



Accessible location intelligence for informed **decisions**

## Geodaten mit **Sprachmodellen** (LLM) zugänglich machen

Mit der Unterstützung von

**Strategie Geoinformation Schweiz**  
**Stratégie suisse pour la géoinformation**



Unsere **ersten Tests** → November 2023

Plugin auf ChatGPT



GeoGPT



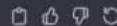
You

Generate me sentinel 2 satellite imagery of geneva for the last month

GeoGPT

✓ Talked to app.ageospatial.com

I have generated the Sentinel 2 satellite imagery of Geneva for the last month. The imagery is from the date 2023-11-08. You can view the image through the following link:



Message GeoGPT...

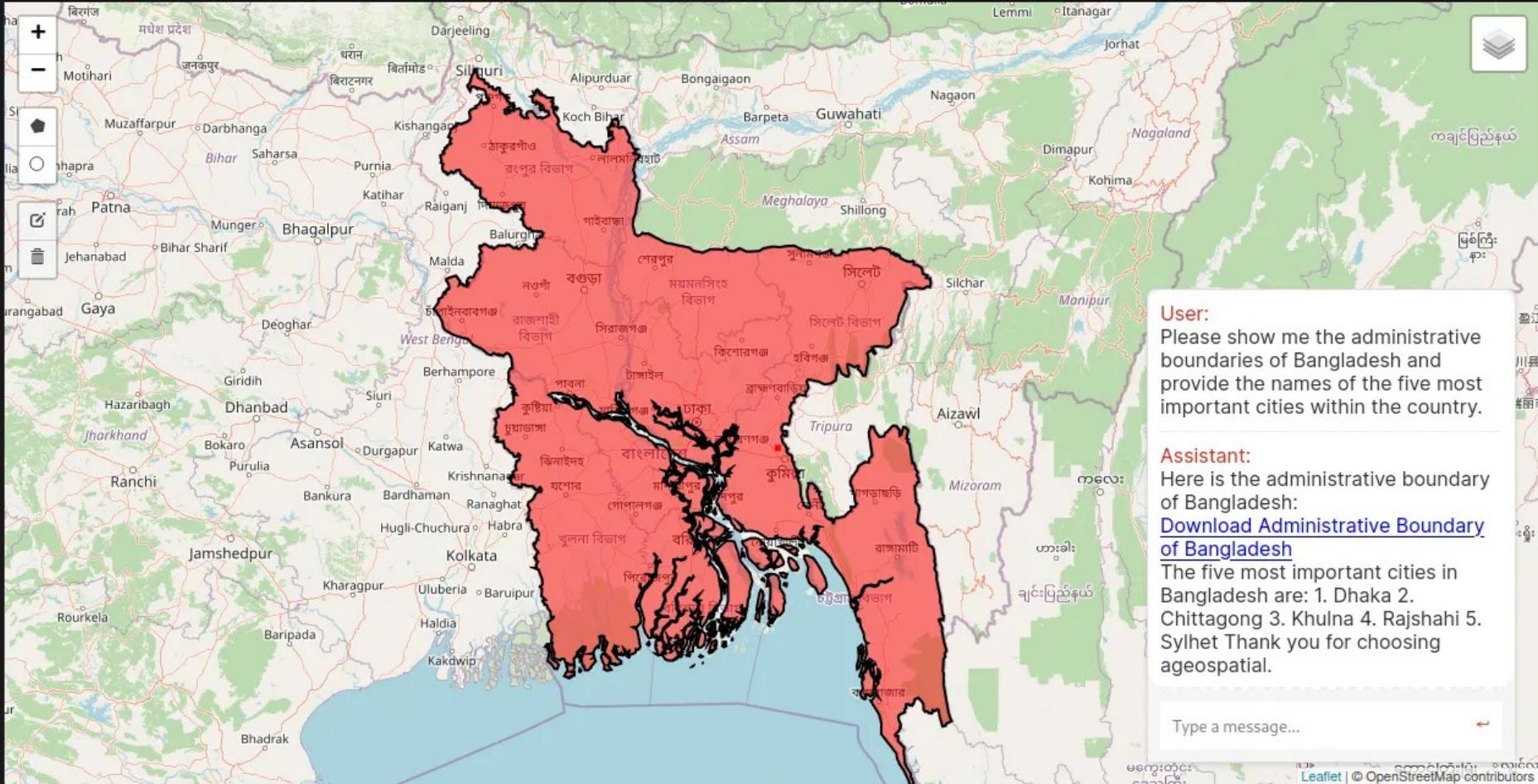


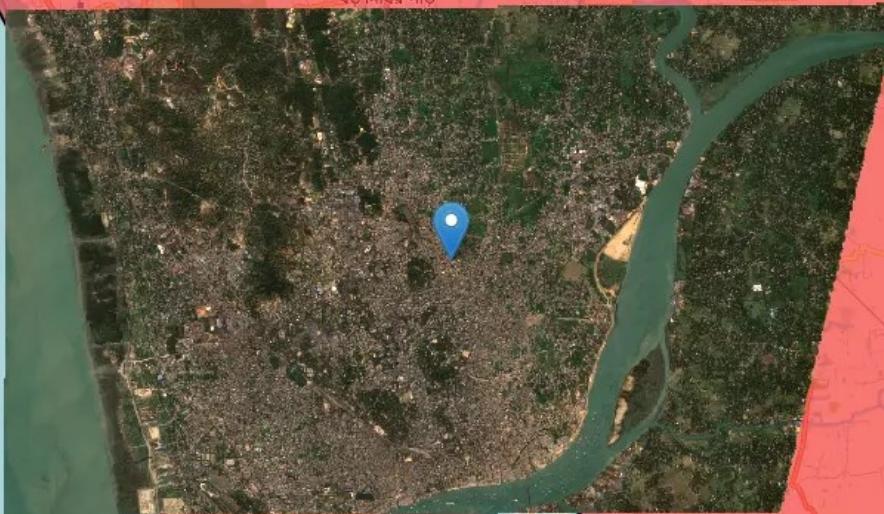
ChatGPT can make mistakes. Consider checking important information.



Unsere v0 → März 2024

Offene Datensätze





### link

. Thank you for choosing  
ageospatial!

### User:

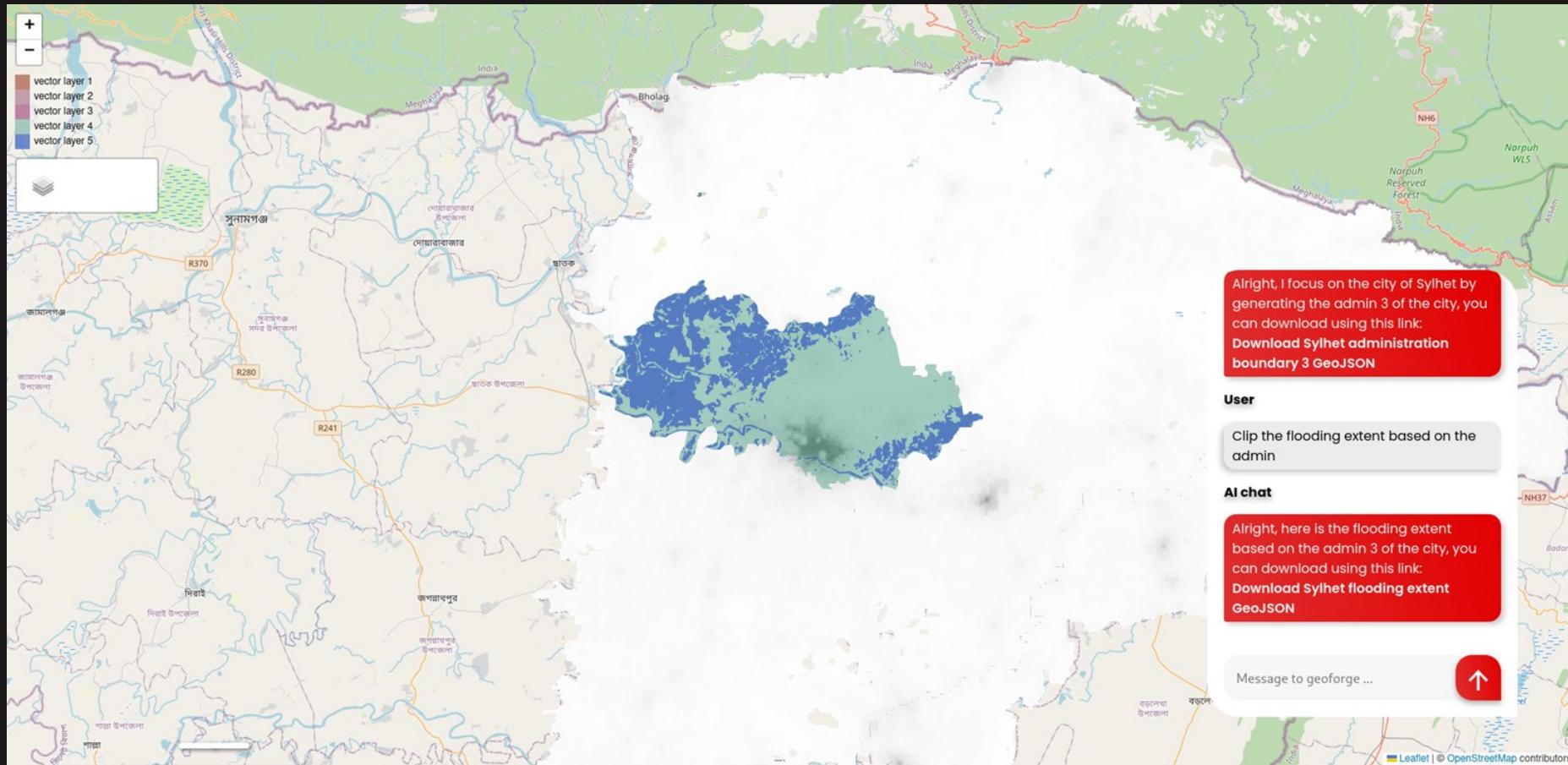
Generate me a sentinel image of  
Chittagong

### Assistant:

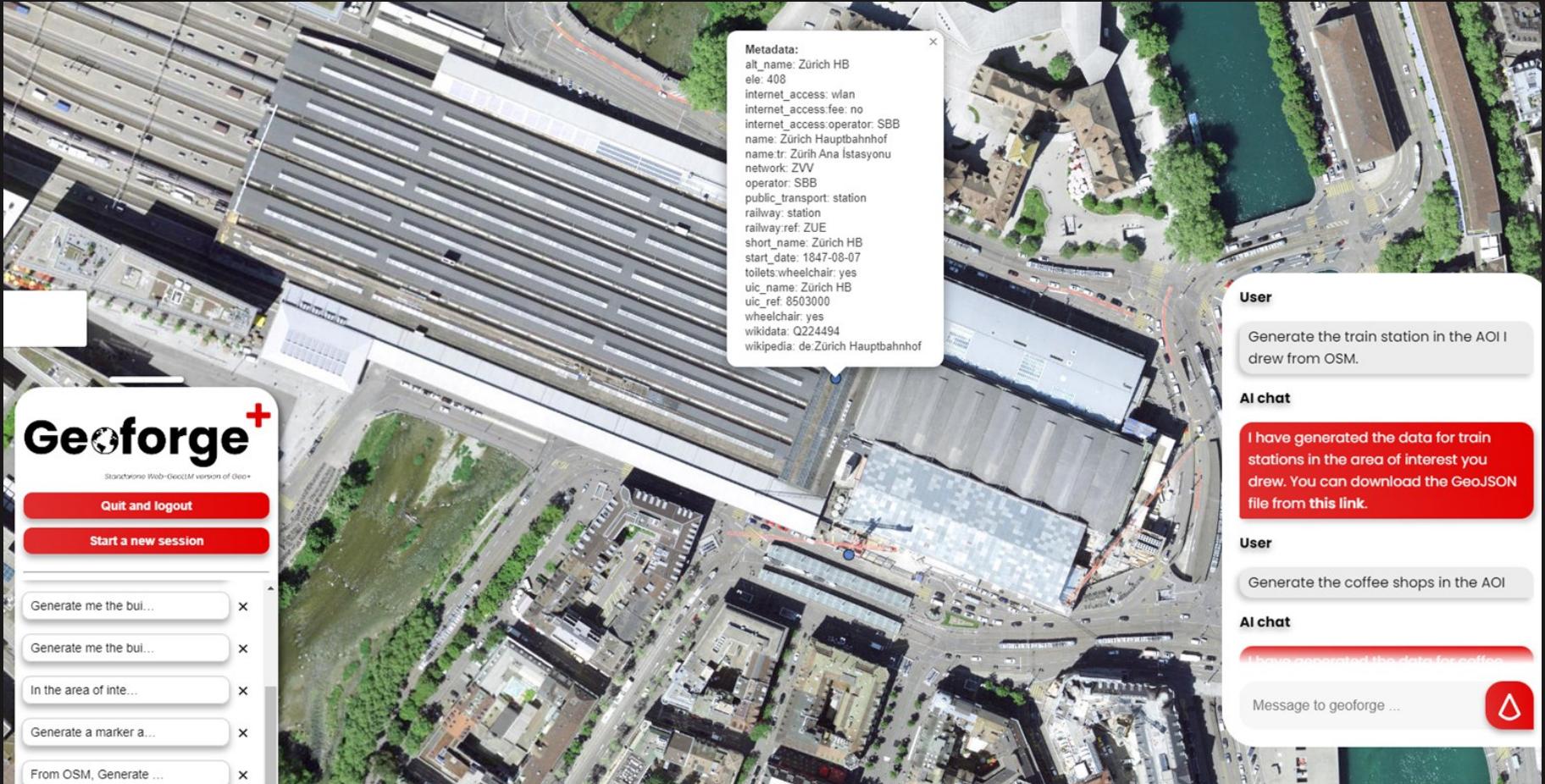
Here is the Sentinel image of a 10km  
radius from Chittagong, Bangladesh:  
[Sentinel Image](#)

Please note that the image is from  
March 2, 2023. Thank you for  
choosing ageospatial!

Type a message... 



# „Erstelle den Bahnhof“



**Metadata:**

- alt\_name: Zürich HB
- ele: 408
- internet\_access: wlan
- internet\_access: fee: no
- internet\_access: operator: SBB
- name: Zürich Hauptbahnhof
- name:tr: Zürih Ana İstasyonu
- network: ZVV
- operator: SBB
- public\_transport: station
- railway: station
- railway:ref: ZUE
- short\_name: Zürich HB
- start\_date: 1847-08-07
- toilets:wheelchair: yes
- uic\_name: Zürich HB
- uic\_ref: 8503000
- wheelchair: yes
- wikidata: Q224494
- wikipedia: de: Zürich Hauptbahnhof

**User**

Generate the train station in the AOI I drew from OSM.

**AI chat**

I have generated the data for train stations in the area of interest you drew. You can download the GeoJSON file from [this link](#).

**User**

Generate the coffee shops in the AOI

**AI chat**

I have generated the data for coffee

Message to geoforge ...

Geoforge+

Standalone Web+GeoJSON version of Geoforge

Quit and logout

Start a new session

Generate me the bu... x

Generate me the bu... x

In the area of inte... x

Generate a marker a... x

From OSM, Generate ... x

# „Erstelle die Cafés“



Metadata:  
addr:city: Zürich  
addr:country: CH  
addr:housenumber: 12  
addr:postcode: 8001  
addr:street: Bahnhofplatz  
amenity: cafe  
check\_date: 2024-01-27  
cuisine: italian  
indoor\_seating: yes  
name: Albanesi  
opening\_hours: Mo-Fr 07:00-20:00; Sa 08:00-21:00;  
Su 09:30-20:00  
outdoor\_seating: yes  
shop: bakery  
website: <https://www.albanesigroup.ch>  
wheelchair: limited

I have generated the data for train stations in the area of interest you drew. You can download the GeoJSON file from this link.

#### User

Generate the coffee shops in the AOI

#### AI chat

I have generated the data for coffee shops in the area of interest you drew. You can download the GeoJSON file from this link.

#### User

Message to geoforge ...



# „Erstelle die Restaurants & Bekleidungsgeschäfte“



Metadata:

- addr:city: Zürich
- addr:country: CH
- addr:place: Hauptbahnhof, Südtakt
- addr:postcode: 8001
- amenity: restaurant
- contact:facebook: sorasushihb
- contact:phone: +41 44 217 15 10
- cuisine: japanese
- diet:vegan: yes
- diet:vegetarian: yes
- level: 0
- name: Sora Sushi
- opening\_hours: 09:00-22:00
- operator: Candrian Catering
- outdoor\_seating: yes
- website: <https://website.sora-sushi.ch/>

User

Generate the restaurants in the AOI

AI chat

I have generated the data for restaurants in the area of interest you drew. You can download the GeoJSON file from [this link](#).

User

Generate the clothing shops in the AOI

AI chat

I have generated the data for clothing shops in the area of interest you drew.

Message to geoforge ...

# „Erstelle die Marker der wichtigsten Städte zwischen Zürich und Bern“ → **Solothurn, Olten, Aarau**

me from this link. The CSV contains the names, latitudes, longitudes, and Google Maps links for each city.

User

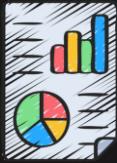
Generate the markers of major cities between Zurich and Bern and give me the CSV

AI chat

I have generated the markers for the major cities between Zurich and Bern. You can download the CSV file from [this link](#). The CSV contains the names, latitudes, longitudes, and Google Maps links for each city.

Message to geoforge ...

# Kooperation mit **SGS**



Stand der Technik bzgl. LLM und Geodaten



Potenzial und Grenzen von LLMs für Geodaten



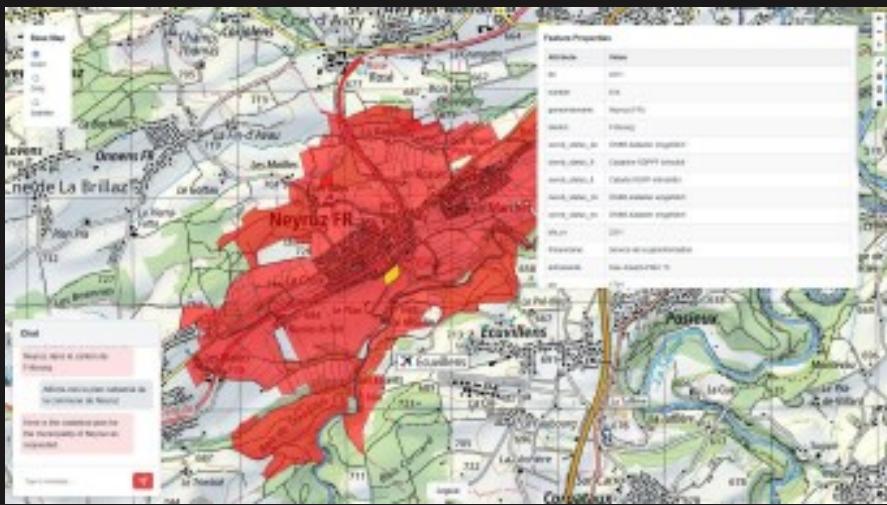
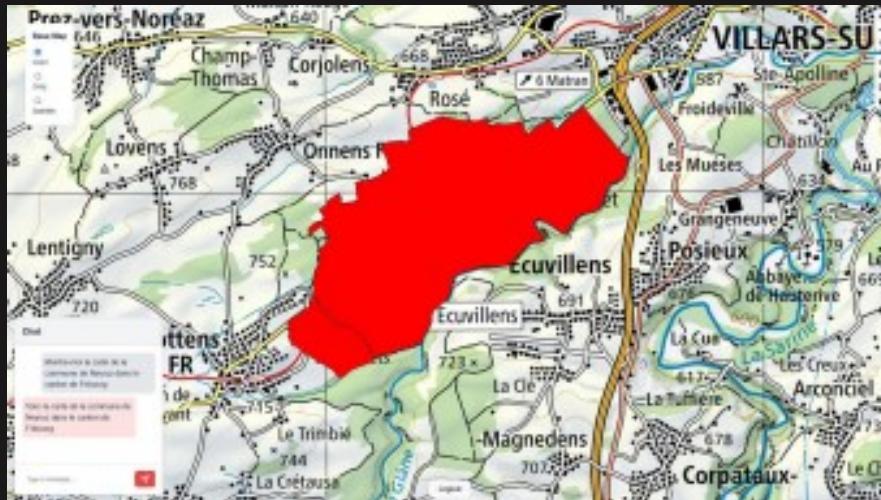
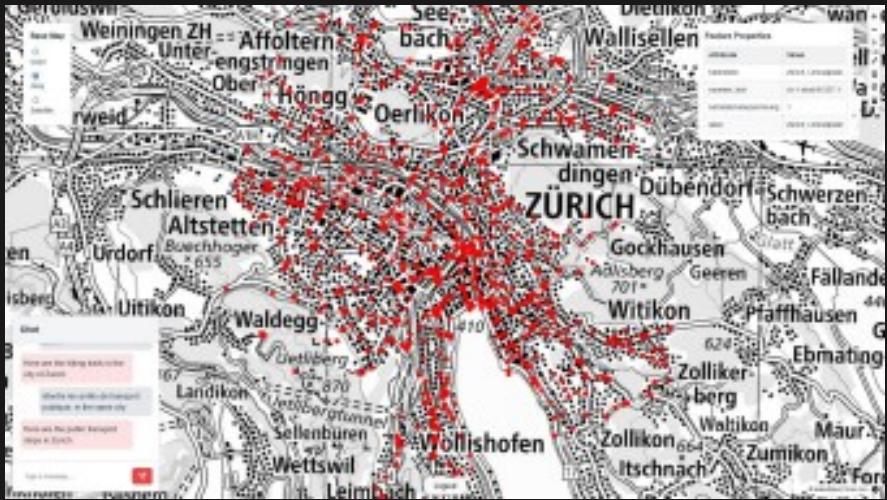
Proof of Concept – Web-Geodatenplattform mit  
swisstopo Daten über API und LLMs

Mit der Unterstützung von

**Strategie Geoinformation Schweiz**  
**Stratégie suisse pour la géoinformation**



Die v1  
Eigenständiger Proof of Concept (PoC)  
mit **swisstopo API** Bundesgeodaten



Von 10 Test-Layern zu über 300 Layern  
aus **swisstopo API** Bundesgeodaten

Die v2

| Name | Color | Actions |
|------|-------|---------|
|------|-------|---------|

|  |  |     |
|--|--|-----|
| <input type="checkbox"/> City of Gland | <span style="background-color: red; width: 10px; height: 10px; display: inline-block;"></span> | ... |
|--|--|-----|

|   |   |     |
|---|---|-----|
| <input type="checkbox"/> Roads in Gland | <span style="background-color: blue; width: 10px; height: 10px; display: inline-block;"></span> | ... |
|---|---|-----|

|  |  |     |
|--|--|-----|
| <input type="checkbox"/> swiss_buildings_query_re... | <span style="background-color: red; width: 10px; height: 10px; display: inline-block;"></span> | ... |
|--|--|-----|

[Previous](#)

Page 1 of 1

[Next >](#)

Show me the city of Gland

You • 7:35:57 PM

I have retrieved the boundaries for the city of Gland, Switzerland. The data includes the municipality's geographical boundary in GeoJSON format.

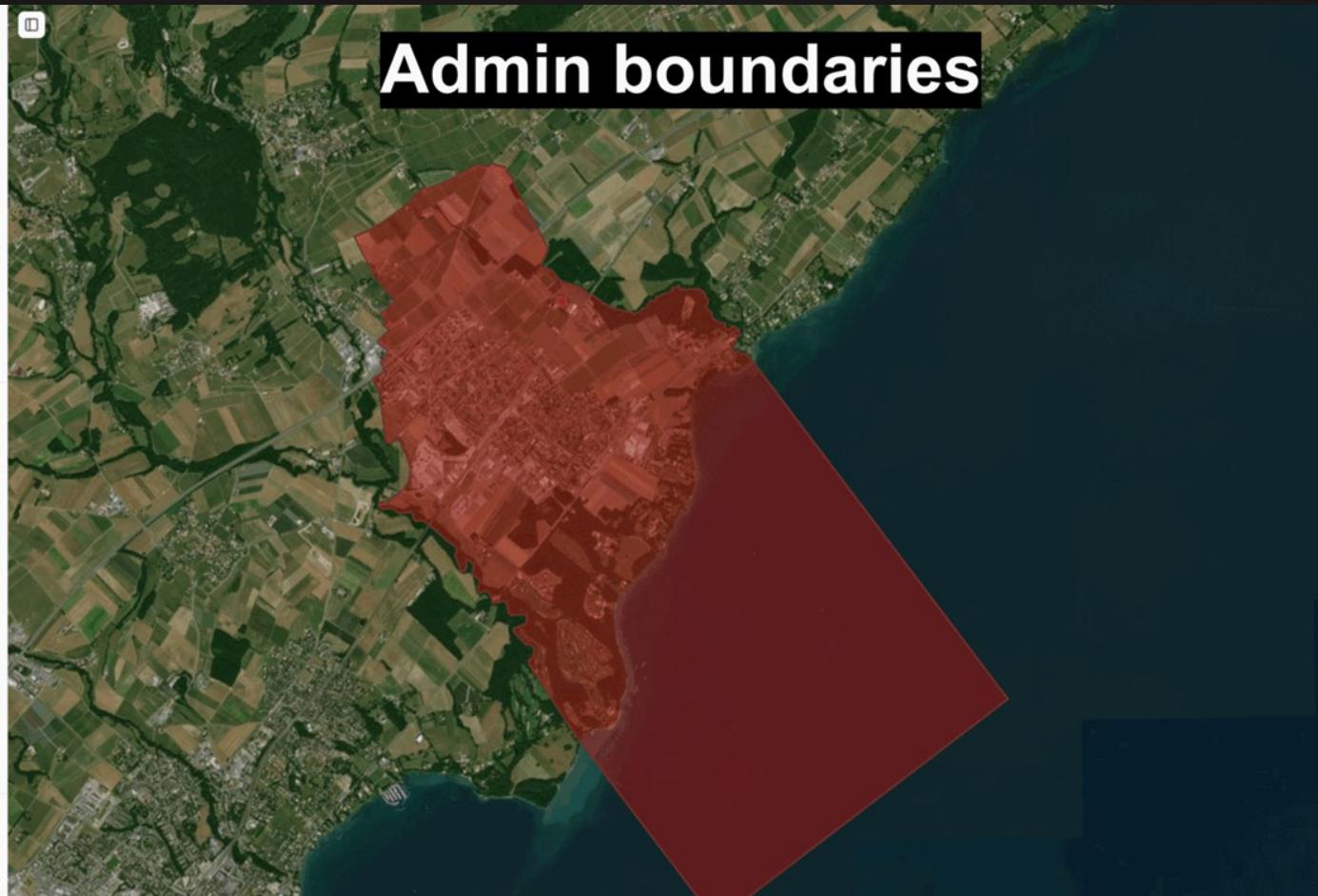
Boundary Coordinates

- **Xmin:** 6.25277
- **Ymin:** 46.3813
- **Xmax:** 6.32203
- **Ymax:** 46.43954

You can use this data for further geospatial



CN [geoforme@gmail.com](mailto:geoforme@gmail.com)  
[geoforme@gmail.com](mailto:geoforme@gmail.com)

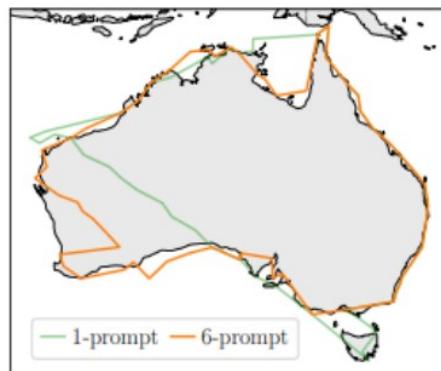


# Anwendungsfälle

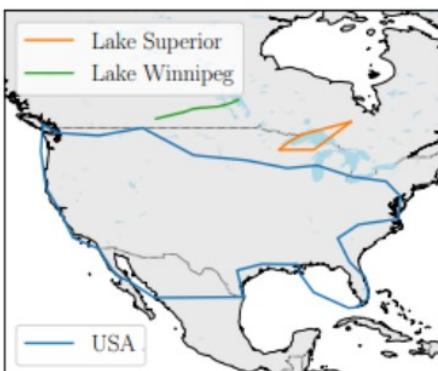


# Bericht 1 – Stand der Technik bzgl. LLM und Geodaten

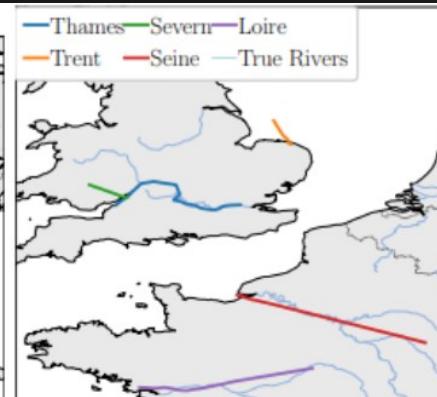
# Native Datenextraktion



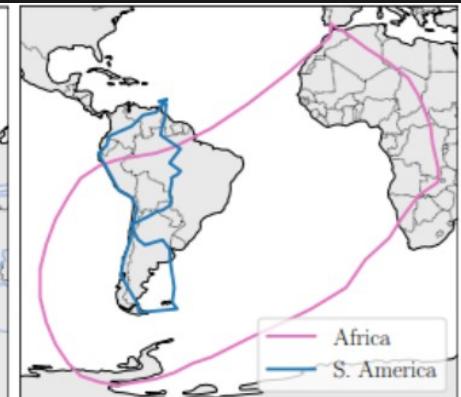
(a) Australia.



(b) USA + Lakes.



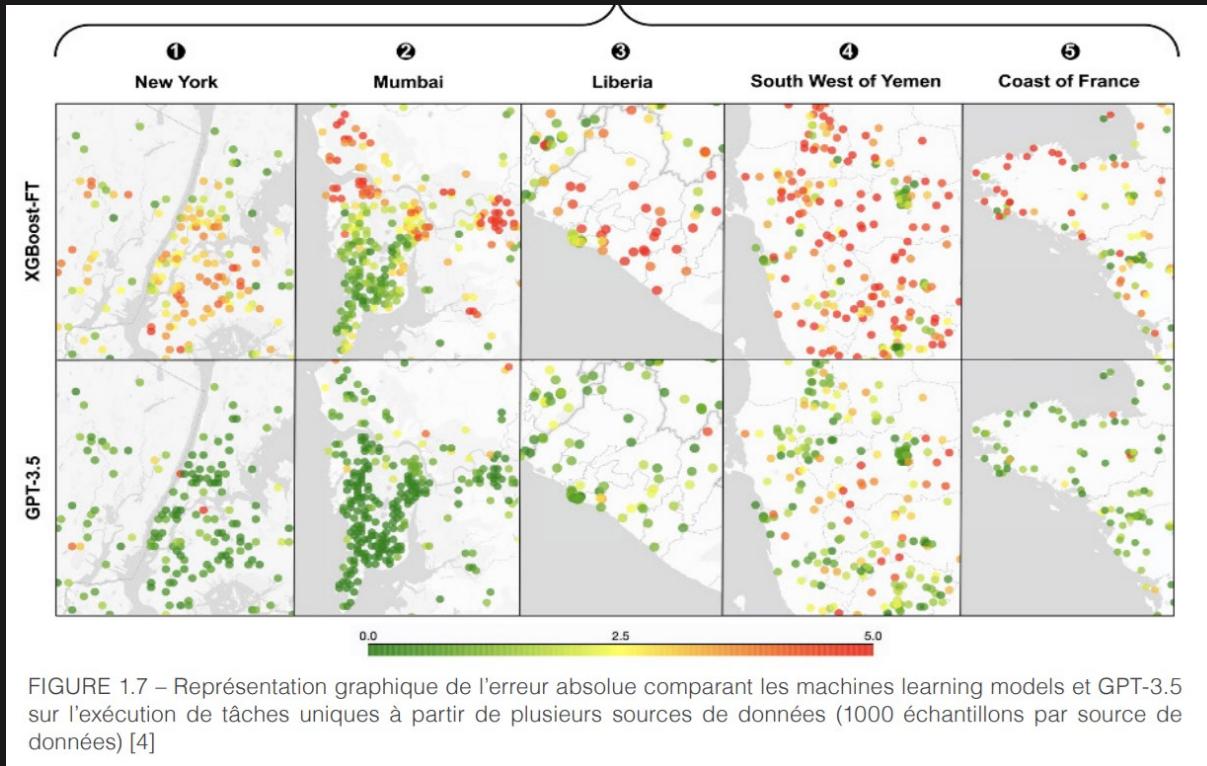
(c) Rivers.



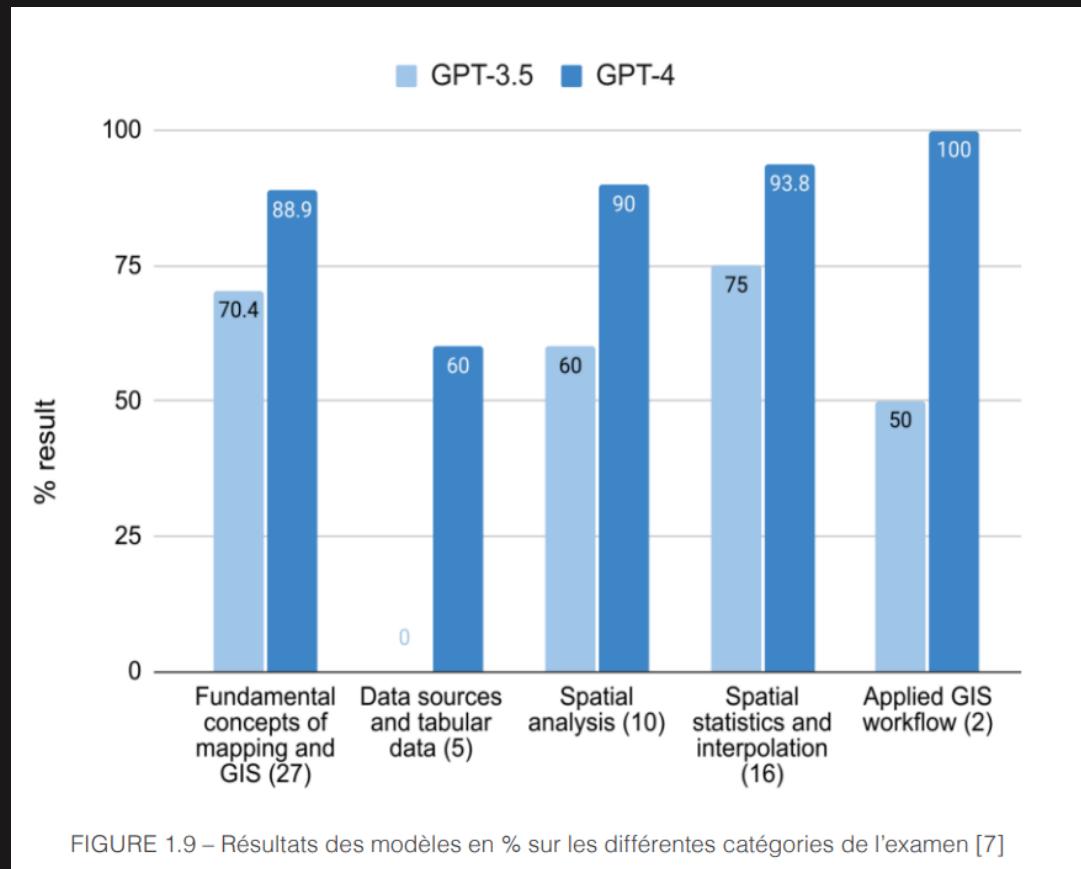
(d) Continents.

FIGURE 1.4 – Contours de divers éléments géographiques produits à l'aide des coordonnées fournies par GPT-4. L'affinement avec des prompts supplémentaires améliore les résultats [3]

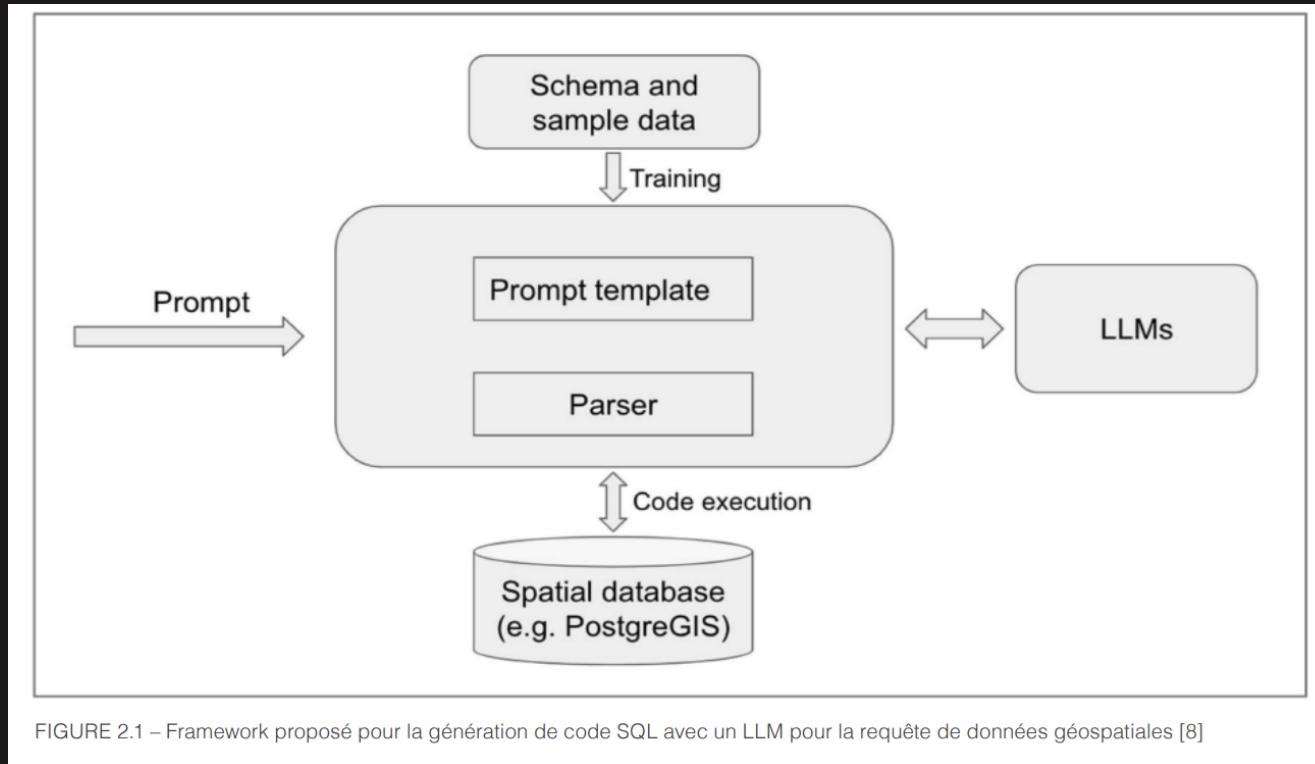
# Geografische Standorteinbettung



# Wissen über geografische Informationssysteme (GIS)



# Von Sprache zu SQL Spatial-Code



# Sequenzielle Operationen

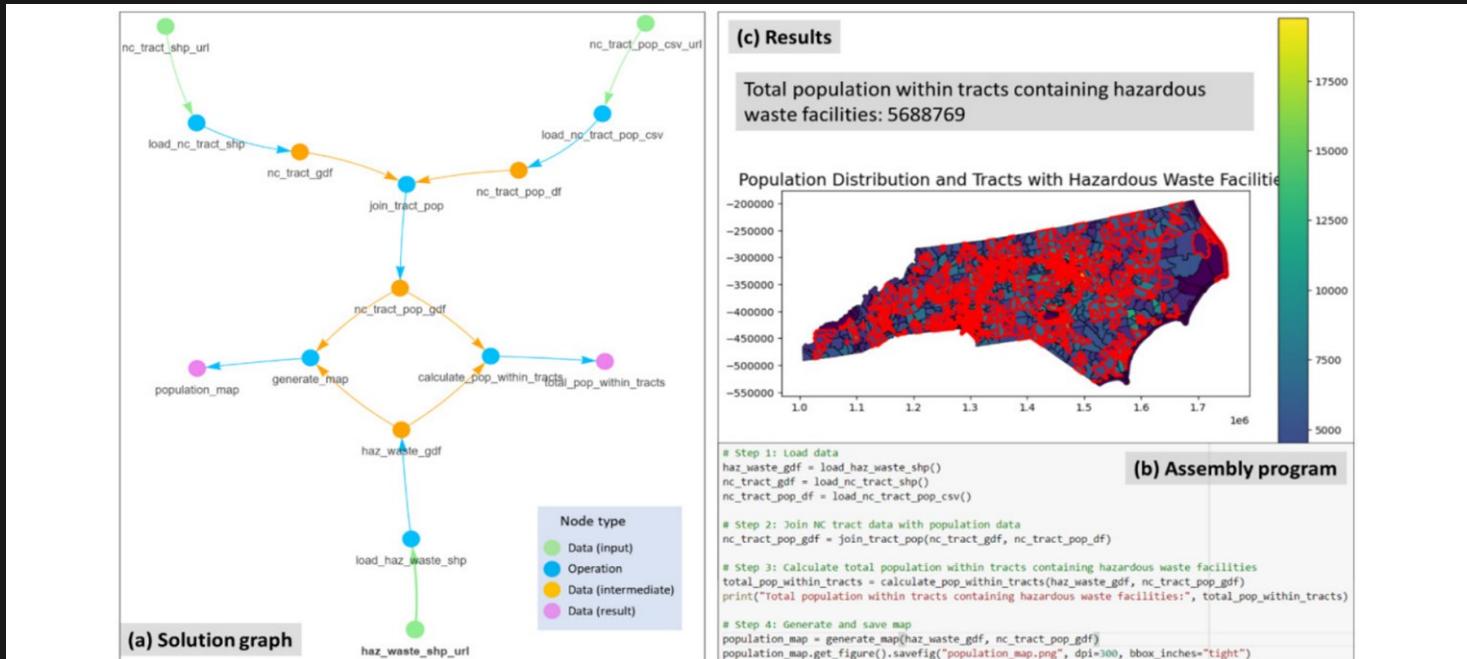


FIGURE 2.7 – Résultats générés automatiquement par LLM-Geo pour le dénombrement des populations vivant à proximité de déchets dangereux. (a) Graphe, (b) programme d'assemblage (codes Python), et (c) décompte de la population et carte générée [12]

# Autonomes GIS

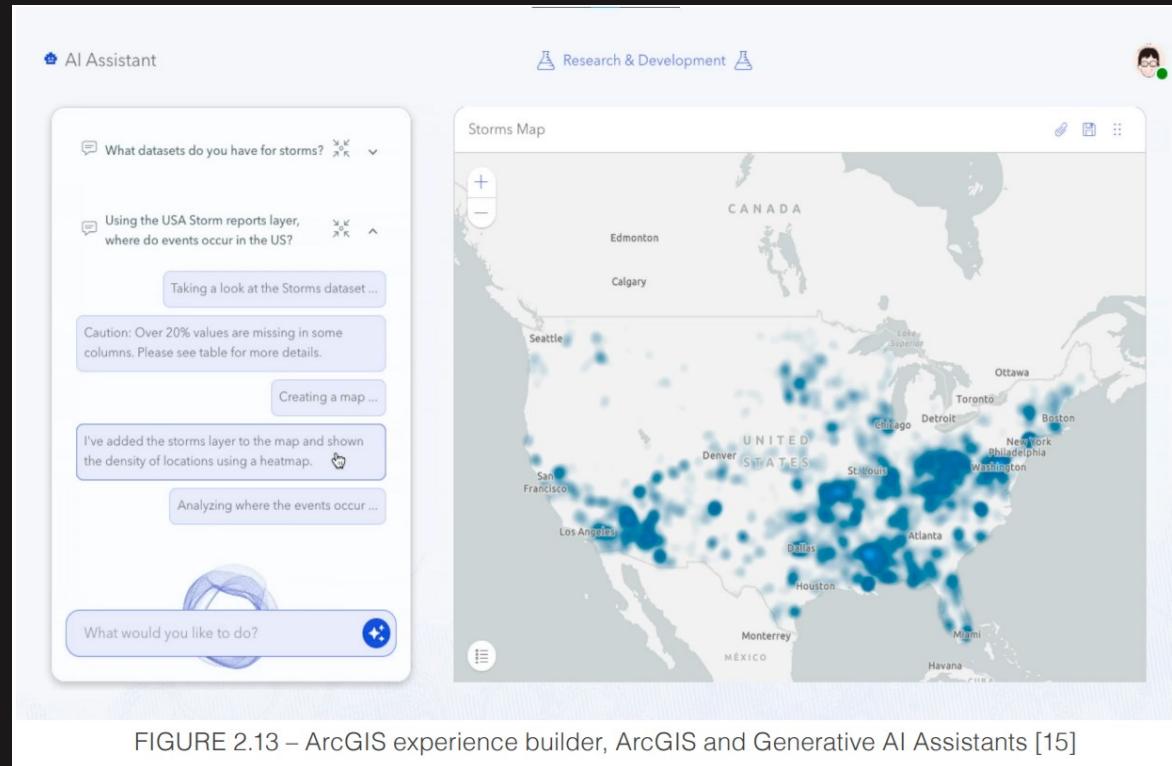


FIGURE 2.13 – ArcGIS experience builder, ArcGIS and Generative AI Assistants [15]

# Multimodale GeoLLMs: Änderungsdetektion mit visuellen Sprachmodellen (VLMs)

**Prompt:**  
These 4 satellite images are taken in different seasons. For each image, provide a prediction of the season. Select a single season per image, without replacement, from the following: Spring, Summer, Autumn, Winter. Let's think step by step.



The image shows a landscape with a lack of greenery, and the **fields are mostly brown with no visible crops**. This could indicate a time either before planting or after harvest. There is no snow, so it's likely not winter. This image could represent either autumn, after harvest time, or early spring, before planting has begun. **Prediction: Spring.**

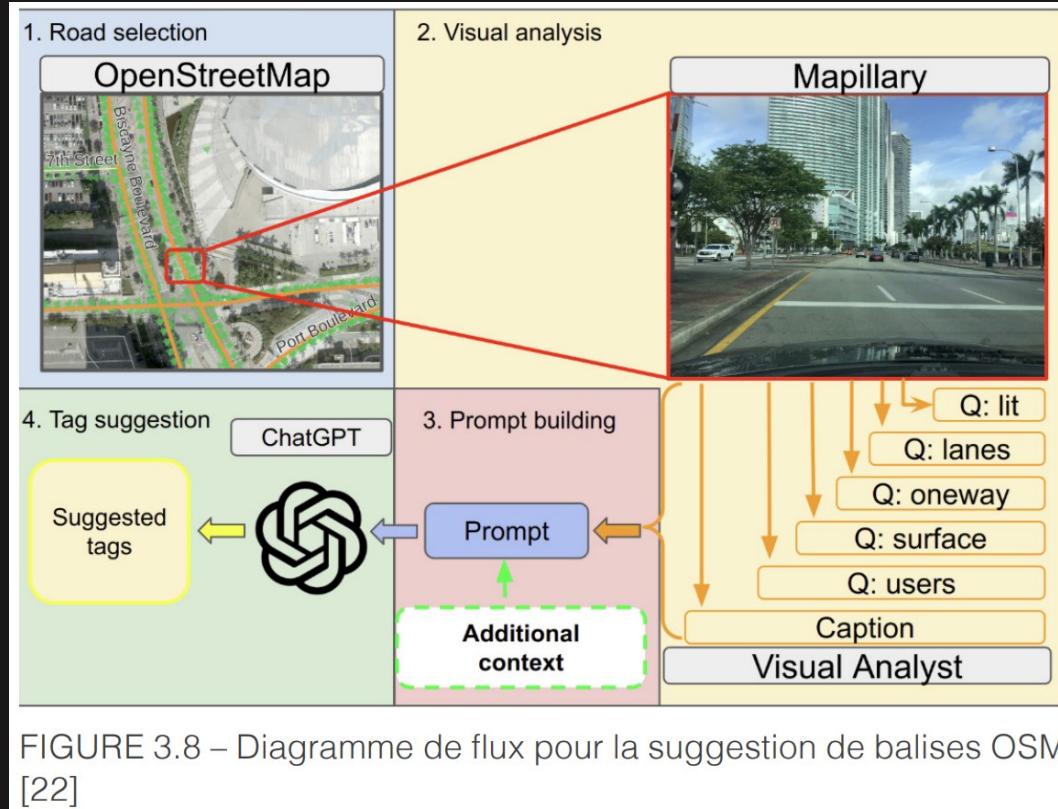
The image shows **fields that appear to be lush and possibly in full growth**. This is indicative of a time when crops are at their peak, which is typically in the summer. **Prediction: Summer.**

The image shows **fields with varying shades of brown and some patches that could be interpreted as either harvested fields or fields lying fallow**. There isn't a clear indication of snow or full greenery. This image might suggest the season is either autumn, with fields that have been recently harvested, or late winter, where some vegetation is still dormant. **Prediction: Autumn.**

The image has a **darker tone to it, and some of the fields have a very slight white hue which might suggest frost or light snow**. This could imply that the season is winter. **Prediction: Winter.**

Figure 2. **Satellite imagery change detection.** We test GPT-4V's ability to detect seasonal changes in a four-image time-series from [33]. In this example, the model is able to pick up minor details such as crop colouration and the presence of snow to correctly estimate seasons.

# Multimodale GeoLLMs: Datenanreicherung und Segmentierung



# Bericht 2 – Grenzen und Potenzial von LLMs für Geodaten

# Grenzen von LLMs für die Nutzung für Geodaten



Ursprünglich mit Textdaten trainiert, LLMs sind nur in den durch ihr Training abgedeckten Bereichen leistungsfähig



Verwechslung bei ähnlichen Geonamen (z. B. Stadt Bern vs. Kanton Bern)



Unterschiedliche Formate, Quellen und Arten von Geodaten erschweren es LLMs, zu generalisieren



Mehrstufige Geodatenverarbeitung bleibt schwierig

# Herausforderungen außerhalb der Geodaten-Nutzung



## Ethisch und sozial

- Verzerrungen (Bias)
- Datenschutz
- Fehlinformationen
- Transparenz



## Technisch

- Halluzinationen
- Reproduzierbarkeit
- Abhängigkeit
- Kontextuelle und Generations-Limits



## Umwelt und sozioökonomisch

- Energieverbrauch
- Sozioökonomische Disruption (Transformation von Arbeitsplätzen)



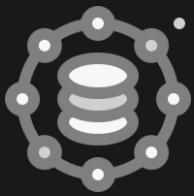
## Betrieblich

- Offen vs. geschlossene Quellen
- Modelllücken für spezialisierte Aufgaben

# Vorteile von LLMs in Geodaten



Barrierefreiheit



Fusion



Entdeckung

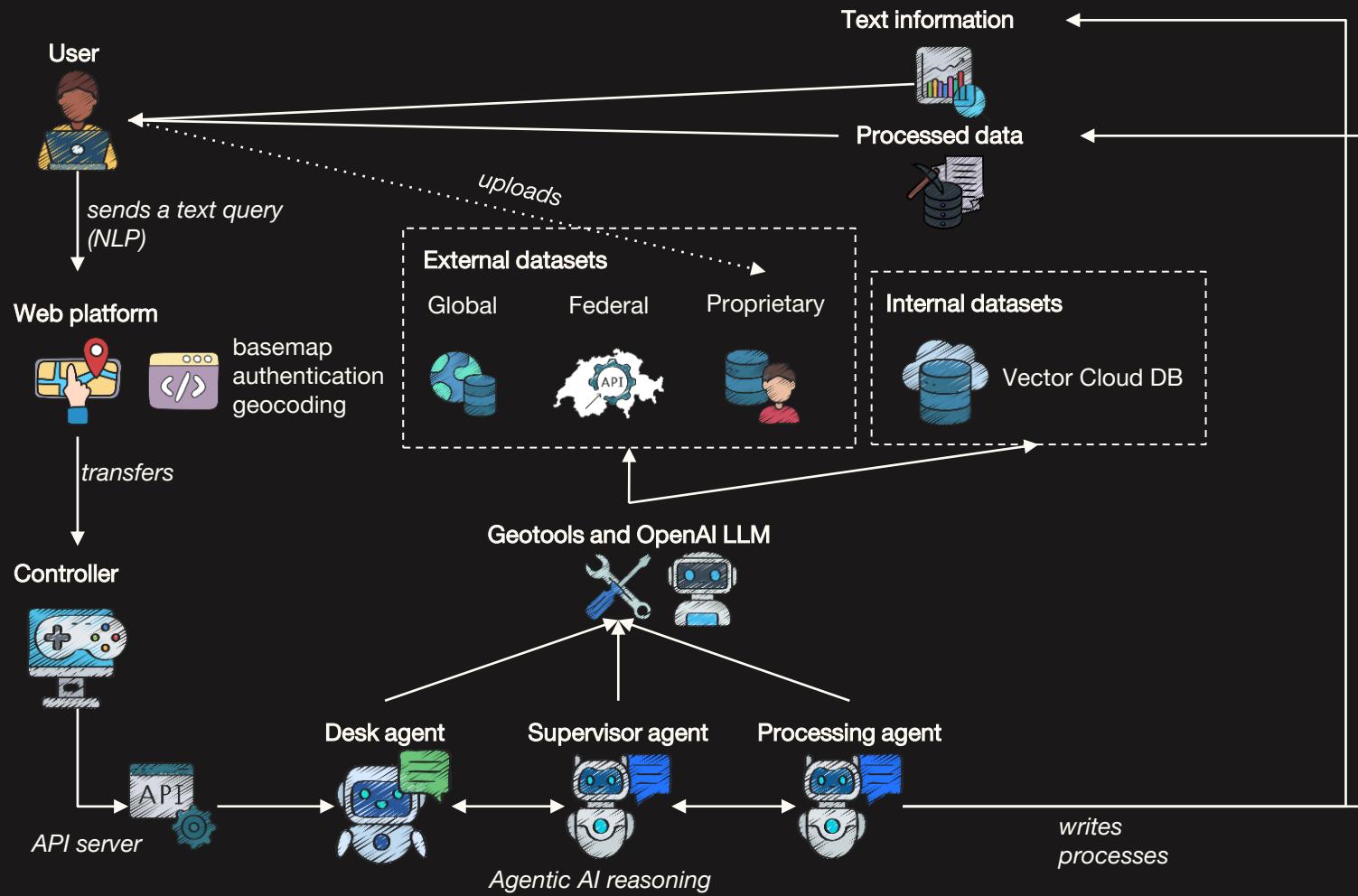


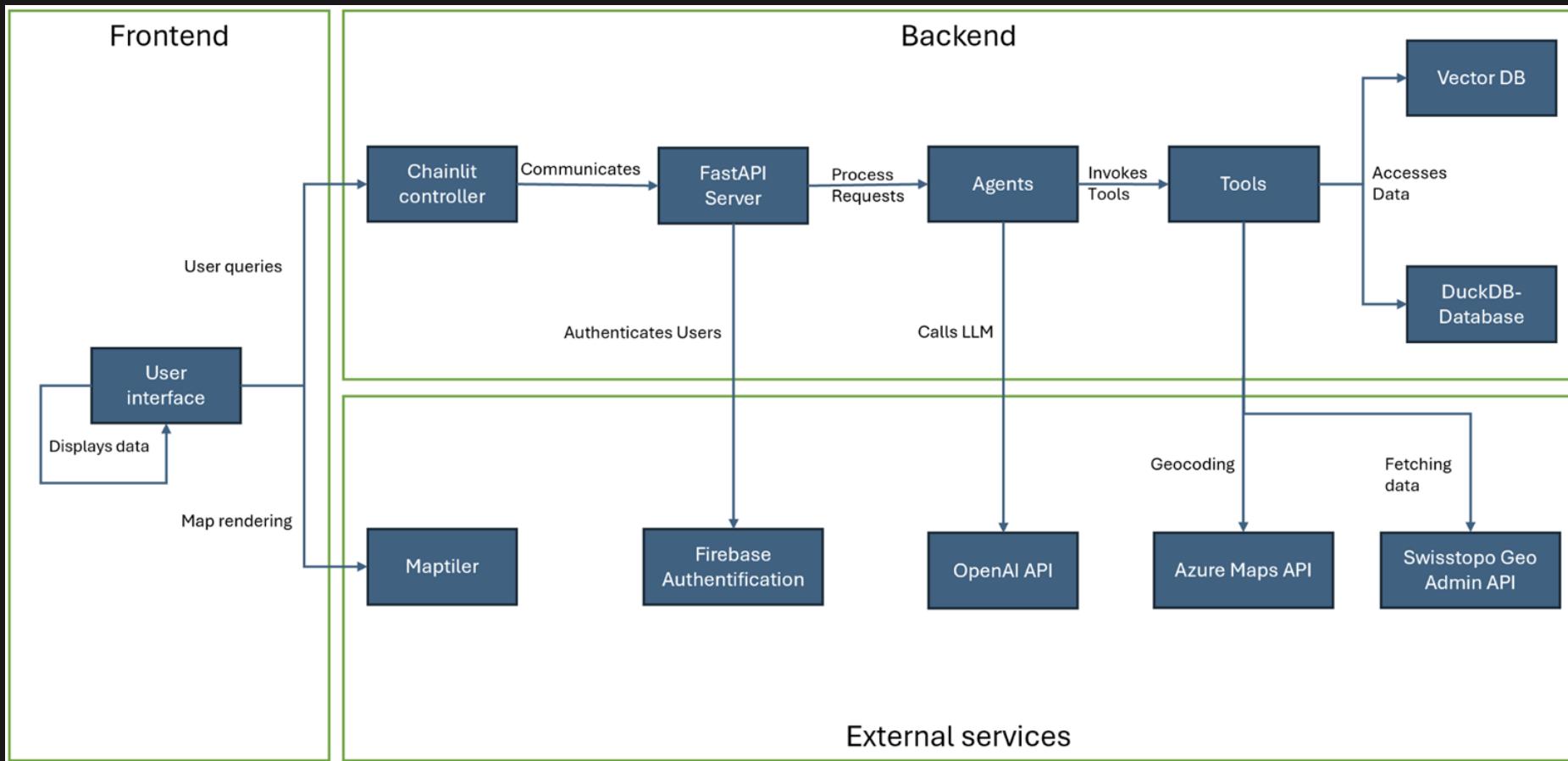
Benutzerfreundlichkeit



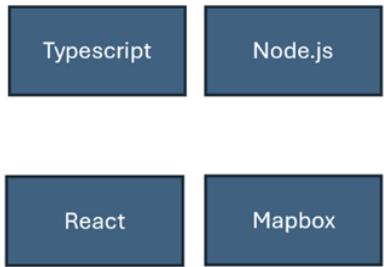
Standardisierung  
Formaten

Jetzt etwas **Theorie...**

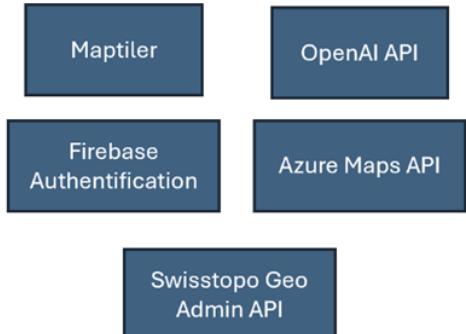




## Frontend



## External services



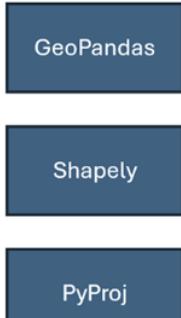
## GenAI



## Backend



## Geospatial Processing



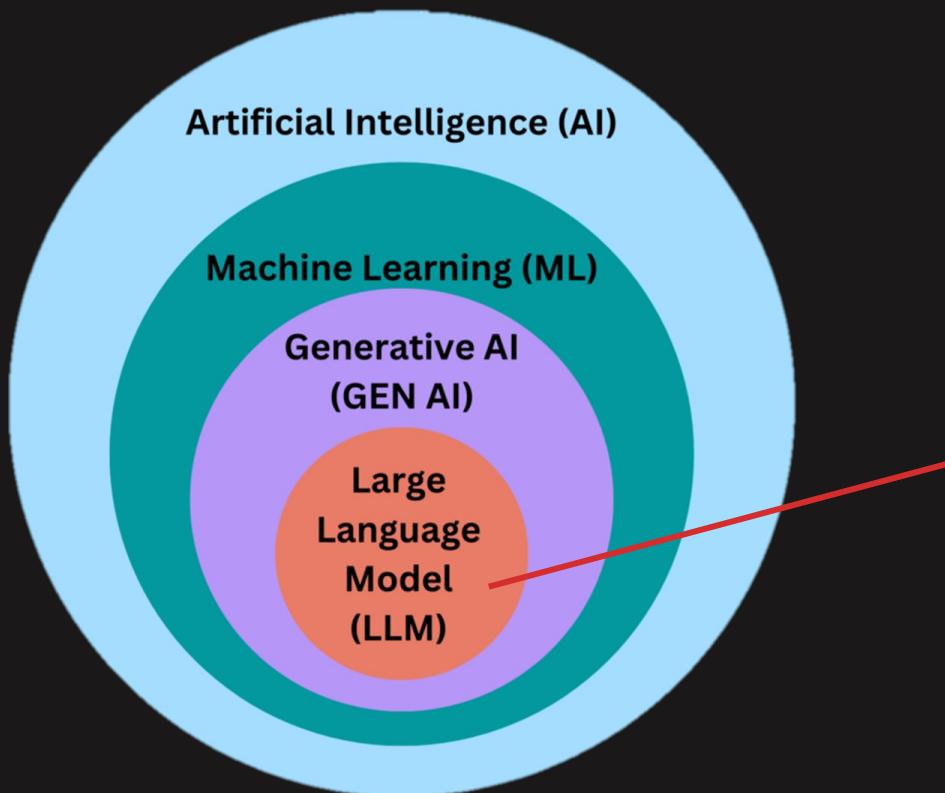
## Databases



## Deployment

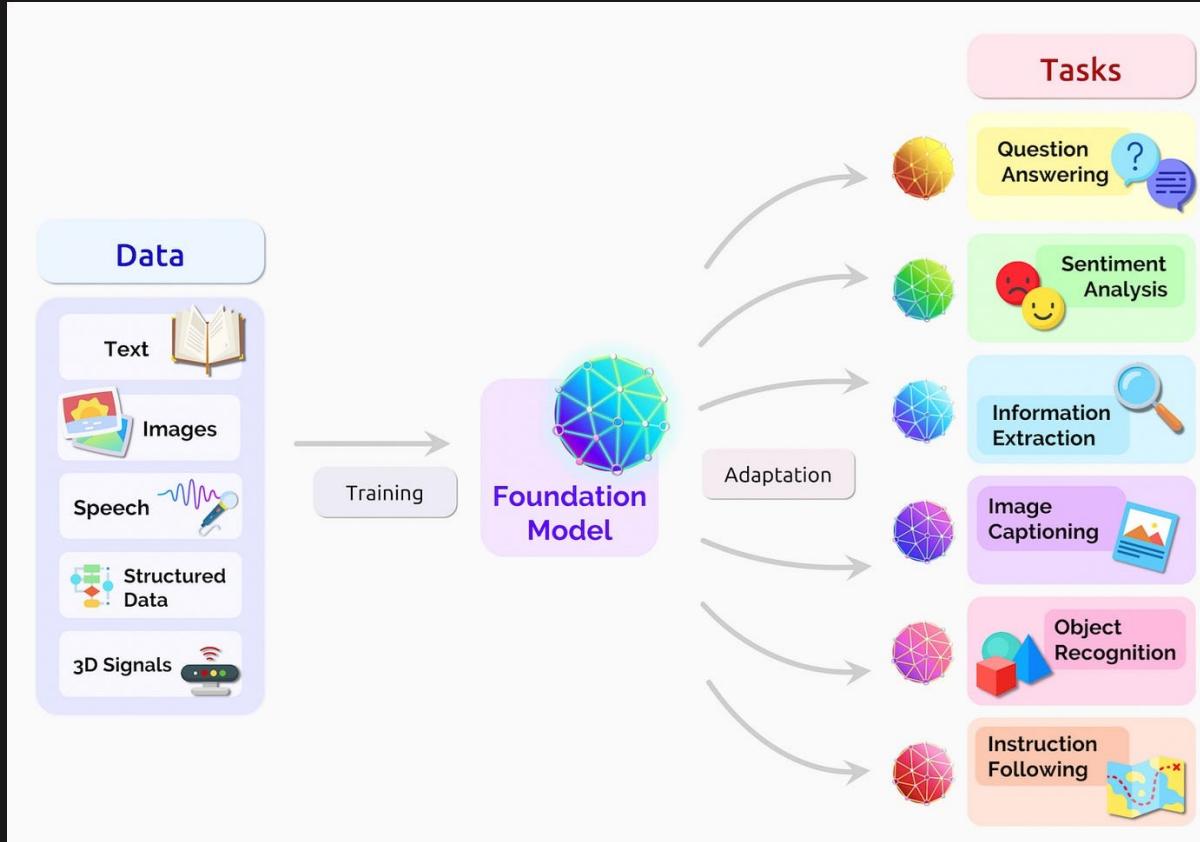


# Was ist ein Large Language Model (LLM) und Generative AI?

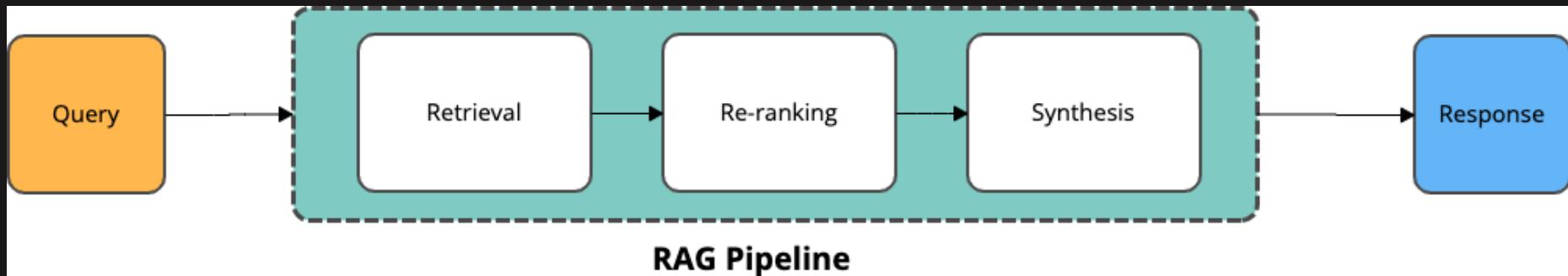


Ein KI-Tool, das menschähnlichen Text versteht und generiert

Es funktioniert, indem das Modell für die **Anpassung** anhand verschiedener **Aufgaben** trainiert wird

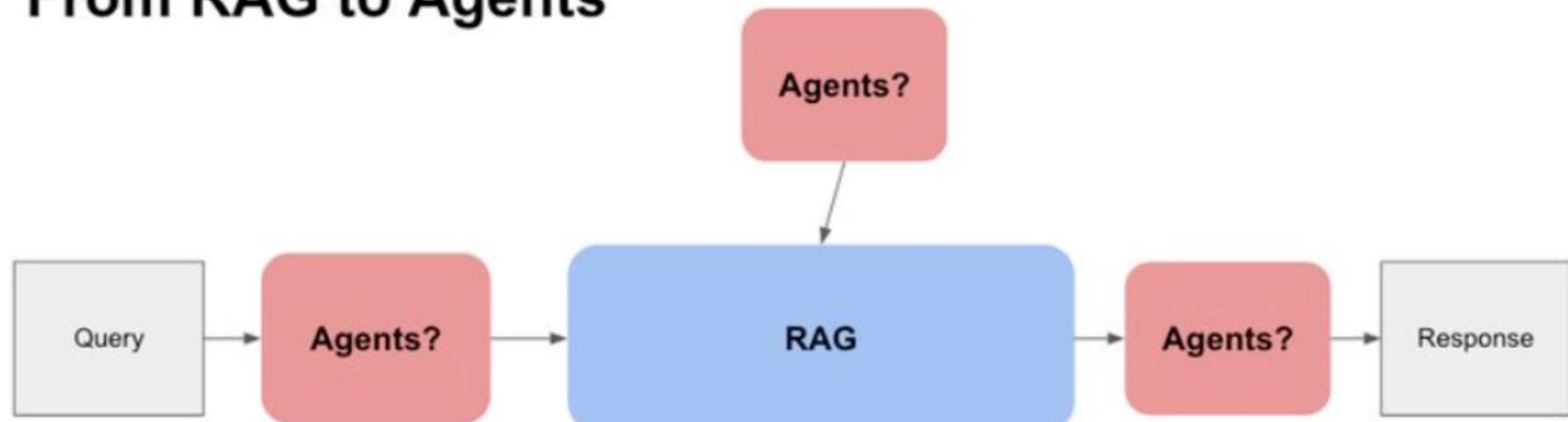


# Retrieval Augmented Generation (RAG)

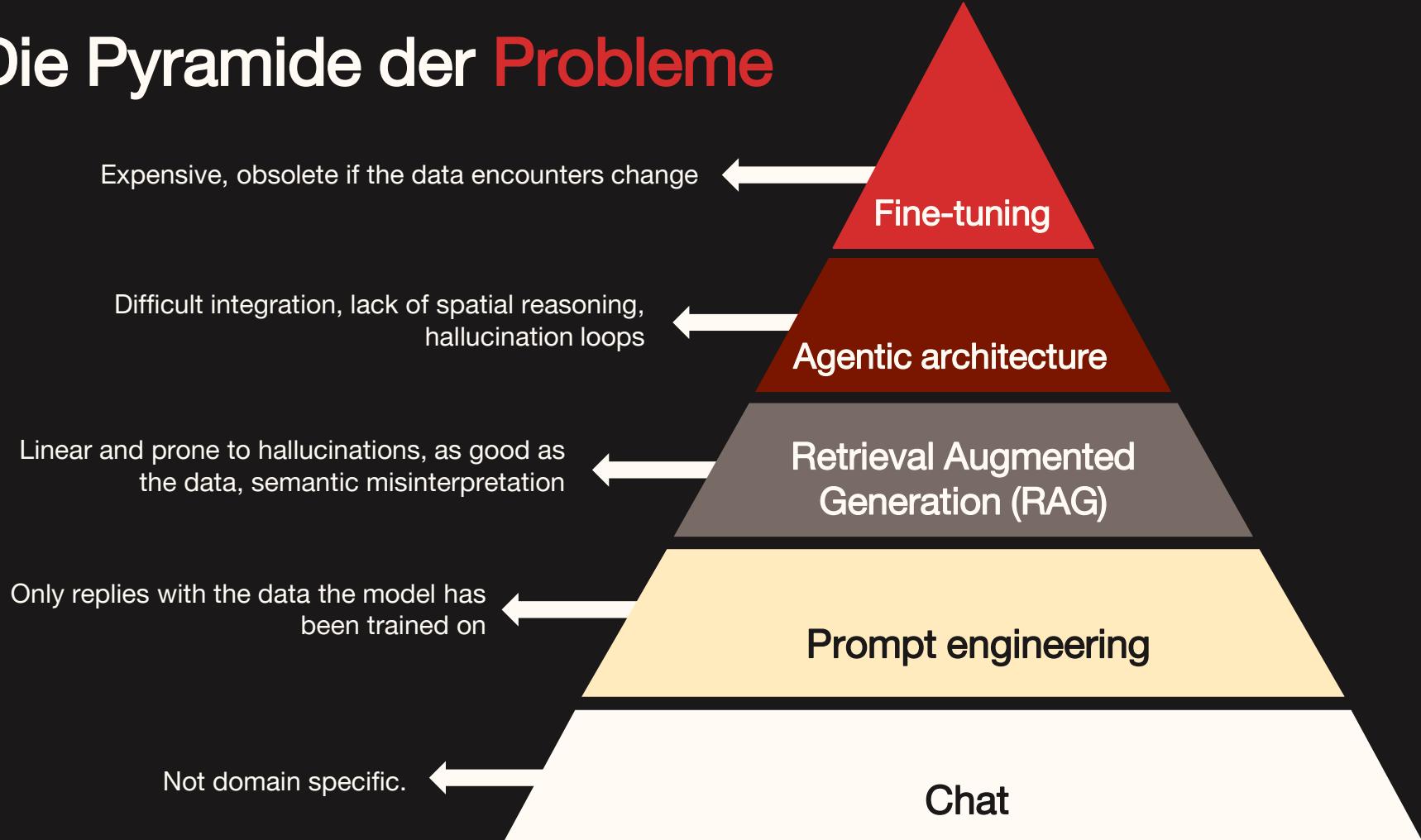


# Was ist **Agentic AI** / Multi-Agenten-Workflow?

## From RAG to Agents



# Die Pyramide der Probleme



# Über uns

# Naturkatastrophen verursachen Verluste an Menschenleben und Eigentum

Schweiz:



Menschen verlieren jedes Jahr ihr Leben aufgrund von Überschwemmungen, Hitzewellen und Erdrutschen



Schadensmeldungen stiegen um 13 % auf CHF 610 Mio im Jahr 2023 aufgrund von Naturkatastrophen



# Entscheidungsträger in **Versicherungen** und der **Regierung** nutzen **Daten**, aber selten **Geodaten** für Entscheidungen



Sie könnten davon **profitieren**

- **Underwriter und Portfoliomanager**
  - Geodatenbasierte Preisgestaltung
  - Finanzielle Risiken reduzieren
  - Vertrauen stärken
- **Schadensmanager**
  - Unterstützung bei der Schadensprüfung
  - Verluste durch mangelhafte Daten vermeiden
  - Verbesserte Entscheidungen bei Auszahlungen

- **Projektkoordinatoren und Bauleiter**
  - Briefings verbessern
  - Ressourcen zuweisen
  - Fortschritt überwachen
  - Improve Briefings
- **Militärische Offiziere**
  - Briefings verbessern
  - Situationsbewusstsein steigern

# Und sie nutzen Geodaten nicht oft, weil der **Zugriff** auf Geodaten ein **Problem** darstellt

Traditionelle Geodaten



**Zeitaufwändig**

Erforderlich: Quellen finden, Daten sammeln, Formatieren, Größe, Qualität prüfen..



**Komplex**

Benötigt Kenntnisse eines geografischen Informationssystems (GIS)



**Kostspielig**

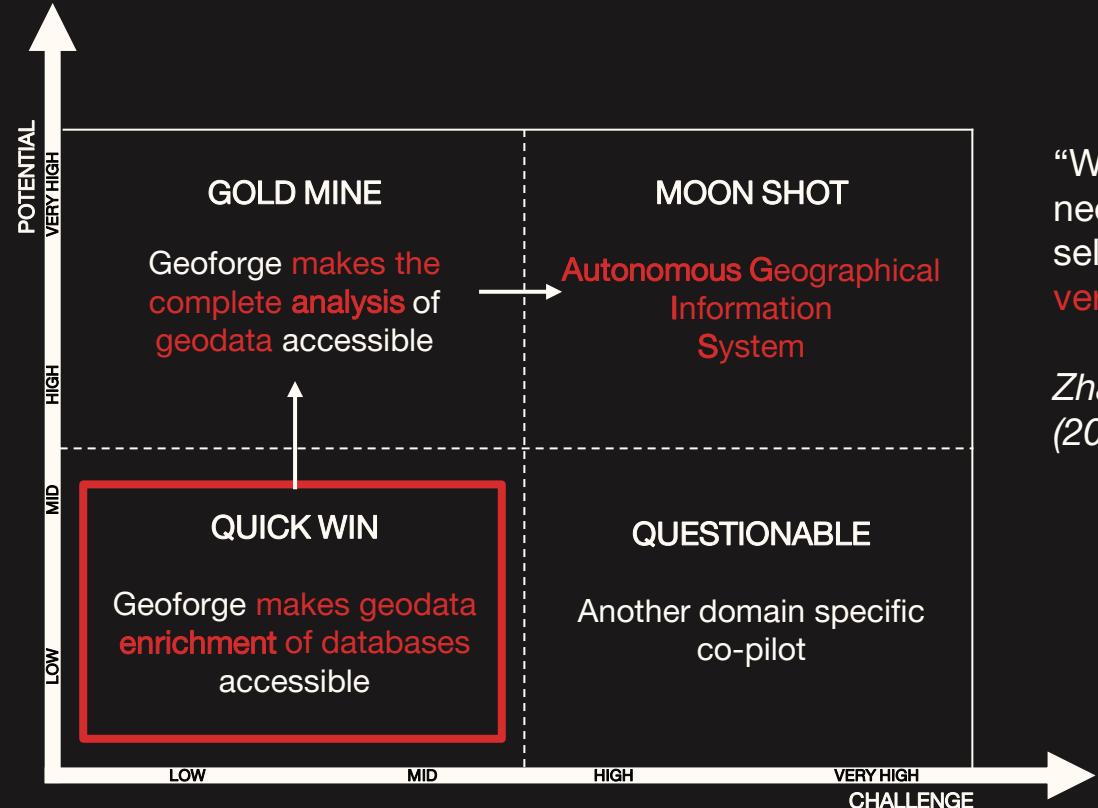
Erfordert entweder GIS-Kenntnisse oder die Einstellung eines Experten



Zugängliche webbasierte **Location-Intelligence-Plattform**, die Ihre **Daten** mit **Geodaten** für fundierte **Entscheidungen** anreichert

- Aktuell → **POC**
  - Zugänglich (kein Expertenwissen erforderlich)
  - Schnell (Stunden → Sekunden)
  - Kostengünstig (cloud-native und skalierbar)
- Februar 2025 → **MVP**

# Die Innovation



“We envision that autonomous GIS will need to achieve five autonomous goals: **self-generating**, **self-organizing**, **self-verifying**, **self-executing**, and **self-growing**”

Zhang, Y., Wei, C., Wu, S., He, Z., & Yu, W. (2023)

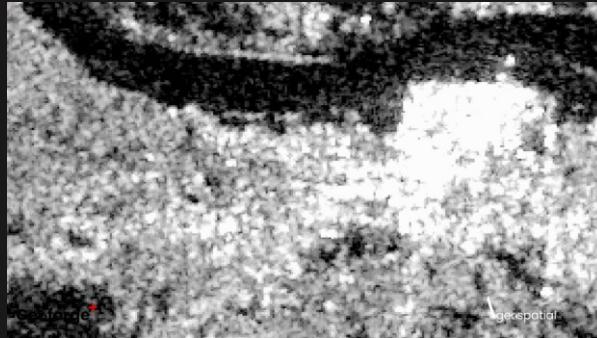
# Erdbeobachtung zur Bereitstellung nahezu in Echtzeit verfügbarer Daten

Angewandte GeoAI-Modelle auf Satellitenbildern zur Erkennung von Überschwemmungsgebieten

1 - **Imagery and essential infrastructure**  
(roads, buildings, power network)



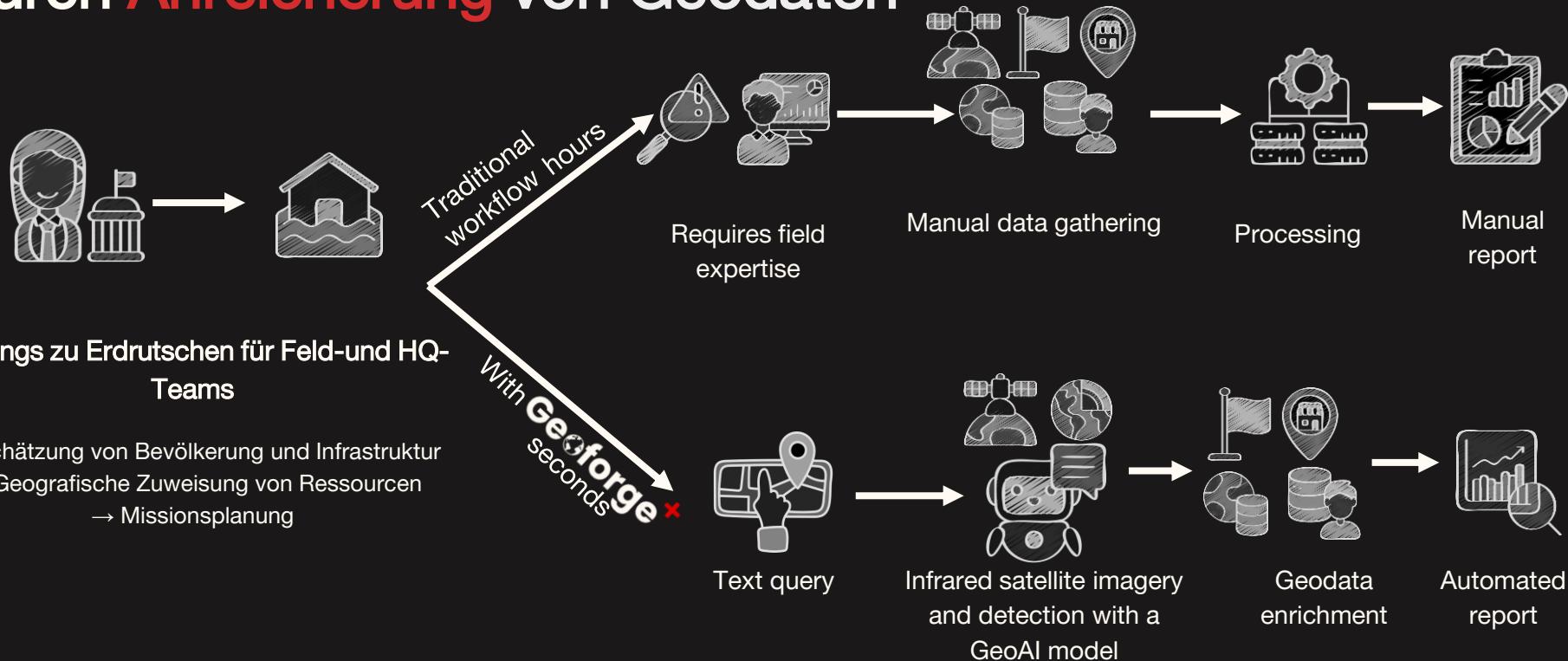
2 - **Detection of flood with satellite radar imagery data**



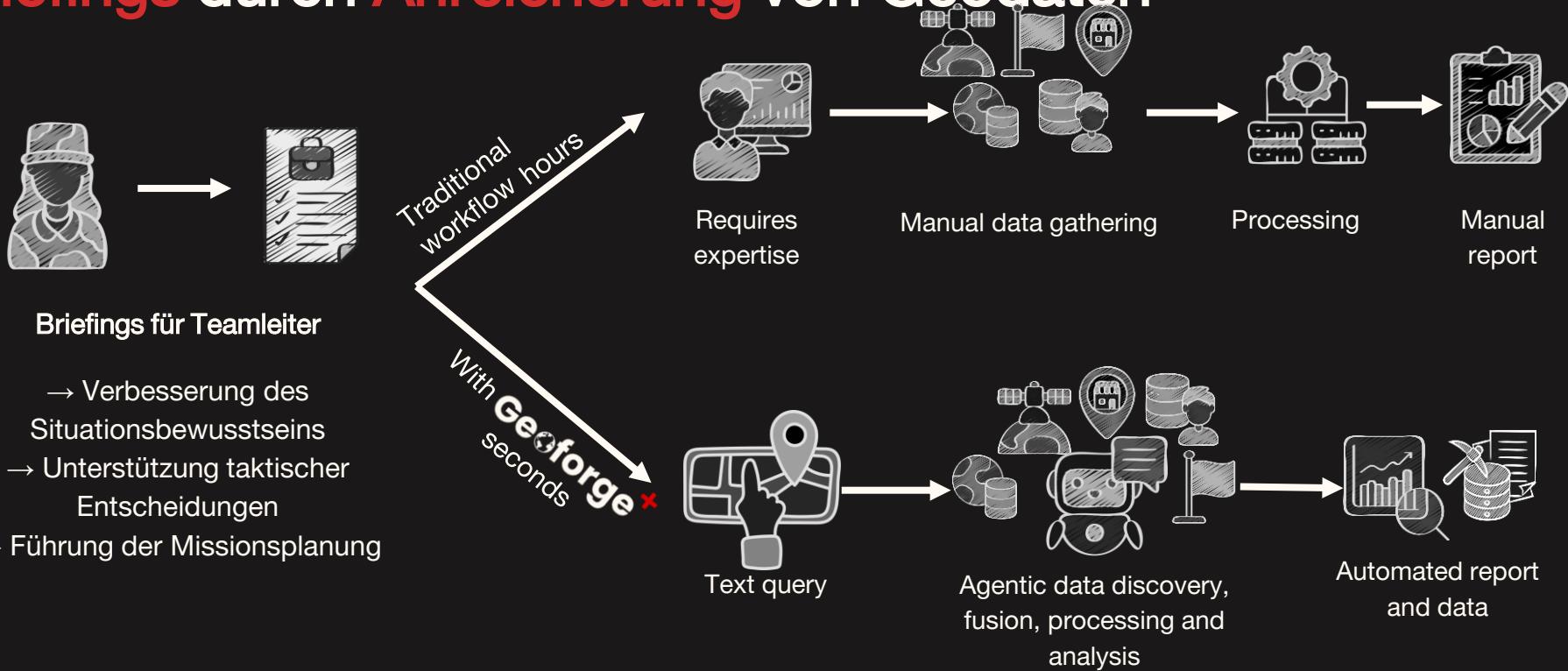
3 - **Results of affected infrastructure**  
(extent, features, amount)



# Anwendungsfall 1: Projektkoordinator verbessert Briefings durch Anreicherung von Geodaten



# Anwendungsfall 2: Militärischer Offizier verbessert Briefings durch Anreicherung von Geodaten



# Team



**Maaz Sheikh**  
Founder & CEO



**Julien Delambilly**  
Lead NLP Engineer



**Anil Sethi**  
Lead Innosuisse coach



**Anatole Deligant**  
Technical advisor



**Nicolas Escotte**  
NLP Engineer



**Prof. Thomas Maillart**  
Advisor in business



**Antony Gandonou**  
Full-stack developer



**Dragos Vlad Tatar**  
Masters project intern,  
NLP engineer



Upcoming board member  
Advisor in insurance



# Aktuelle Unterstützung seit der Gründung im April 2024

Microsoft for Startups  
**Founders Hub**

Strategie Geoinformation Schweiz  
Stratégie suisse pour la géoinformation



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra  
  
Swiss Confederation  
  
Innosuisse – Swiss Innovation Agency



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Agency for Development  
and Cooperation SDC



**science  
2market**  
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UNIVERSITÉ  
DE GENÈVE



Geneva  
Responsible  
Entrepreneurship  
Center



Imperial College  
London

**EPFL**

**EPFL** Innovation  
Park

431



Vielen Dank für Ihr Vertrauen



[ageospatial.com](http://ageospatial.com)



[contact@ageospatial.com](mailto:contact@ageospatial.com)



[linkedin.com/company/ageospatial](https://linkedin.com/company/ageospatial)



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