Knowledge Graphs have unfinished business...

WU
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http://polleres.net/presentations

Panel Questions - Short answers:

- **What are the problems of current KG approaches?**

  Knowledge Graphs have unfinished business…
  i.e., we can't just go along, without solving some core problems
  (that don't go away by rebranding Semantic Web and Linked Data)!

- **What are your visions or thoughts about KG applications in academia and industry**

  Decentralised Data Eco-Systems beyond centralised KGs!

- **What are the future directions for KG**

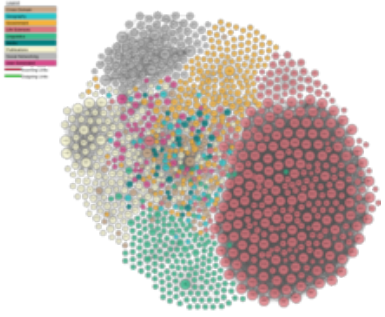
  Natural **Data** Understanding, i.e. "NoNLP"!
  Contextualisation … still ;-)
  Scalable Linked Data Processing… now for real!

Knowledge Graphs have unfinished business…

… with ***Linked Open Data***

more specifically, with **BOTH**

Linked Data

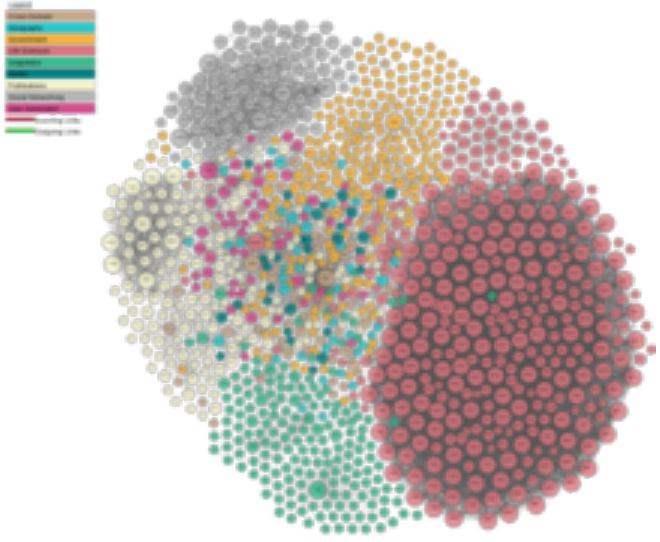


AND

Open Data

Knowledge Graphs and Linked Data

Beyond Dbpedia and Wikidata… we had the vision of a ***Web of Open KGs*** that would be *interlinked* and *queryable*



Did it produce more than this lovely picture?

Yet: we are left with tons of issues [1]!

… e.g.
linkage between KGs still sparse [2],
but also others, e.g. availability & sustainability (beyond a PhD lifetime) of Open KGs!

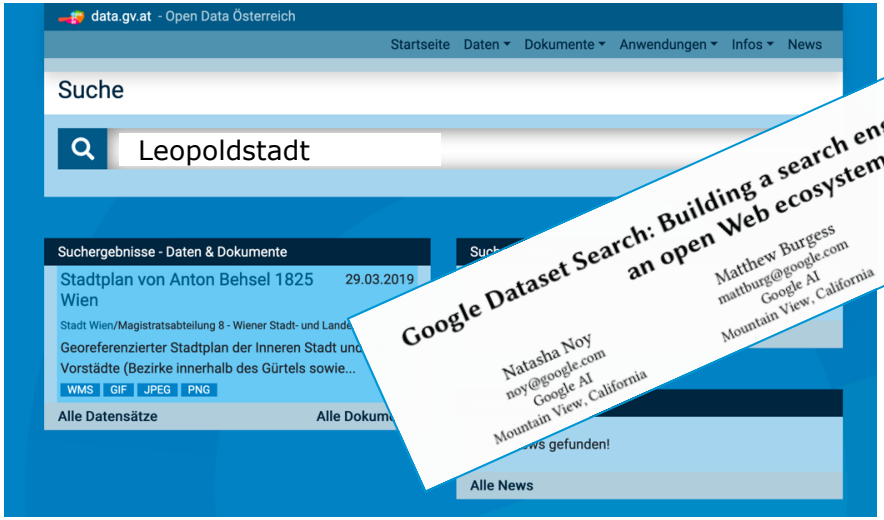
[1] Axel Polleres, Maulik Rajendra Kamdar, Javier D. Fernández, Tania Tudorache, and Mark A. Musen. A more decentralized vision for linked data. 11(1):101--113, January 2020. SWJ 10-years special issue. [http]
[2] Armin Haller, Javier D. Fernández, Maulik R. Kamdar, and Axel Polleres. What are links in linked open data? a characterization and evaluation of links between knowledge graphs on the web. *ACM Journal of Data and Information Quality (JDIQ)*, to appear, Pre-print available https://epub.wu.ac.at/7193/.

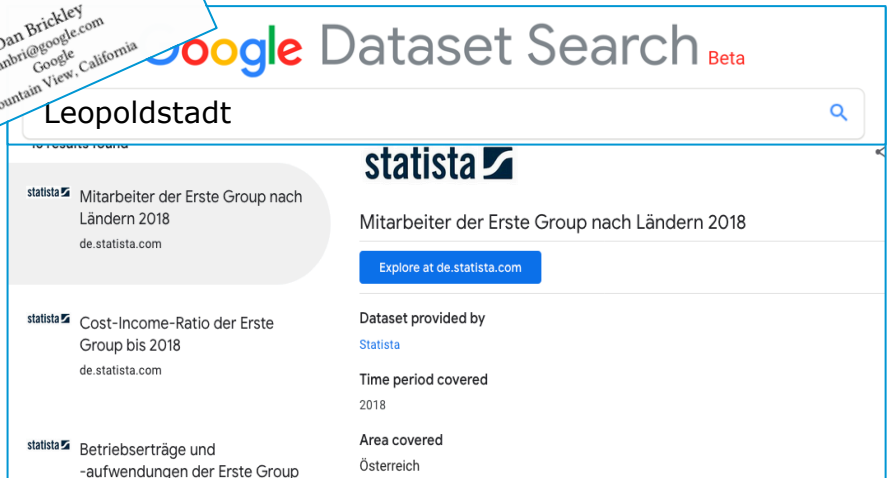
Knowledge Graphs and Open Data

Open Data had a boost some years ago and is still trending, esp. for Government Data & Transparency!

Yet: hardly any of this data is linked/linkable or even findable!

A good start, but not much better either!





Knowledge Graphs and Open Data

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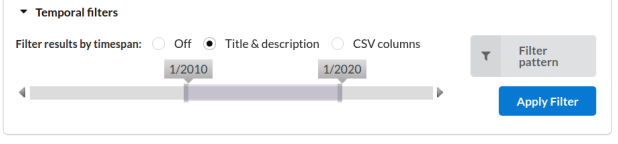
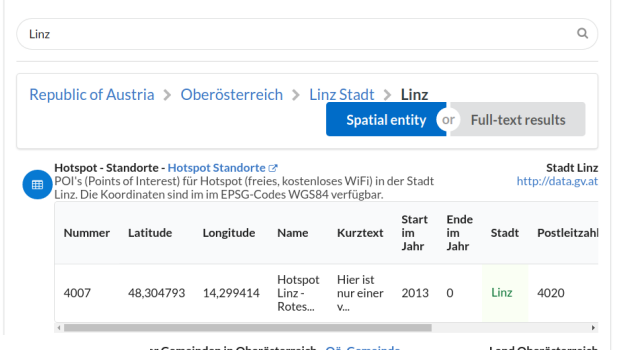
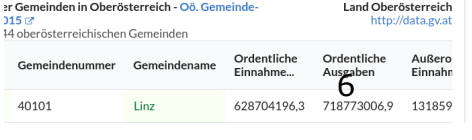






- *(Open) Knowledge Graphs can be used to **link Open Data**!*
  - *challenges: Coverage, numeric data, OD Quality/KG Quality*

Keynote "How do Linked Data, Open Data, and Knowledge Graphs interplay?" at DEXA 2019, August 2019, Linz, Austria.
polleres.net/presentations/20190827DEXA_keynote.pdf

What are your vision or thoughts about KG applications in academia and industry

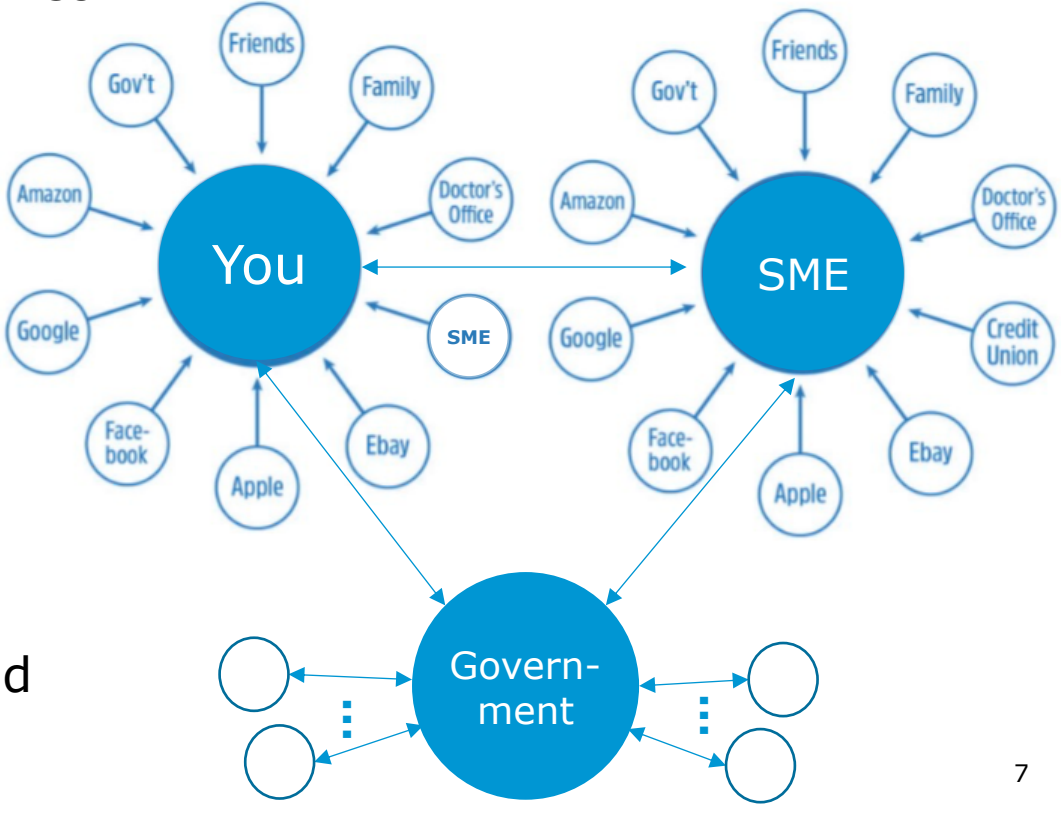
We need to build on our strength!

- Rather than (more) centralised KGs ….
  - Make a **Decentralised** Data Eco-Systems work!

→ enable trusted data sharing
→ enable FAIR principles

Applications galore!

e.g.: bring together personal data spaces and industrial data spaces!



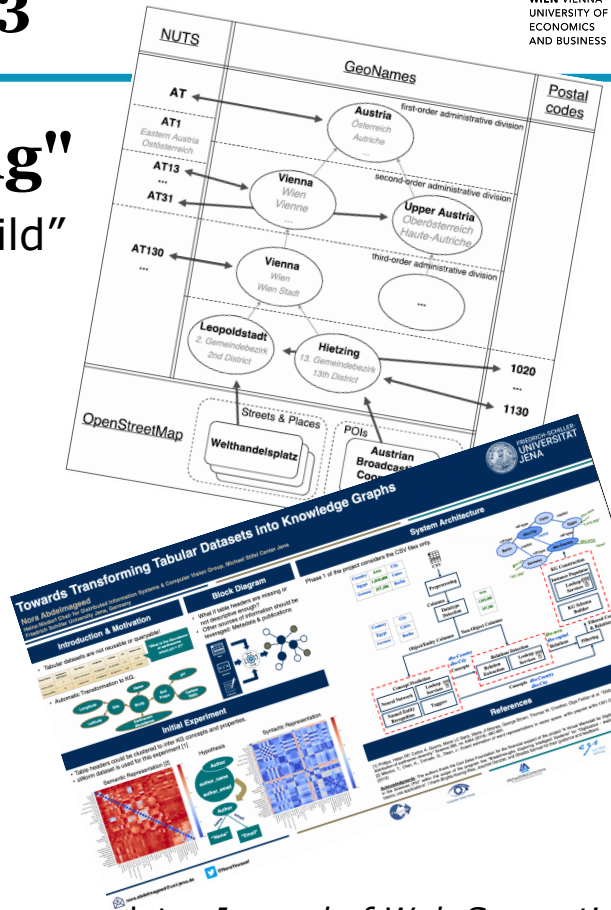
What are the future directions for KG 1/3

Towards "Natural Data Understanding"

”Natural Data” = “Structured Data as it occurs in the wild”

- Heterogenous data assets
- From different sources and origins
- Different Formats
- Different Semantics
- Sparse descriptive metadata
- Raw/not necessarily for human consumption

→ (**Still**) Hard to search and integrate!

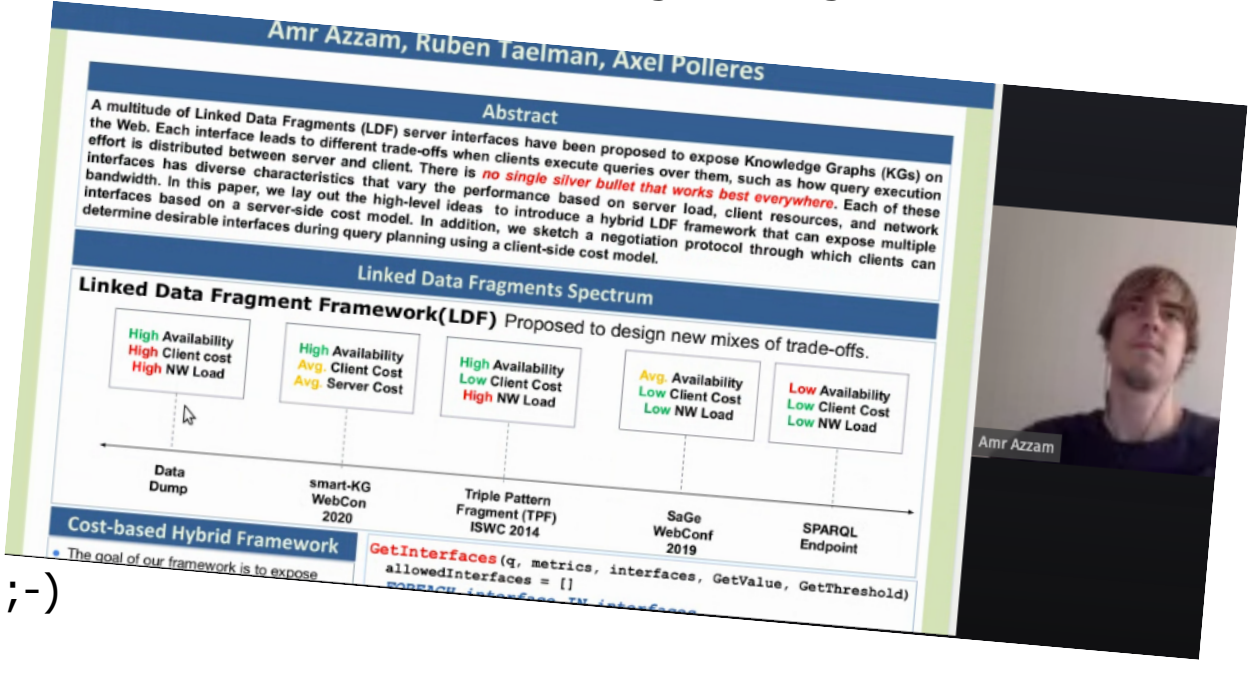


[3] Sebastian Neumaier and Axel Polleres. Enabling spatio-temporal search in open data. *Journal of Web Semantics (JWS)*, 55, March 2019.

[4] Sebastian Neumaier, Jürgen Umbrich, Josiane Parreira, and Axel Polleres. Multi-level semantic labelling of numerical values. (ISWC2016)

What are the future directions for KG 2/3

- Scalable Linked Data Processing… now for real!
  - (SPARQL EP, TPF, SMART-KG --> there's something moving here!



- Contextualisation … still ;-)
  - next step: Represent and query at scale contextualised KGs
    - Provenance, Policy-constrained Graphs/Triples, Property Graphs, SPARQL*

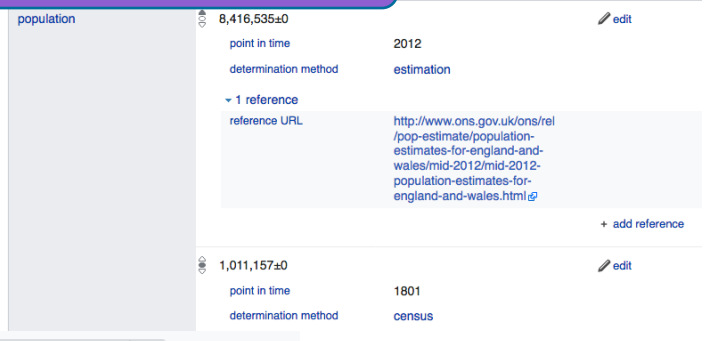
What are the future directions for KG 3/3

- *Managing context makes things even harder! → but is also doable!*

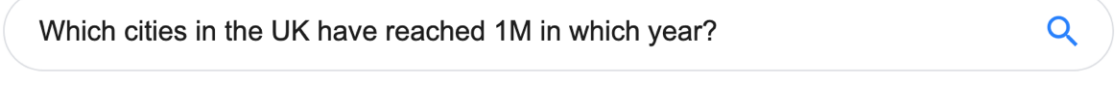
- However, Wikidata has more complex info: (**temporal** context, **provenance**,…)

  Which cities in the UK have reached 1M in which year?

  … Can I query that with SPARQL? Yes!



BTW, seemingly not yet doable in Google



Take-home summary

if I could predict the future, I wouldn't be here…

... rather an invitation (especially to young researchers):

p.s.: Don't ***only*** work on DL, I know you do anyway, there's plenty of other stuff to do ;-)

There's still a lot of unfinished business and unfuilfilled promises from Semantic Web, Linked Data, etc. that (despite "rebranding" into KGs)

- haven't been solved
- should and could be solved/tackled with more research!

Let's do this together!

https://www.cost.eu/cost-action/distributed-knowledge-graphs/ COST Action
https://knowgraphs.eu/ ITN