

Geonames and Semantics

Cornerstones of reliable AI

Florian Twaroch and Markus Jobst
Federal Office of Metrology and Surveying
Amsterdam, 30. April 2026

Federal Office of Metrology and Surveying

- Founded 1923, is Austria's national authority for surveying, geoinformation, legal metrology and market surveillance
- subordinate of the Federal Ministry of Economy, Energy and Tourism, Republic of Austria
- Headquarters are located in Vienna, Austria
 - approx. 1200 employees
 - 60 regional offices

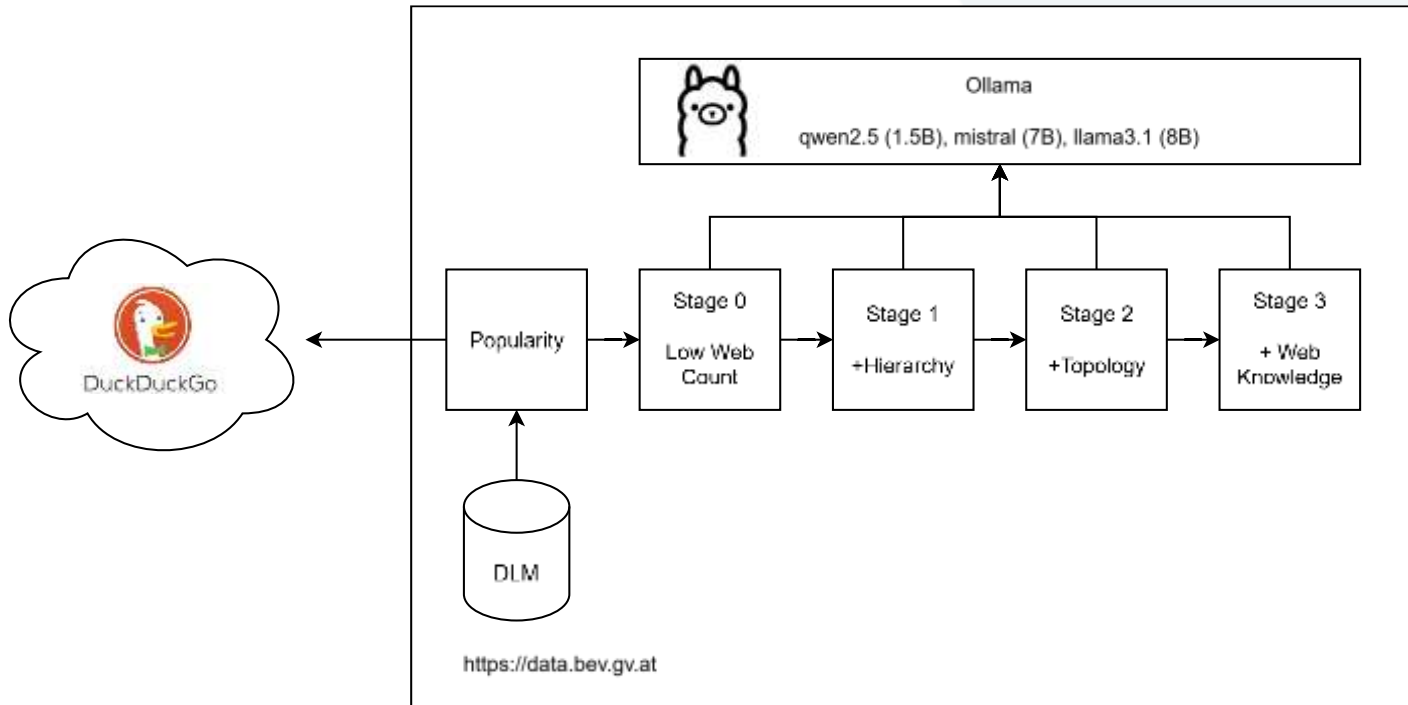


AI at the Federal Office of Metrology and Surveying

- Evaluation of LLMs in the context of a public authority
 - Local Inferencing / no Internet
 - Hardware Optimization
 - Sovereignty
- Use Case: An experiment with micro-toponyms („Riednamen“) in a local area in Lower Austria



Workflow and Setup Experiment



Results

Modell	S ₁ – Zero Shot	S ₂ Hierarchy	S ₃ Topology	S ₄ Web RAG
Qwen 2.5 (1.5B)	100% Exit 100% Exit	100% OK 94.4% OK	100% OK 92,9% OK	43.1% OK (45% Exit) 24.6% OK (69 Exit)
Mistral (7B)	86.3% Exit 99.7% Exit	100% OK 99.1% OK	100% OK 99.7% OK	100% OK 95.4% OK
Llama 3.1 (8B)	62.7% Halluz. 95.4% Halluz.	98.0% OK 98.6% OK	100% OK 97.8% OK	100% OK 98.9% OK

Summary and Take Aways

The Geographic Long-Tail requires a new AI Paradigm

- The Web is Spatially Blind: Classic text based-search engines and LLMs fail at micro-toponyms. Relying on unstructured Web-RAG causes severe „Attention Collapse“ in small edge models.
- Spatial Anchoring is Key! Injecting deterministic spatial data (administrative hierarchy and topology) improves answering behaviour immense.

Conclusion

- Edge AI works perfectly – if anchored: Even tiny, offline models achieve a near 100% factual accuracy when performing a „Graph-to-Text“ serialization
- Call to Action for NMAs: To enable secure, hallucination free On-Premise AI for public administration, National Mapping Agencies must transition their Gazeteers into Topological Knowledge Graphs
- Further experiments are required to investigate language bias, larger models.
- A key challenge remains the evaluation of the results.

Thanks !

Florian Twaroch
Federal Office of Metrology and Surveying
Florian.Twaroch@bev.gv.at