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why not change the world?

Knowledge Graph Semantics

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Tetherless World Chair of Computer, Web and Cognitive Sciences
Director, Rensselaer Institute for Data Exploration and Analytics
@jahendler

IDEA

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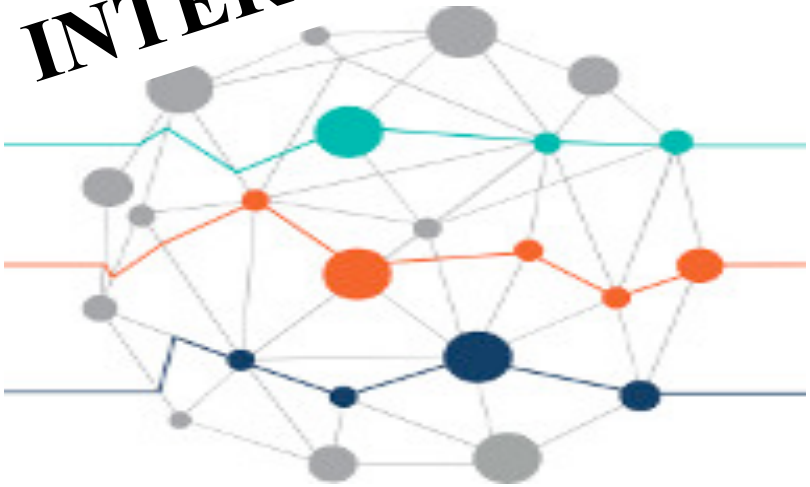
Knowledge Graph ~~Services~~ INTEROPERABILITY



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IDEA

Ancient History I (ca 2000)

- The Web is growing
  - Siloed search engines
  - Social web just taking off
    - Flickr will be the future!
  - Challenge: hyperlinks are not enough

Ancient History I (ca 2000)

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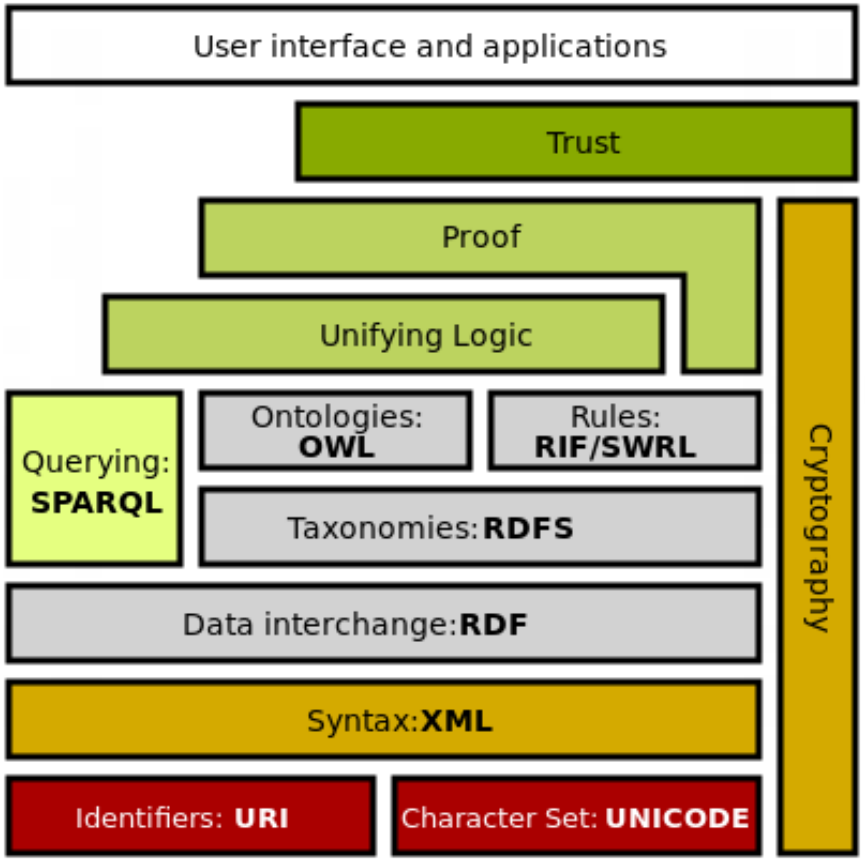
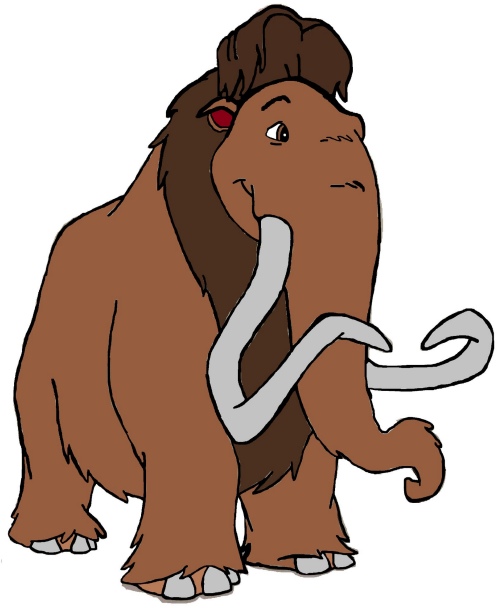
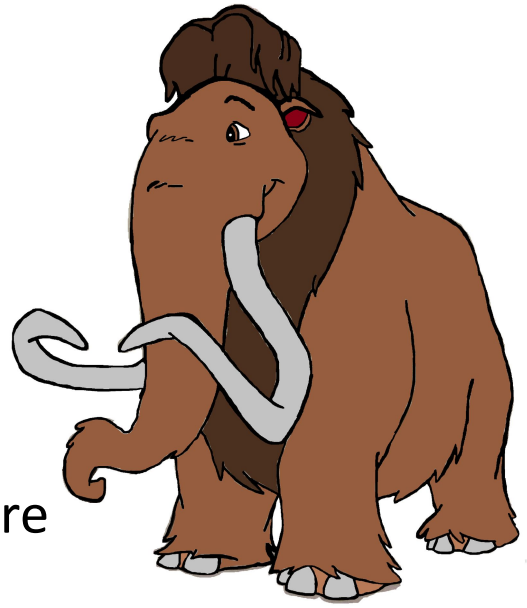


Ancient History II (ca 2010)



- Database access from the Web is Growing
  - Powerful KDD tools evolving
    - More powerful tools can consume more data
    - More powerful tools need more data
  - Open Data Movement gets started



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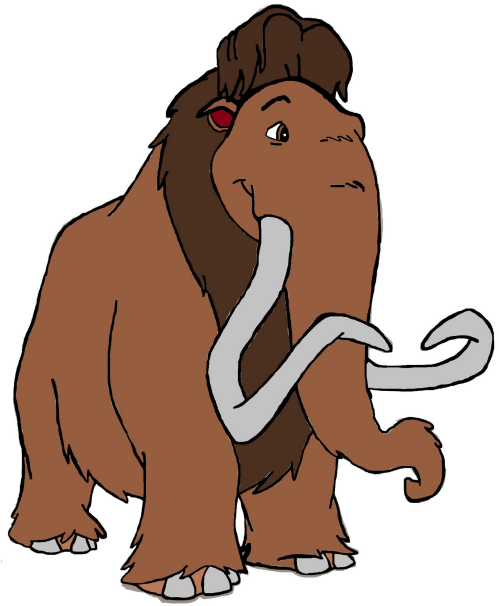
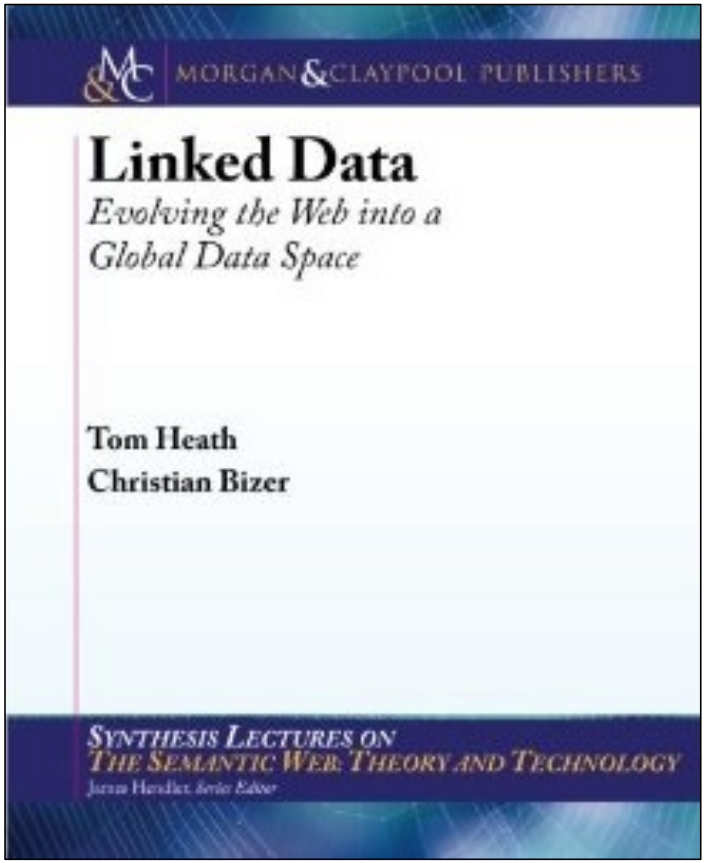
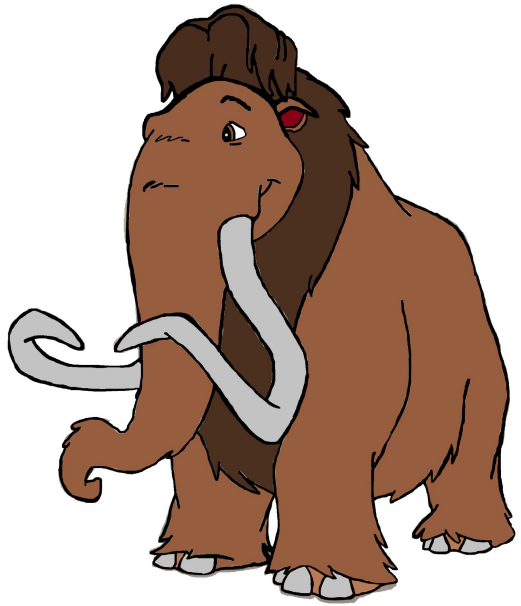
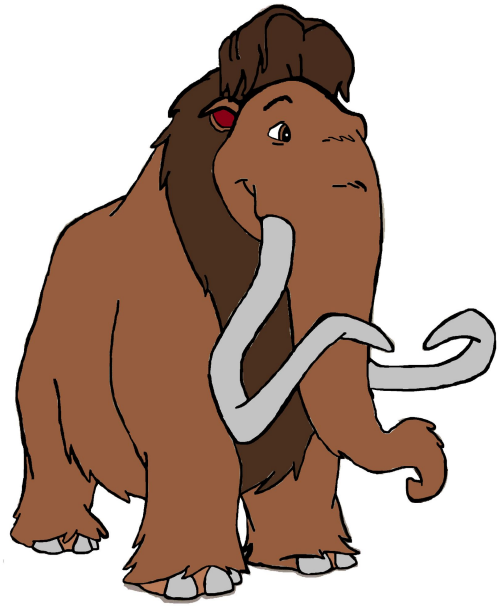
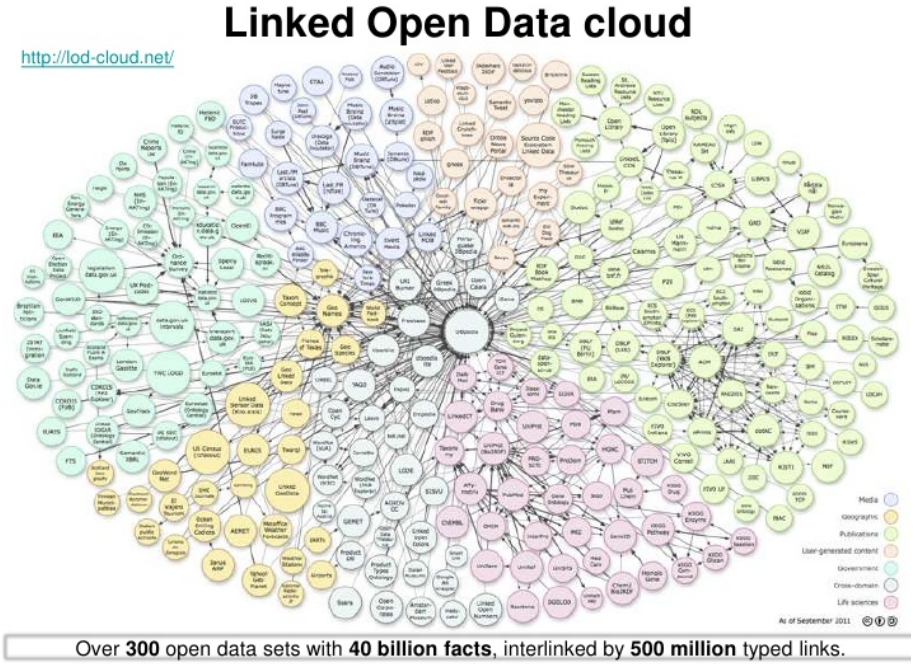




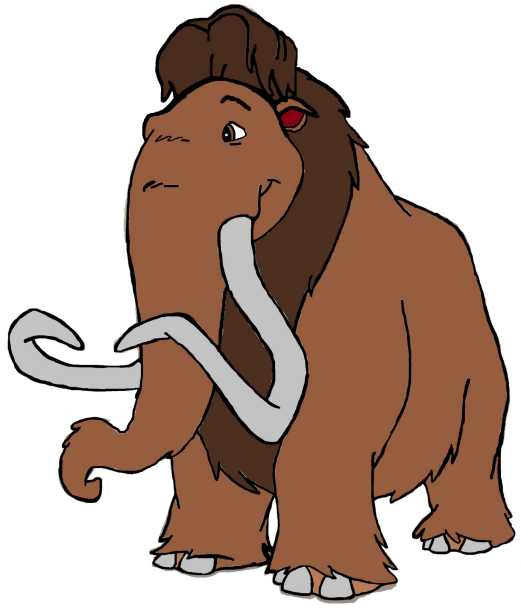


Ancient History II (ca 2010)



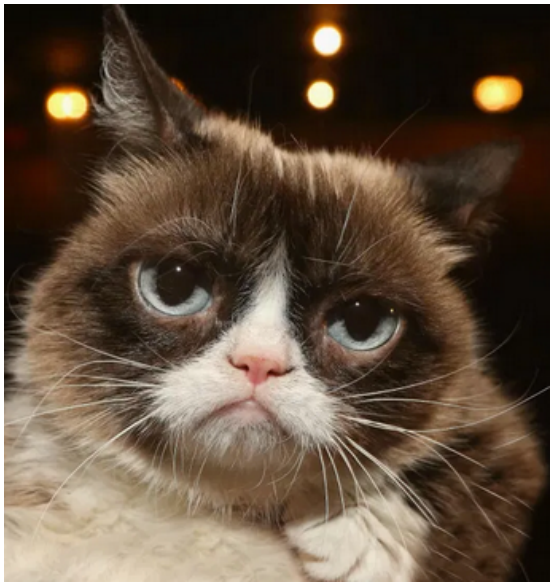


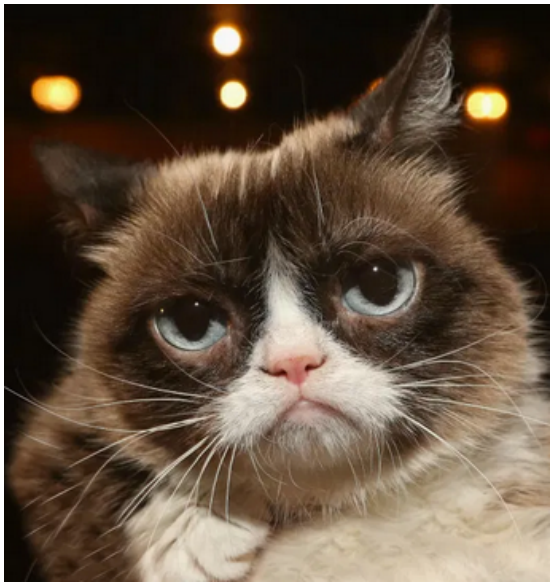
Over **300** open data sets with **40 billion facts**, interlinked by **500 million** typed links.



Moving Forward

- Unstructured data use is increasing
  - Powerful KG tools evolving (esp as GNNs improve)
    - More powerful tools can consume larger KGs
    - KGs are growing within, but not between siloes
  - ”open” KGs mainly powered by wikidata or other single systems

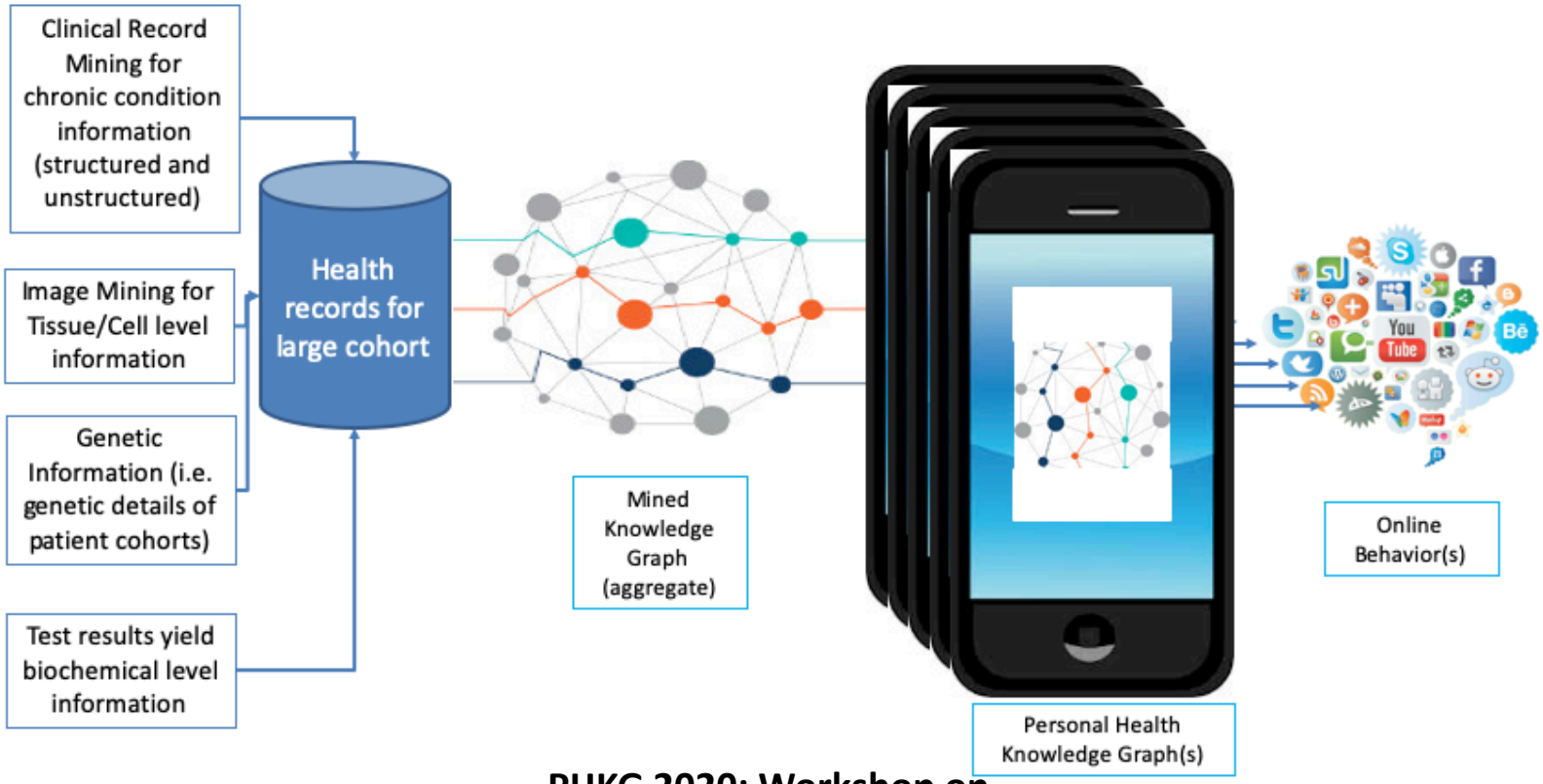




Repeating History (the good stuff)

- Open, or interoperable knowledge graphs, could power new and innovative applications
  - General KGs interoperable with specialized KGs
    - For example, Health Knowledge Graphs
  - Specialized KGs merged with Business of Personal KGS
    - For example, Personal Health Knowledge Graphs

(Personal Health Knowledge Graphs)



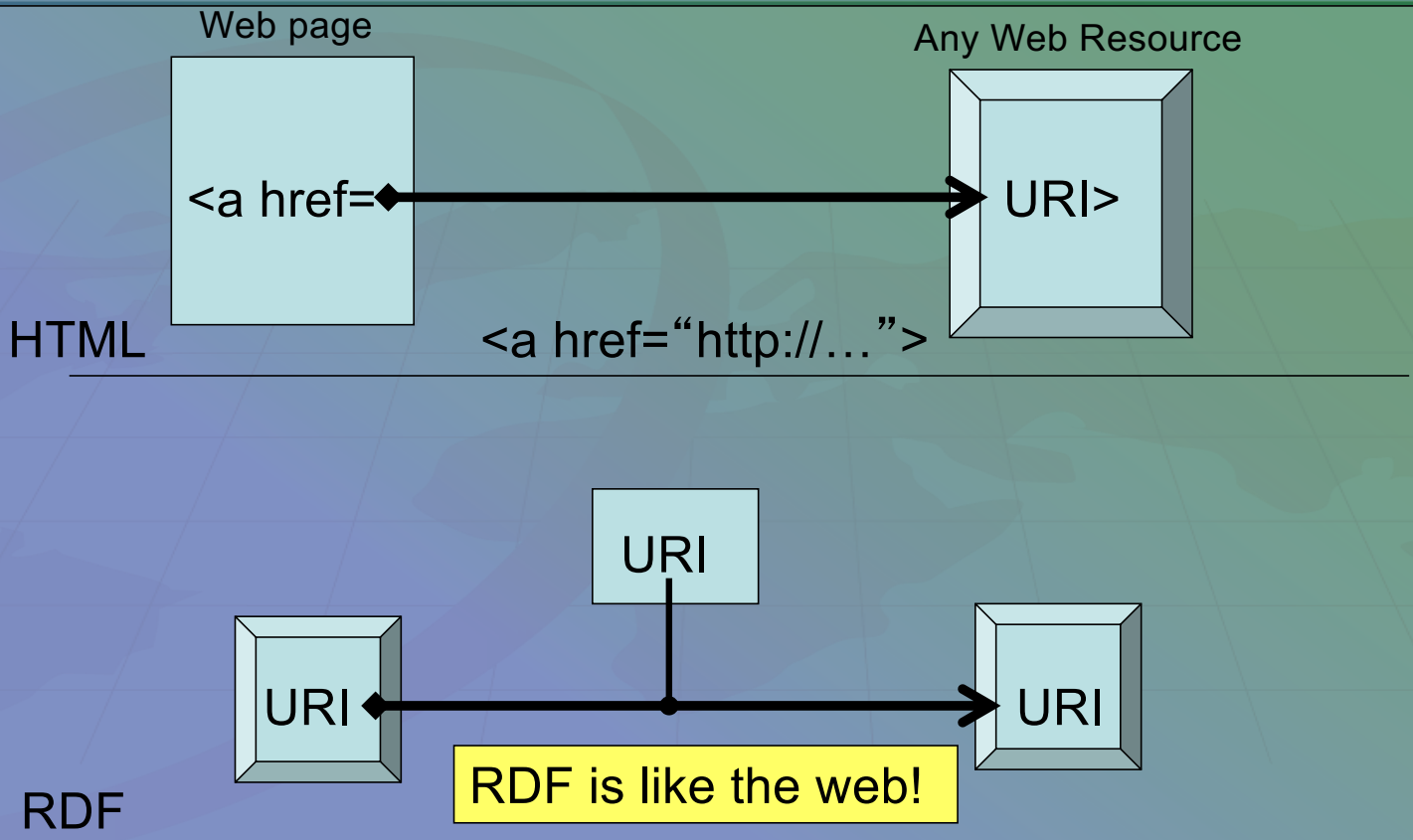
PHKG 2020: Workshop on
The Personal Health Knowledge Graph

https://suitclub.ischool.utexas.edu/PHKG2020/index.html

What do we need?

- Start from what already works (Don't reinvent):
  - Reuse some of the best parts of RDFS/OWL (or their equivalents)
    - URI-based name scheme (RDF or JSON-LD)
    - Heavily used vocabularies
      - Schema.org, Wikidata, DBpedia, YAGO, OGP, …
    - Equality statements (owl:sameAs, skos:exactMatch)

On the Web -- links are critical!



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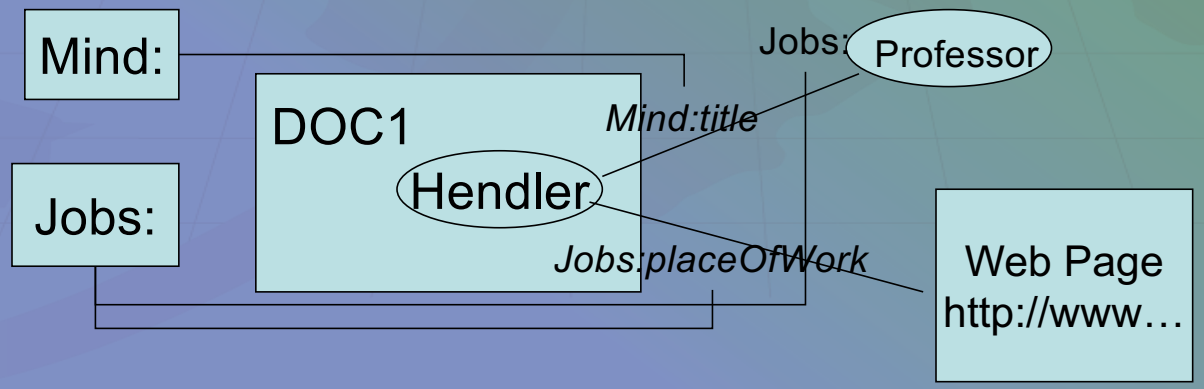

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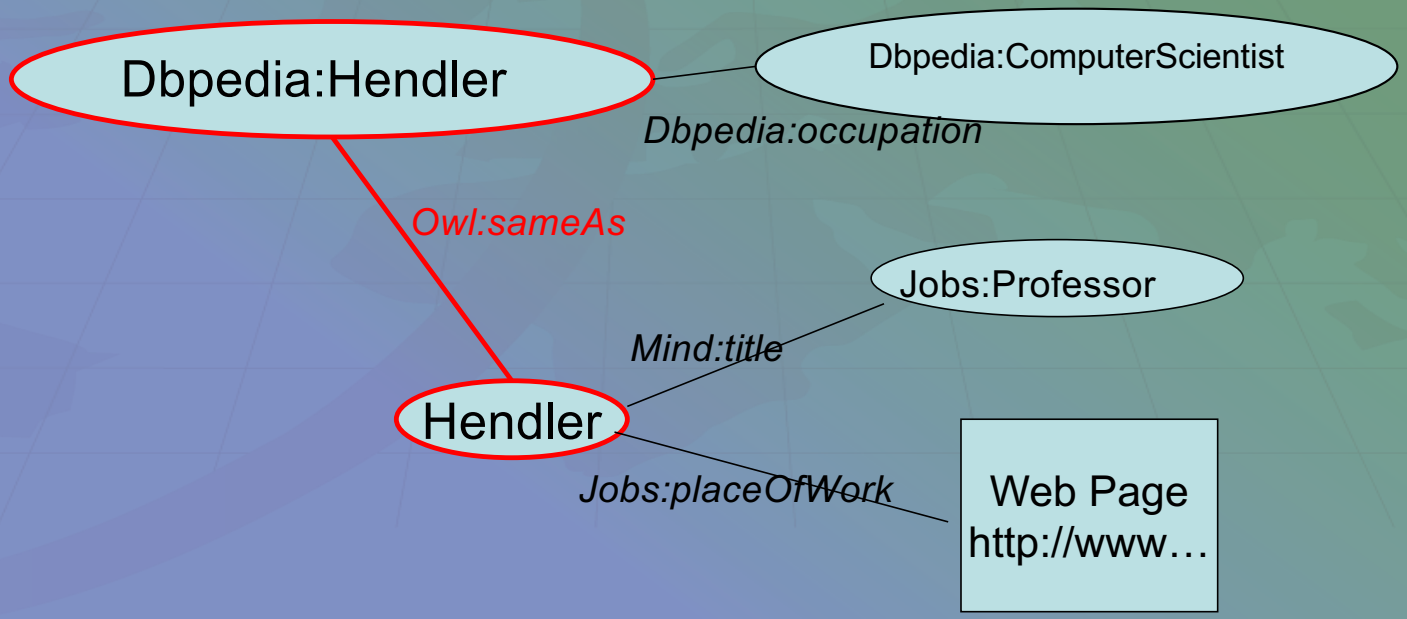
owl:sameAs
<http://dbpedia.org/page/James_Hendler>



Linking Web Resources

Tetherless World Constellation

indice "James Hendler"

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Show 86 more

90. http://www4.wiwiss.fu-berlin.de/factbook/resource/Macau

rdf+xml · n3 · json · text

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Show 123 more

127. http://www.w3.org/2006/03/wn/wn20/instances/synset-football_player-noun-1

rdf+xml · n3 · json · text

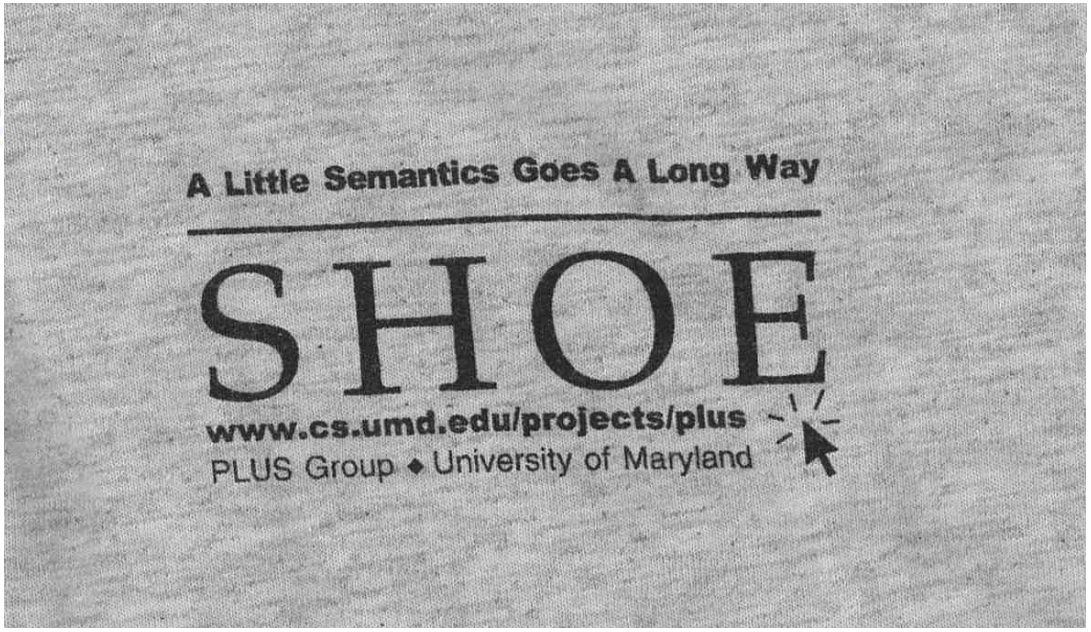
- DERI
- Fondazione Bruno Kessler
- OpenLink Software

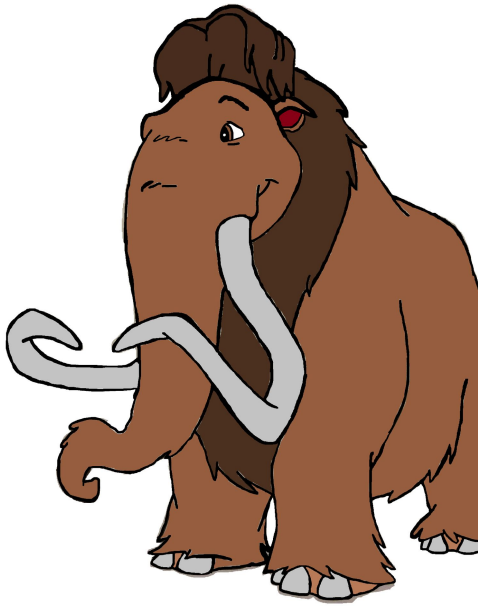
Sindice.com

What do we need?

- Add some critical missing pieces
  - Procedural Attachment
    - Standardizing access from KG to data resources
      - Particularly KG to DB
  - Things needed in data interoperability
      - Part-Whole, Temporal model, Uncertainty, …
      - More on this in https://www.slideshare.net/jahendler/wither-owl
        - » Pun on wither vs. whither is intentional
  - Privacy/Security controls
    - Access controls in particular
  - Links to heavily used Business & esp Business Intelligence tools
    - Monetize opening and sharing KG resources

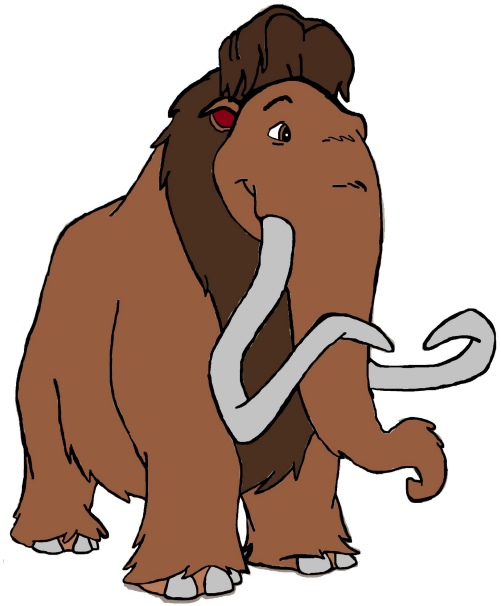
Back to the Future

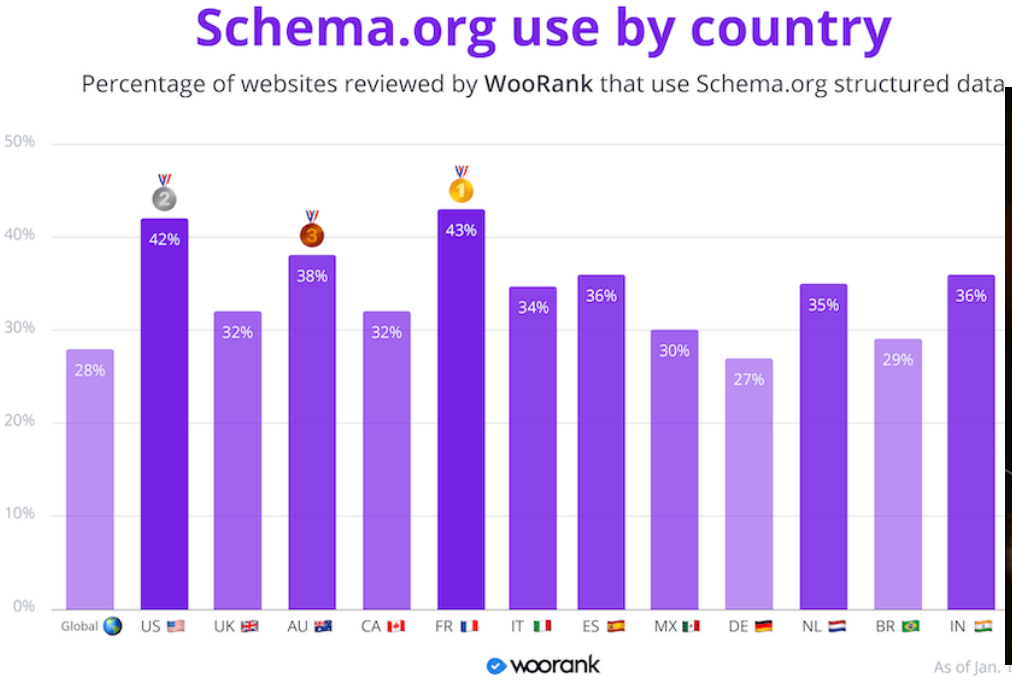


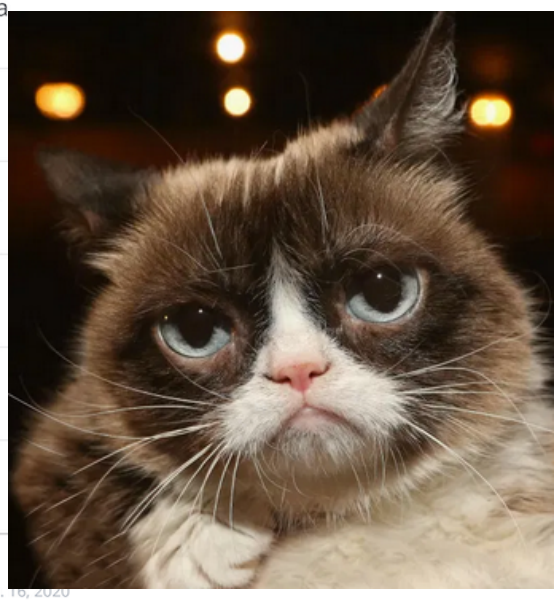


A little semantics goes a long way!

A little semantics went a long way!!!

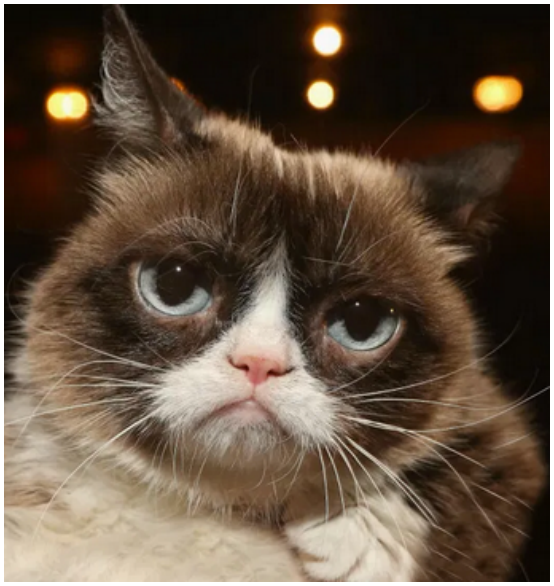






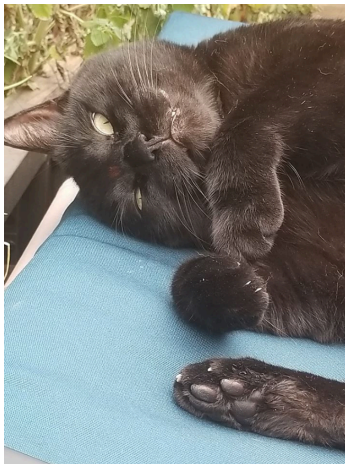
Schema.org, descendant of Semantic Web and Linked Data is now on billions of web pages!

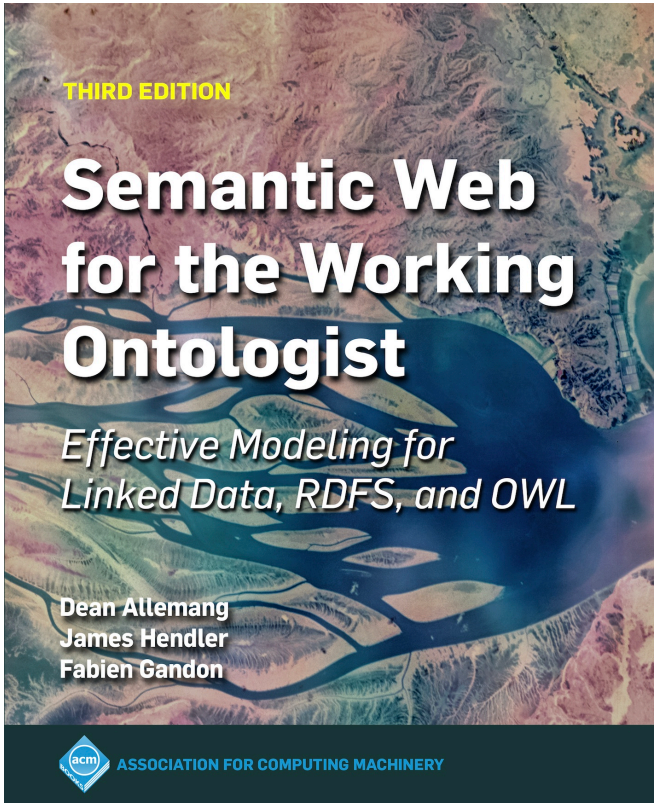
Knowledge Graph Interoperability



- Let's OPEN the world of Knowledge graphs
  - Stress interoperability
  - Learn from the past
    - Avoid over standardization to particular use models
    - Reuse existing successful standards
    - Start from successful business models

Questions?





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3rd Edition includes: Linked-Data Platform, Knowledge graphs, SHACL, schema.org, …

timbr.ai The SQL Knowledge Graph Company™

KG/DB integration