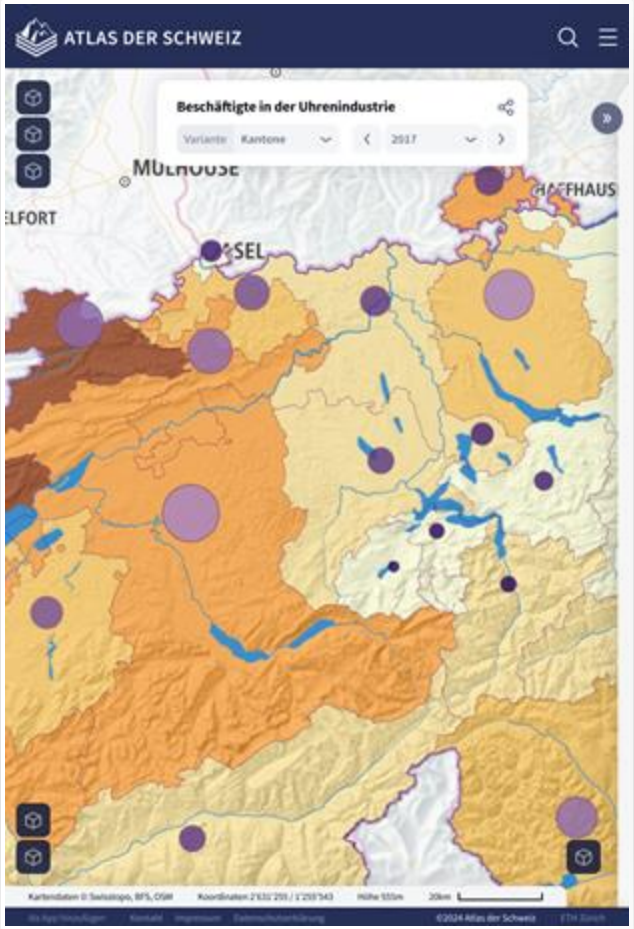
🔎 Suche als Schlüssel - damit Nutzer finden, was sie suchen

Der neue, webbasierte Atlas der Schweiz

User Interface Design (exemplarisch)



Desktop



Tablet

Mobile

Bleibt dran - wir suchen schon bald **Betatester*innen**.

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ATLAS DER SCHWEIZ
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ATLAS OF SWITZERLAND

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