

Applying Commercial Computer Vision Tools to Cope with Uncertainties in a Citizen-driven Archive. The case study Topothek@exploreAT!

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Background, Problem Definition and Motivation

Uncertainty

- commonly encountered issue across data of different disciplines and communities
- causes: mixed data quality, low-level annotations, time, lack of standards, incoherent infrastructures, etc
- challenges: data extraction, analysis, interlinking

Background, Problem Definition and Motivation

Motivation

- **Digital Humanities** → availability of digital methods & tools to tackle uncertainties
- Use-case **Topothek** → testing of AI technologies (Clarifai, IBM Watson, Microsoft cognitive services) with the aim to enhance data access for humans (researchers, citizens) as well as machines

Background, Problem Definition and Motivation

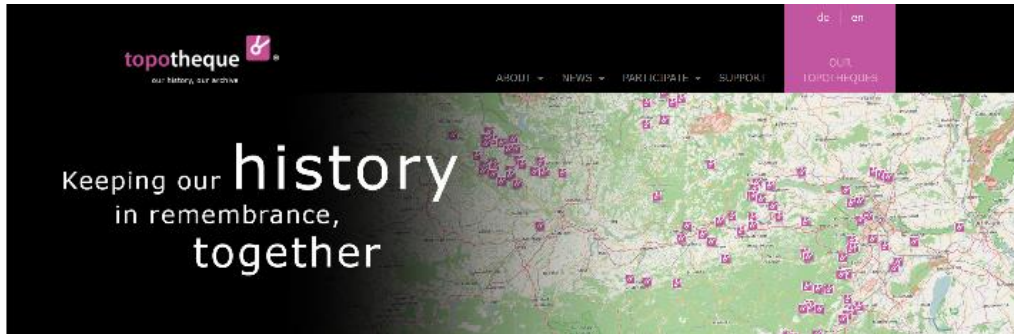
Context



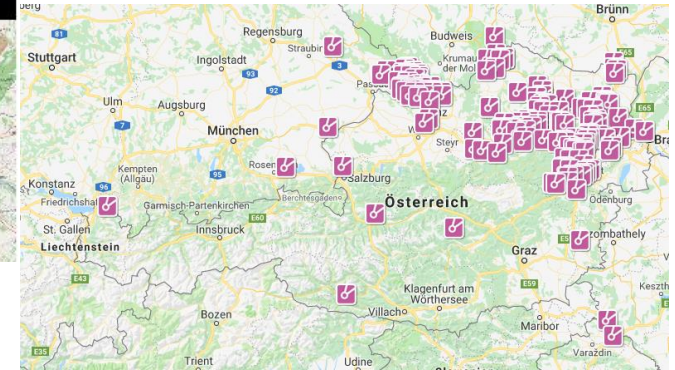
@ exploration space ACDH-OeAW

- multidisciplinary DH-project
- implementation in Open Innovation Research Infrastructure (OI-RI)
- link language data to **real-world objects**

Use Case Topothek - Background, Goals and Tagging



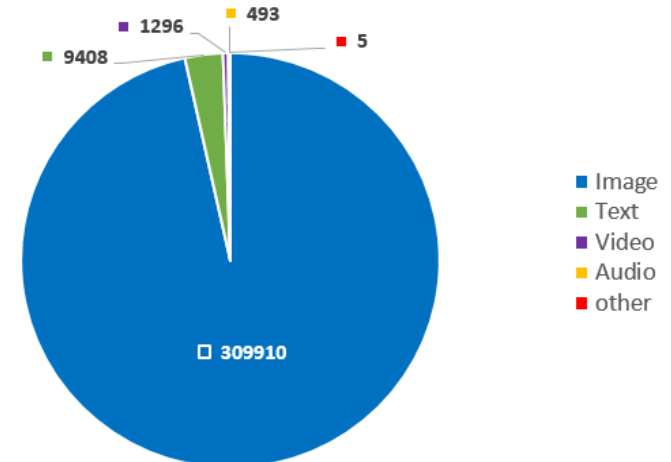
Sources: <https://www.topothek.at/en/>; <https://www.topothek.at/de/unsere-topotheken>



Map data ©2018 GeoBasis-DE/BKG (©2009), Google

- completely citizen-driven archive
- focus on history of municipalities
- 200 topothèques in 14 European countries
- ~300.000 objects

Total number of object types in topothek.at



Use Case Topotheque - Background, Goals and Tagging

Community tags

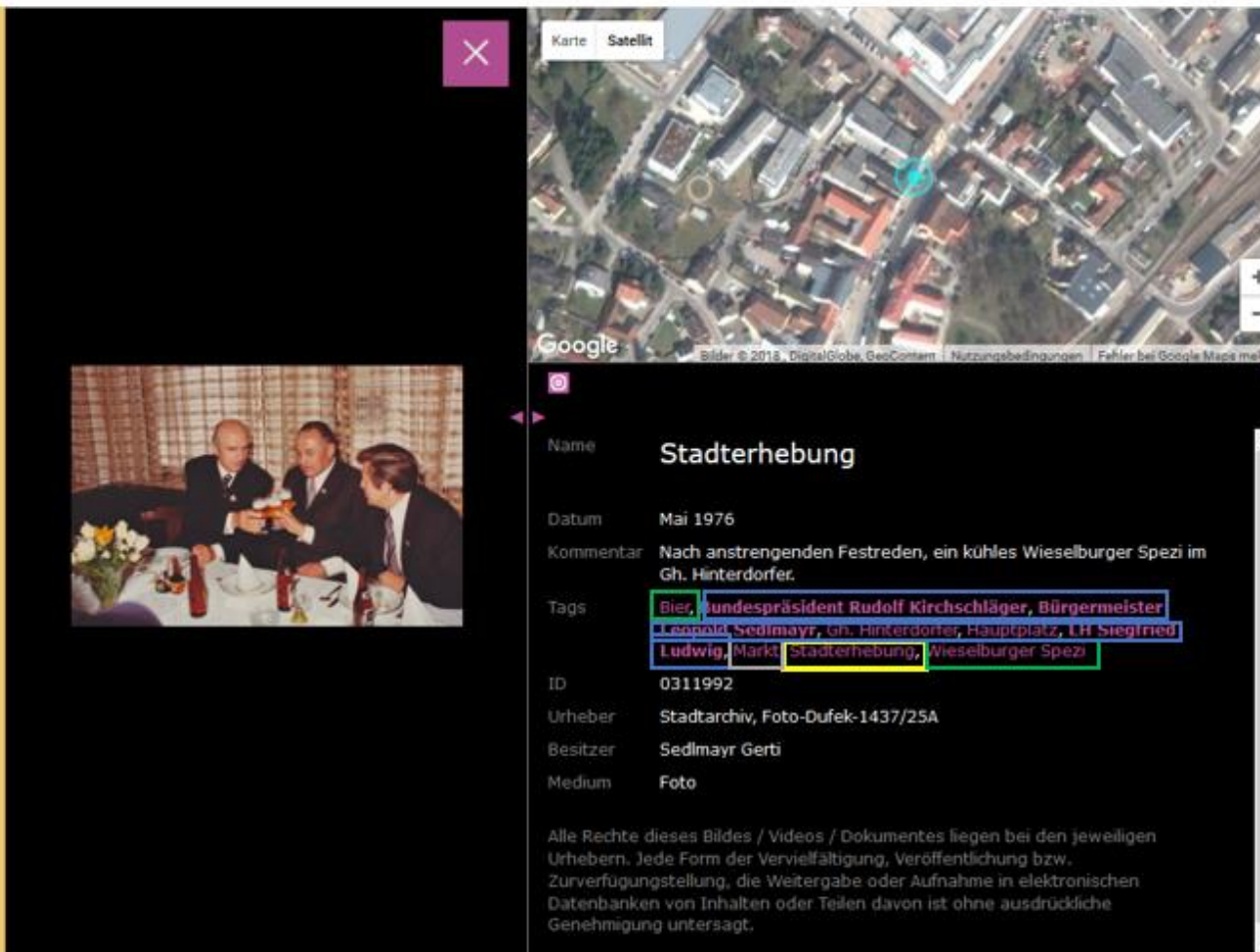
- persons

Object tags

- buildings

Context tags

- events



The screenshot displays the Topotheque interface. On the left, a photograph shows three men in suits seated at a table, engaged in conversation. On the right, a map of Wieselburg is shown with a red pin indicating the location of the photo. Below the map, a metadata panel for the photo is visible, containing the following information:

Name	Stadterhebung
Datum	Mai 1976
Kommentar	Nach anstrengenden Festreden, ein kühles Wieselburger Spezi im Gh. Hinterdorfer.
Tags	Bier, Bundespräsident Rudolf Kirchschläger, Bürgermeister Leopold Sedlmayr, Gh. Hinterdorfer, Hauptplatz, LH Siegfried Ludwig, Markt, Stadterhebung, Wieselburger Spezi
ID	0311992
Urheber	Stadtarchiv, Foto-Dufek-1437/25A
Besitzer	Sedlmayr Gerti
Medium	Foto

At the bottom of the metadata panel, a disclaimer states: "Alle Rechte dieses Bildes / Videos / Dokumentes liegen bei den jeweiligen Urhebern. Jede Form der Vervielfältigung, Veröffentlichung bzw. Zurverfügungstellung, die Weitergabe oder Aufnahme in elektronischen Datenbanken von Inhalten oder Teilen davon ist ohne ausdrückliche Genehmigung untersagt."

Source: Topothek Wieselburg. <http://wieselburg.topothek.at/#doc=311992>. Copyright notice: Urheber: Stadtarchiv, Foto-Dufek 1437/25A

Use Case Topotheque - Background, Goals and Tagging

Community tags

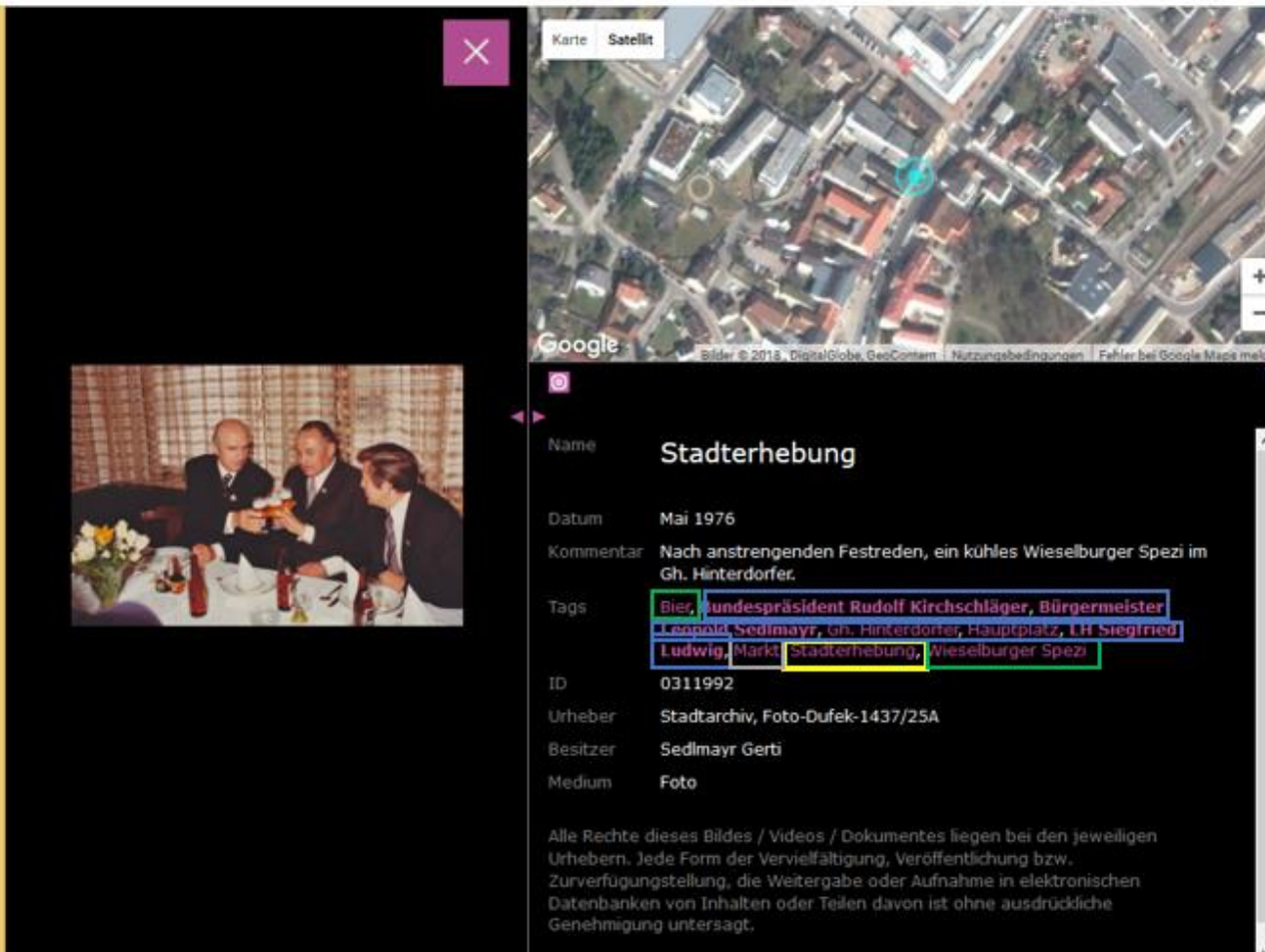
- persons

Object tags

- buildings

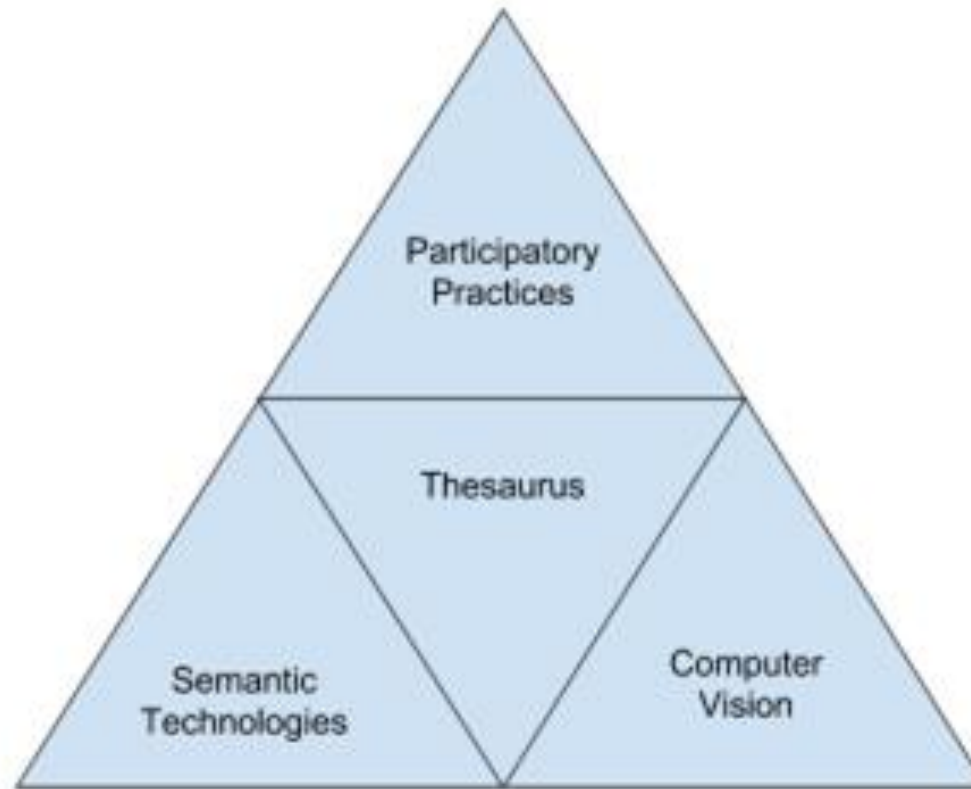
Context tags

- events



→ sources of uncertainty:
image quality, tag quality

Methods: addressing uncertainties in Topothek (AT)



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Research Questions

Q1: How many algorithm generated concepts are identified as relevant/ irrelevant for the image for pooled results from the three different tools?

Q2: What are the consequences of Q1 regarding certainty/ uncertainty in Topotheque's data for access and interconnection?

Results: Computer Vision (1)

	clarifai		watson		microsoft
	Name	Value			
1	people	0,97773945	claret red color	0,89	people
2	adult	0,96684860	person	0,79	man
3	wine	0,95140040	headwaiter	0,71	group
4	man	0,94854170	reddish brown color	0,56	table
5	group	0,94612230	Representative	0,53	woman
6	table	0,94333255	waiter	0,52	restaurant
7	drink	0,93793310	table	0,51	room
8	woman	0,93096310	furniture	0,51	sitting
9	indoors	0,91963980	dining table	0,50	indoor
10	restaurant	0,89973056	dinner table	0,50	food
11	room	0,89374640			curtain
12	facial expression	0,86856353			window
13	furniture	0,83037627			plate
14	sit	0,82568610			eating
15	meal	0,81975570			holding
16	wear	0,81950640			front
17	two	0,81806490			couple
18	group together	0,81430470			black
19	hotel	0,80678654			standing
20	leader	0,79645600			

- 3 CV-algorithms
- 21 images
- 912 / 1067 tags
- 24 common concepts
- 782 differing concepts

Results: Computer Vision (2)

Q1: How many algorithm generated concepts are identified as relevant/ irrelevant for the image for pooled results from the three different tools?

Total: 912 unique concepts

relevant:	40% (n=367)
non-relevant:	36% (n=326)
not useful:	14% (n=128)
uncertain:	4% (n=37)

Topothek > 300.000 objects

Results: CV & Uncertainty

Q2: What are the consequences of Q1 regarding certainty/uncertainty in Topotheque's data for the further application of cv, the citizen user and the researcher?

→ need to train algorithm on data to make CV feasible for citizens

→ 3/3: uncertainty significantly reduced when same concepts produced by the 3 algorithms

→ 2/3: on average 5 relevant and 1 non-relevant concept/image = more than double number of manually added object tags

Challenges, learnings & conclusion

- build on the experiences of a science-as-a-service infrastructure
- improve results with human-machine-interaction
- improve the development of a thesaurus
- tackle technical and societal challenges of uncertainty further