Wissensgraphen
Daten - Informationen - Wissen

Prof. Dr. Harald Sack
#zukunftDerKunstgeschichte
LMU München, 17. Mai 2021
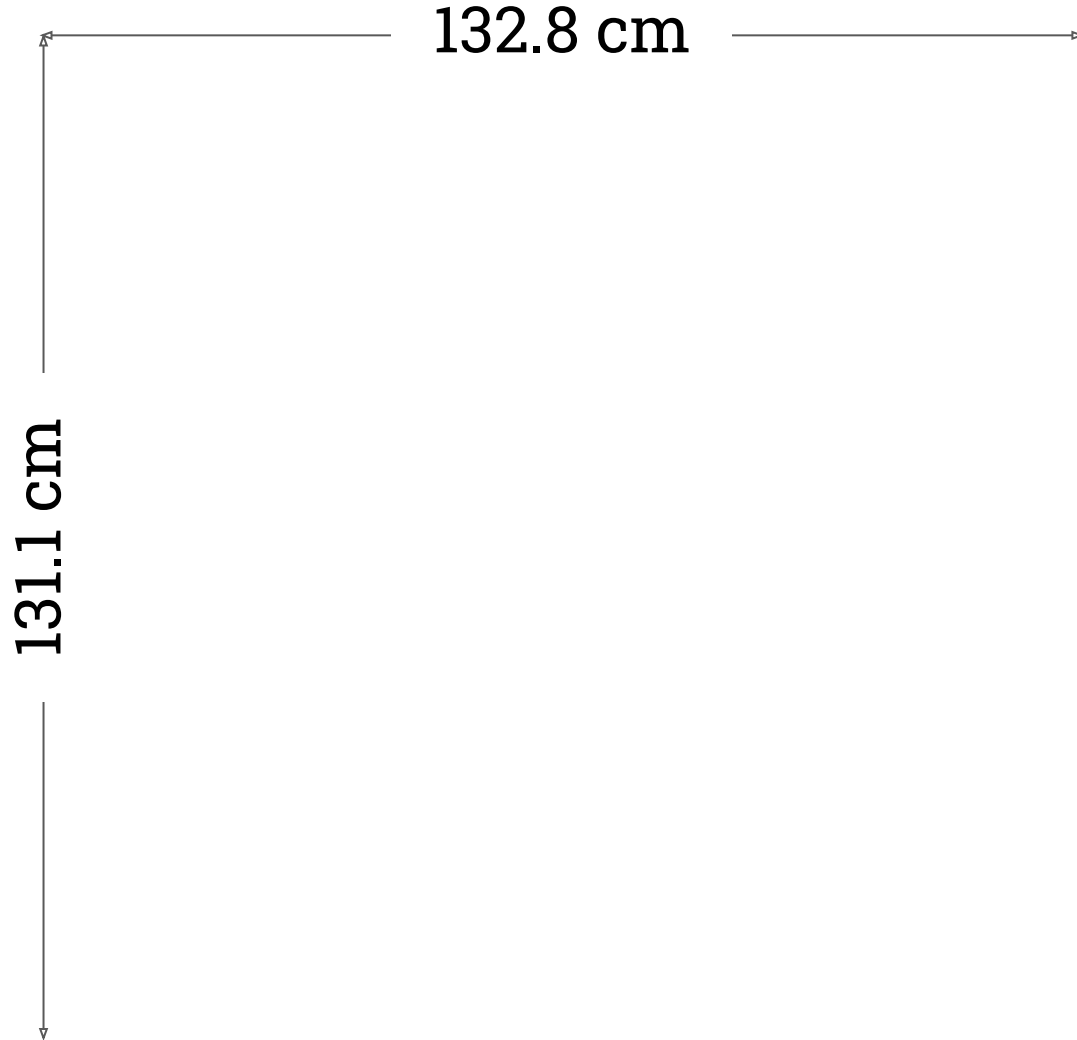
132.8

132.8

131.1

132.8 cm

131.1 cm

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132.8 cm

131.1 cm

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132.8 cm

131.1 cm

"Sechs toskanische Dichter"
1544
Mineapolis Institute of Art

Giorgio Vasari
(1511 - 1574)

[1]

Data

Information

Knowledge

„People can't share knowledge if they don't speak a common language"
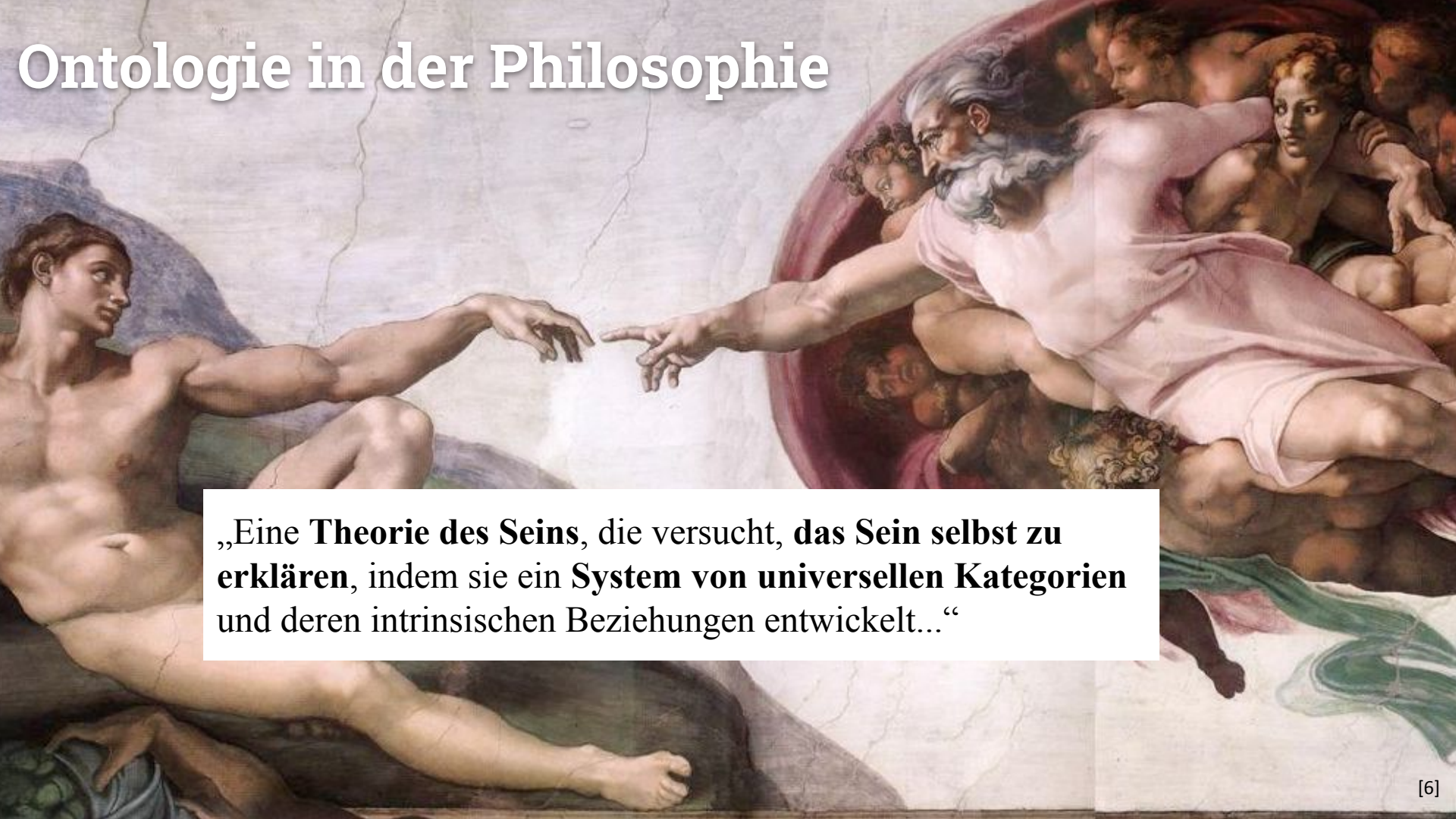
Thomas Davenport (1997)

...eine gemeinsame Sprache sprechen:

- Gemeinsame Symbole und Konzepte **(Syntax)**
- Übereinkunft über deren Bedeutung **(Semantik)**
- Klassifikation von Konzepten **(Taxonomien)**
- Assoziationen und Relationen zwischen Konzepten **(Thesauri)**
- Regeln darüber, welche Relationen erlaubt sind und Sinn machen **(Ontologien)**

Was genau waren noch einmal Ontologien?

Ontologie in der Philosophie

„Eine **Theorie des Seins**, die versucht, **das Sein selbst zu erklären**, indem sie ein **System von universellen Kategorien** und deren intrinsischen Beziehungen entwickelt...“

[6]

Ontologien in der Informatik

Eine Ontologie ist eine
explizite, formale Spezifikation einer gemeinsamen Konzeptualisierung

nach Thomas R. Gruber: A Translation Approach to Portable Ontology Specifications. Knowledge Acquisition, 5(2):199-220, 1993.

[7]

Ontologien in der Informatik

Eine Ontologie ist eine
explizite, formale Spezifikation einer gemeinsamen Konzeptualisierung

Konzeptualisierung:	Abstraktes Modell (Fachgebiet, relevante Konzepte, Beziehungen)
explizit:	Alle Konzepte müssen definiert sein
formal:	maschinenverstehbar
gemeinsam:	notwendiger Konsens über die Ontologie

[7]

[1]
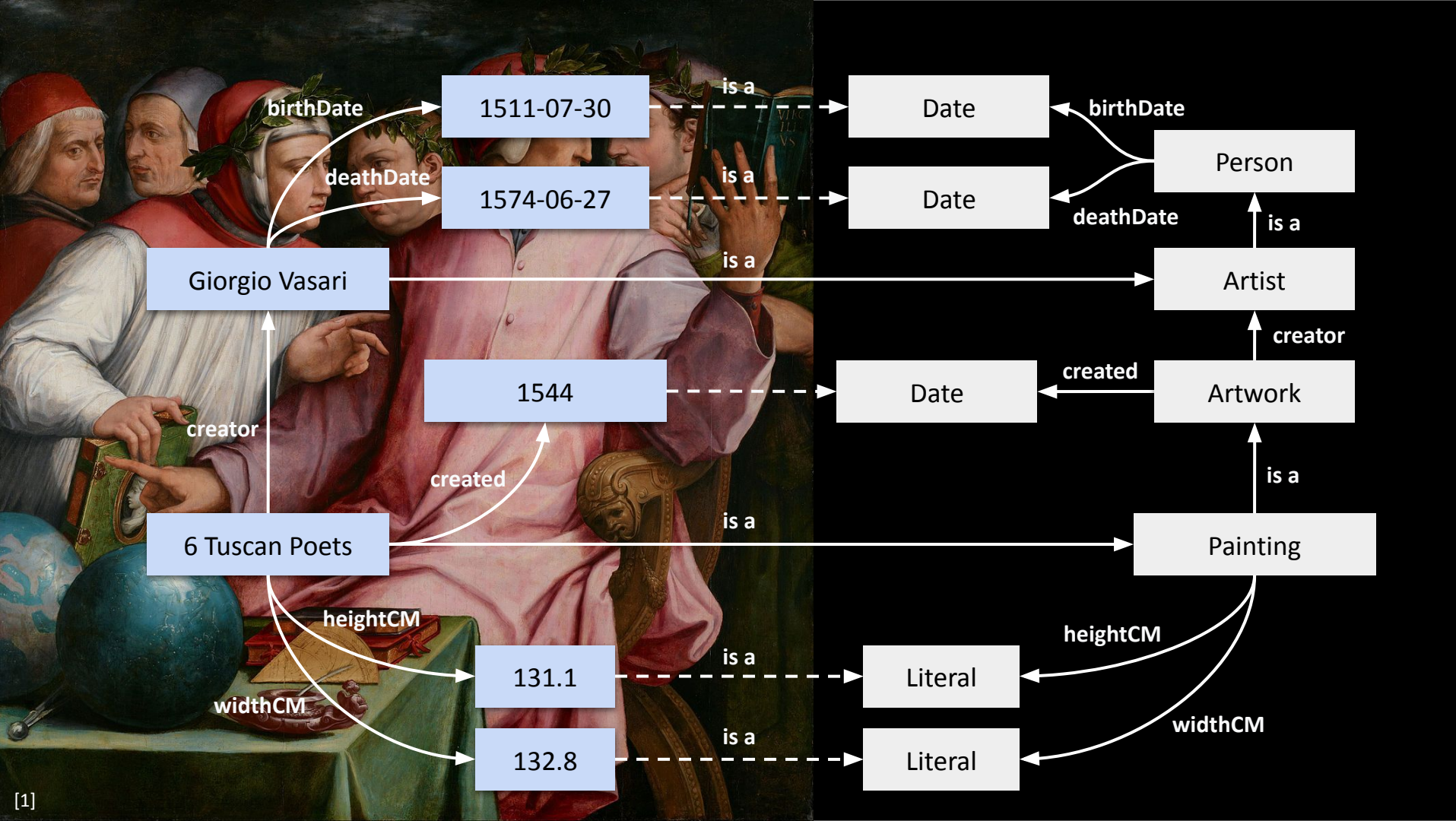
Assertionales Wissen

[1]
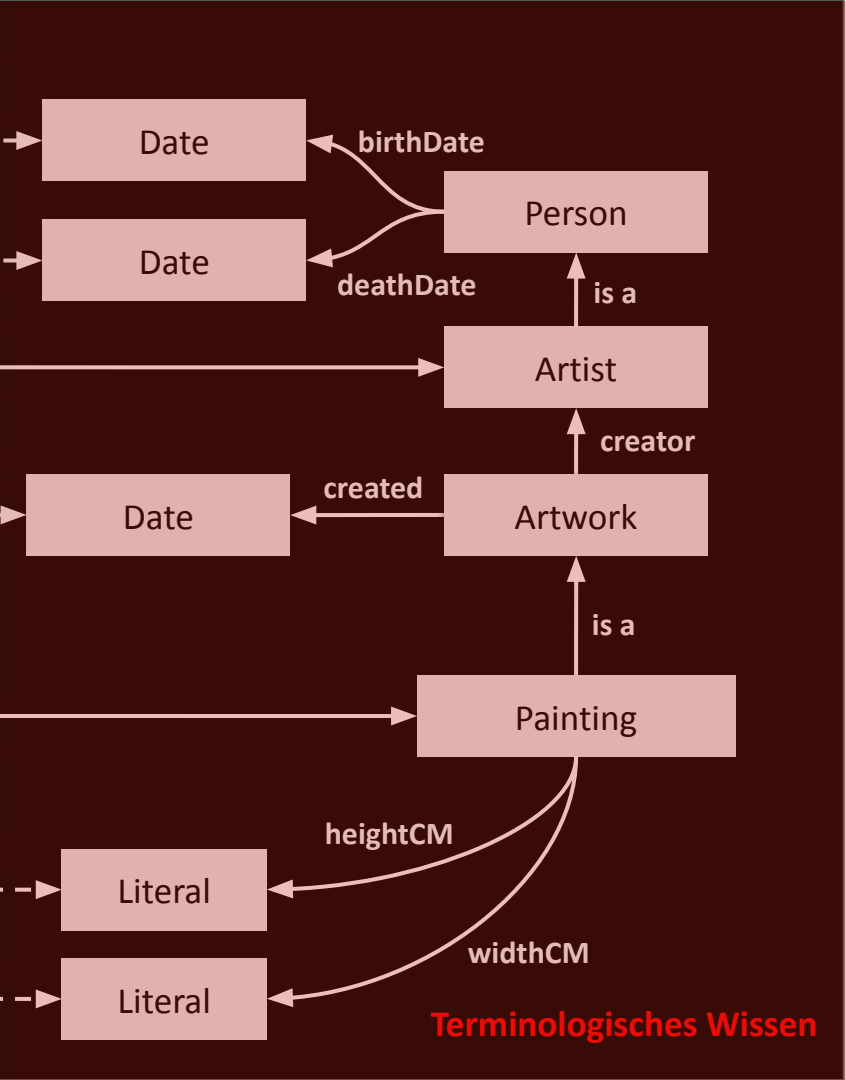
Terminologisches Wissen

Diagram content:

- Giorgio Vasari
  - birthDate → 1511-07-30
  - deathDate → 1574-06-27
  - is a → Artist

- 6 Tuscan Poets
  - creator → Giorgio Vasari
  - created → 1544
  - is a → Painting
  - heightCM → 131.1
  - widthCM → 132.8

- 1511-07-30 → is a → Date
- 1574-06-27 → is a → Date
- 1544 → is a → Date
- 131.1 → is a → Literal
- 132.8 → is a → Literal

Terminology side:
- Person
  - birthDate → Date
  - deathDate → Date
- Artist → is a → Person
- Artwork
  - created → Date
  - creator → Artist
- Painting → is a → Artwork
  - heightCM → Literal
  - widthCM → Literal

T-Box

```
Artist    ⊑ Person
Artwort   ⊑ ∃creator.Artist
Painting  ⊑ Artwork

∃heightCM.⊤ ⊑ Painting          ∃widthCM.⊤ ⊑ Painting
⊤ ⊑ ∀heightCM.Literal           ⊤ ⊑ ∀widthCM.Literal


∃created.⊤ ⊑ Painting           ∃creator.⊤ ⊑ Painting
⊤ ⊑ ∀created.Date               ⊤ ⊑ ∀creator.Person


∃birthdate.⊤ ⊑ Person           ∃deathdate.⊤ ⊑ Person
⊤ ⊑ ∀cbirthdate.Date            ⊤ ⊑ ∀deathdate.Date
```

```
6TuscanPoets  ⊑ Painting
GiorgioVasari ⊑ Artist

creator(6TuscanPoets,GiorgioVasari)
created(6TuscanPoets,"1544"^^xsd:date)
heightCM(6TuscanPoets,"131.1"^^xsd:float)
widthCM(6TuscanPoets,"132.8"^^xsd:float)

birthdate(GiorgioVasari,"1511-07-30"^^xsd:date)
deathdate(GiorgioVasari,"1574-06-27"^^xsd:date)
```

Knowledge Base

A-Box

[1]

Knowledge Graphs and the Web of Data

Legend:
- Cross Domain
- Geography
- Government
- Life Sciences
- Linguistics
- Media
- Publications
- Social Networking
- User Generated

[7]
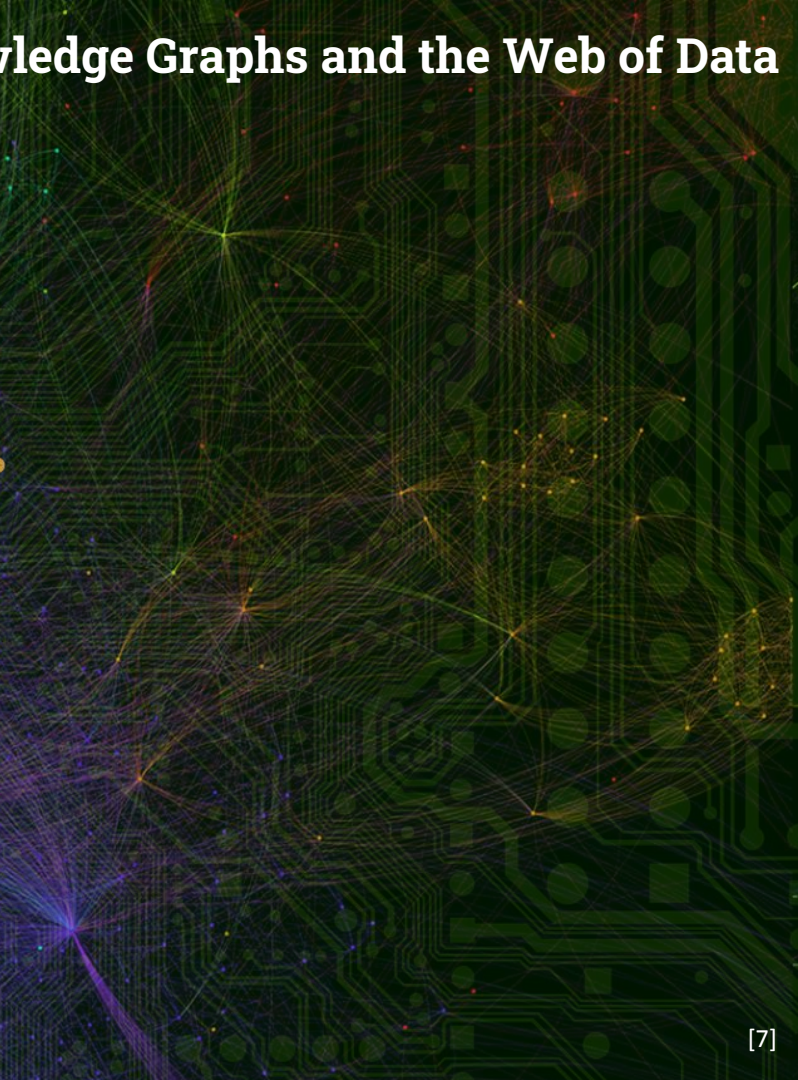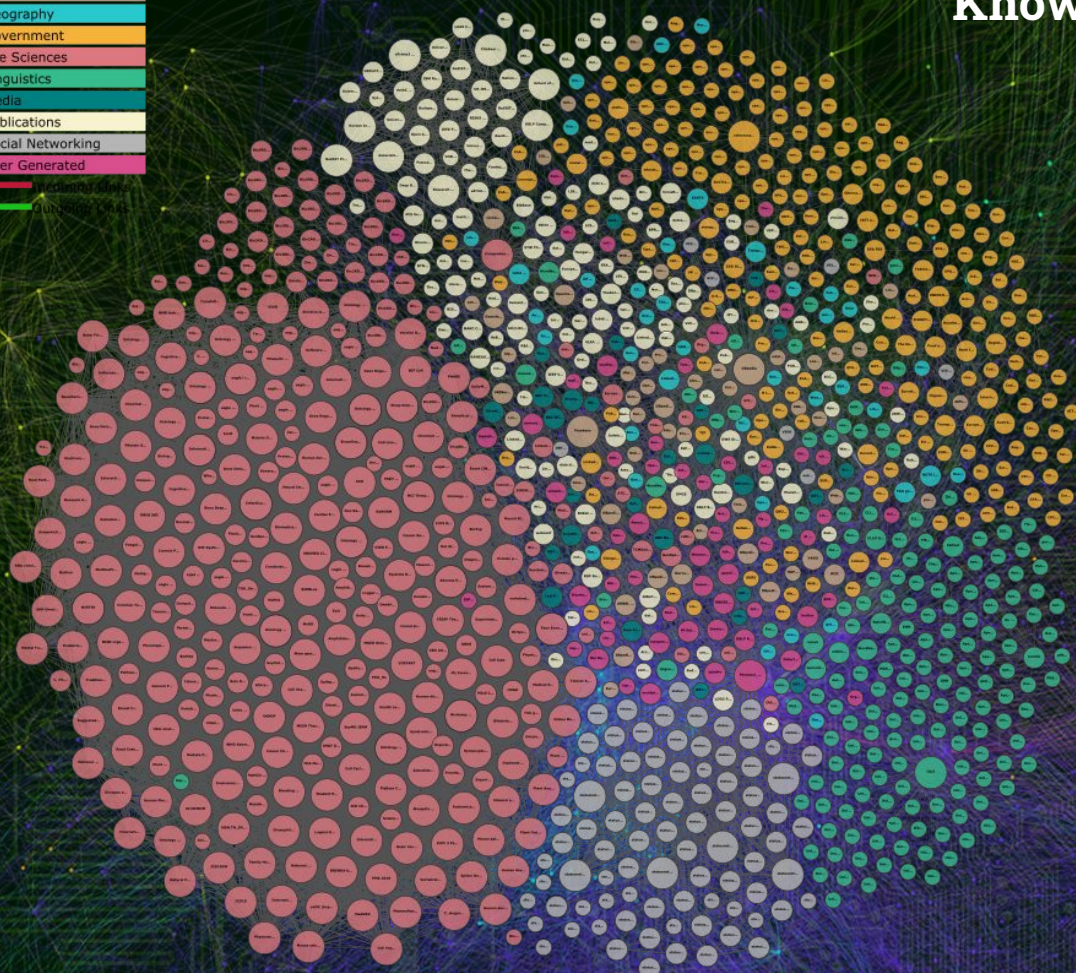
Knowledge Graph Applications

T. Tietz, J. Jäger, J. Waitelonis, H. Sack, Semantic Annotation and Information Visualization for Blogposts with refer, (VOILA 2016)

Data Integration

Visualizations

Semantic & Exploratory Search

Question Answering

Recommender Systems
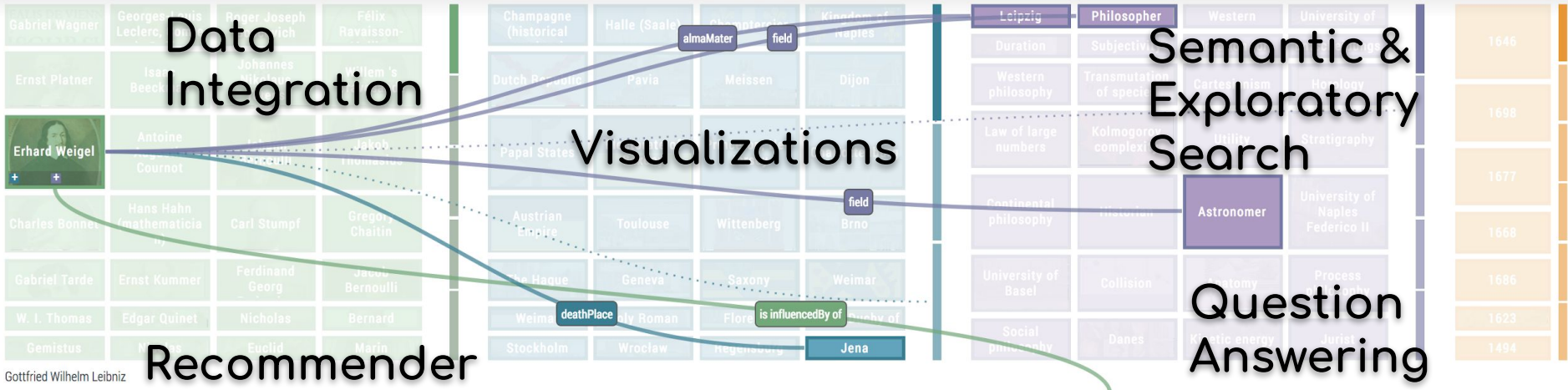
15 Recommended Articles

#1 The Case of J. Robert Oppenheimer

#2 Wilhelm Pfeffer and Plant Physiology

#3 Karl Pearson and Mathematical Statistics

#4 Raphael and the School of Athens

#5 Jerzy Neyman – Architect of Modern Theoretical Statistics

#6 Christian Gottfried Ehrenberg – Father of Micropaleontology

Gottfried Wilhelm Leibniz

Gottfried Wilhelm von Leibniz (German: [ˈɡɔtfʁiːt ˈvɪlhɛlm fɔn ˈlaɪbnɪts] or [ˈlaɪpnɪts]) (July 1, 1646 – November 14, 1716) was a German mathematician and philosopher. He occupies a prominent place in the history of mathematics and the history of philosophy.Leibniz developed the infinitesimal calculus independently of Isaac Newton, and Leibniz's mathematical notation has been widely used ever since it was published. It was only in the 20th century that his Law of Continuity and Transcendental Law of Homogeneity found mathematical implementation (by means of non-standard analysis). He became one of the most prolific inventors in the field of mechanical calculators. While working on adding automatic multiplication and division to Pascal's calculator, he was the first to describe a pinwheel calculator in 1685 and invented the Leibniz wheel, used

DBpedia: Gottfried Wilhelm Leibniz

http://scihi.org

Retrieval vs. Exploration

Giorgio Vasari – Lebensbeschreibungen der ausgezeichnetsten Maler, Bildhauer und Architekten der Renaissance : nach Dokumenten und mündlichen Berichten. dargest. von Giorgio Vasari.
Hrsg. von Ernst Jaffé. [Einband nach Entw. von Walter Tiemann], 40. – 50. Tsd., [Jubiläumsausg.], 446 S. : Mit 31 Vollbildern in Tonätzg ; kl. 8
Verlag Julius Bard, Berlin, 1931

Leipzig: 1933 A 7057

GIORGIO VASARI
KÜNSTLER DER RENAISSANCE

Retrieval vs. Exploration
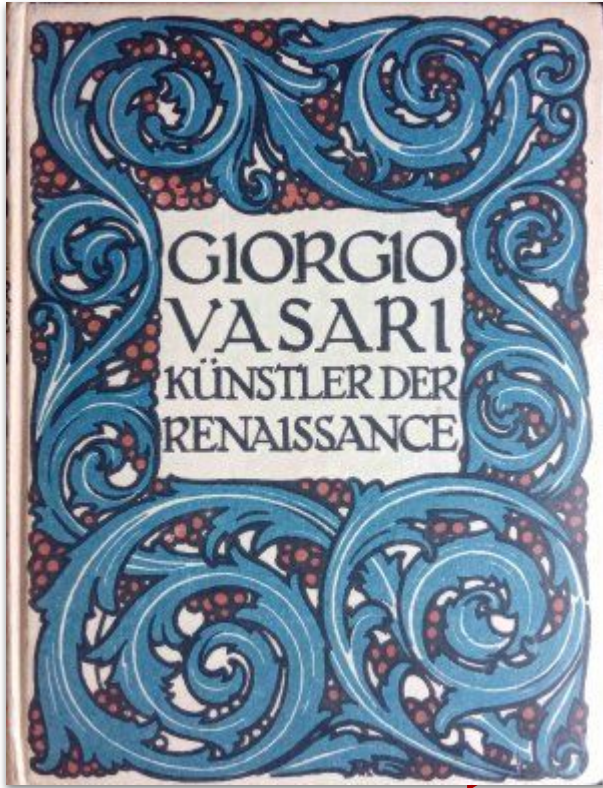
- *Finde etwas "**Interessantes**" für mich*
- *Gibt es **thematisch ähnliche** Bücher?*
- *Welche Bücher **hängen** inhaltlich mit Vasaris Künstlerbiografien **zusammen**?*
- *Wie hat sich das **Genre** Künstlerbiografien über die Zeit **entwickelt**?*
- *Was soll ich als nächstes lesen?*
- *...*
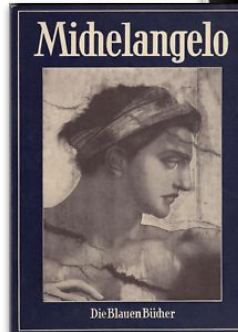
J. Waitelonis, H. Sack: Towards exploratory video search using linked data, Multimedia Tools and Applications, Vol 59, No 2 (2012)

Carl Spitzweg, Der Bücherwurm, 1850 [10]

Knowledge Graph basierte Explorative Suche

http://d-nb.info/576752681

fabio:isManifestationOf

http://d-nb.info/gnd/4383495-4

skos:closeMatch

wd:Q1645493

wdt:P50 (author)

Giorgio Vasari (Q128027)

Dante Alighieri (Q1067)

foaf:depicts

wdt:P800 (notable work)

The Divine Comedy (Q40185)

db-com:Giorgio_Vasari_-_Six_Tuscan_Poets

foaf:creator

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Knowledge Graph basierte Explorative Suche

DNB http://d-nb.info/576752681

DNB http://d-nb.info/451371844

Egon Friedell (Q112255) — WIKIDATA

DNB http://d-nb.info/365863920

foaf:creator

fabio:isManifestationOf

foaf:creator

dct:subject

Modern history (Q3281534) — WIKIDATA

wdt:P527 (has part)

DNB http://d-nb.info/gnd/4383495-4

skos:closeMatch

Renaissance (Q4692) — WIKIDATA

wd:Q1645493 — WIKIDATA

wdt:P50 (author)

Giorgio Vasari (Q128027) — WIKIDATA

wdt:P135 (movement)

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Knowledge Graph basierte Explorative Suche

http://d-nb.info/576752681

fabio:isManifestationOf

http://d-nb.info/gnd/4383495-4

skos:closeMatch

wd:Q1645493

wdt:P50 (author)

scihi:giorgio_vasari

dct:subject

Giorgio Vasari (Q128027)

http://d-nb.info/365863920

dct:subject

Modern history (Q3281534)

wdt:P527 (has part)

Renaissance (Q4692)

wdt:P135 (movement)

Visualization & Exploration

Ontology & Knowledge Graph Applications

http://scihi.org/

Giorgio Vasari (1511-1574)

Requires **semantic annotation** and
tools for **visualization**
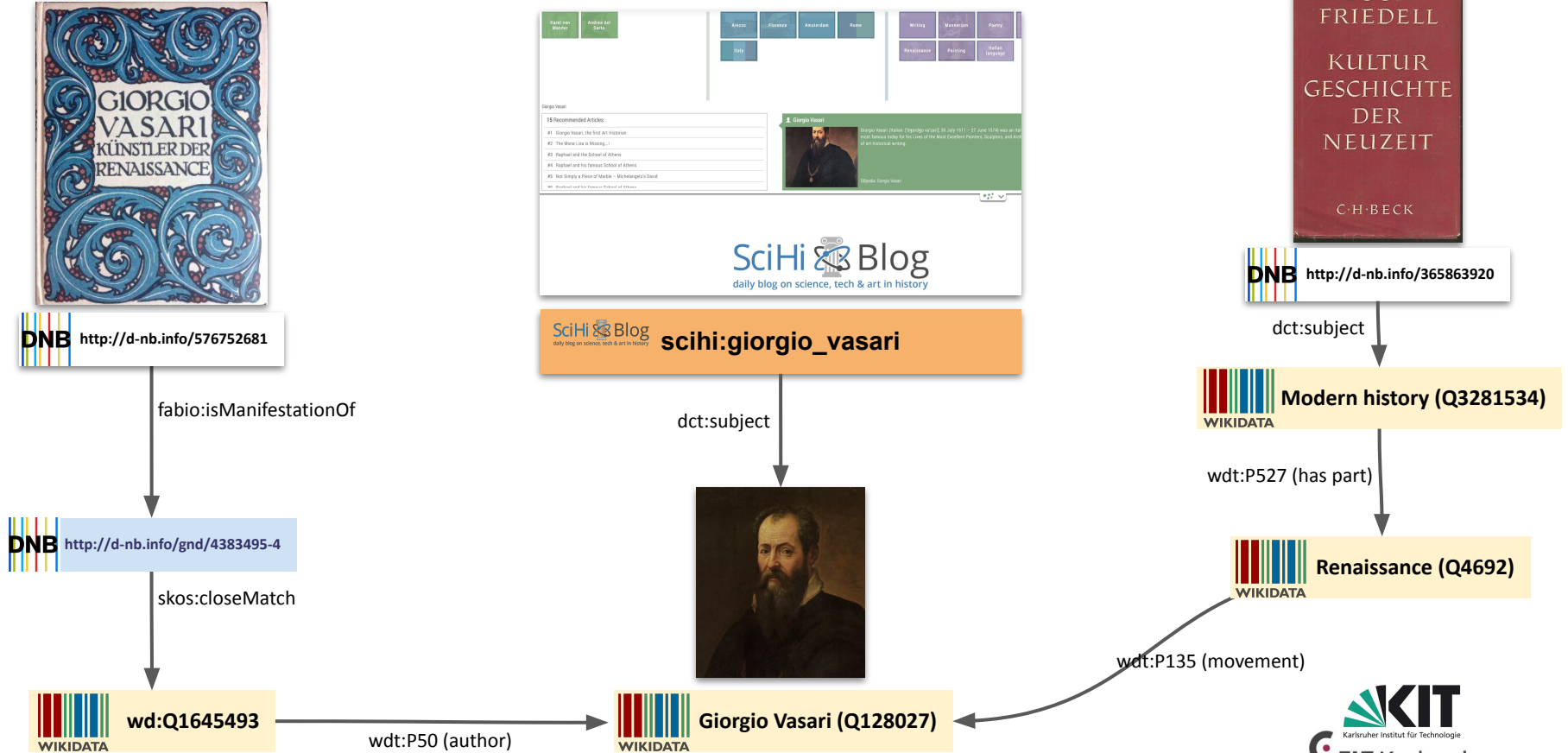
On July 30 , 1511 , Italian Renaissance painter , architect , writer and historian Giorgio Vasari was born. He is best known today for his *Lives of the Most Eminent Painters* considered the ideological foundation of art-historical writing .

One of the Lesser Known Renaissance Artists

From all the great Renaissance artist, Giorgio Vasari might be one of the less this might be that although an artist of considerable repute, there were so ma Renaissance artists that Vasari's art didn't stand out among them. But, on th Vasari's major merits that we know about so many Renaissance artists a authored and published the very first collection of biographies of famous artist

Born in Arezzo

Vasari was born in Arezzo , Tuscany. Recommended at an early age by his cousin Luca Signorelli , he became a pupil of Gugliemo da Marsiglia, a skillful painter of stained glass. Sent to Florence at the age

Giorgio Vasari
Giorgio Vasari (Italian: [ˈdʒordʒo vaˈzaːri]; 30 July 1511 – 27 June 1574) was an Italian painter, architect, writer and historian, most famous

birth year	1511
death year	1574
is influenced of	Andrea del Sarto
field	Architect
birth place	Arezzo
death place	Florence

Visualization & Exploration

Ontology & Knowledge Graph Applications

e.g. via refer.cx WordPress PlugIn at http://scihi.org/

4Culture Knowledge Graph

Ontology & Knowledge Graph Applications

https://nfdi4culture.de/

MaRDI

NFDI4MatWerk

NFDI4DataScience

NFDI4Objects

NFDI4Memory

Text+
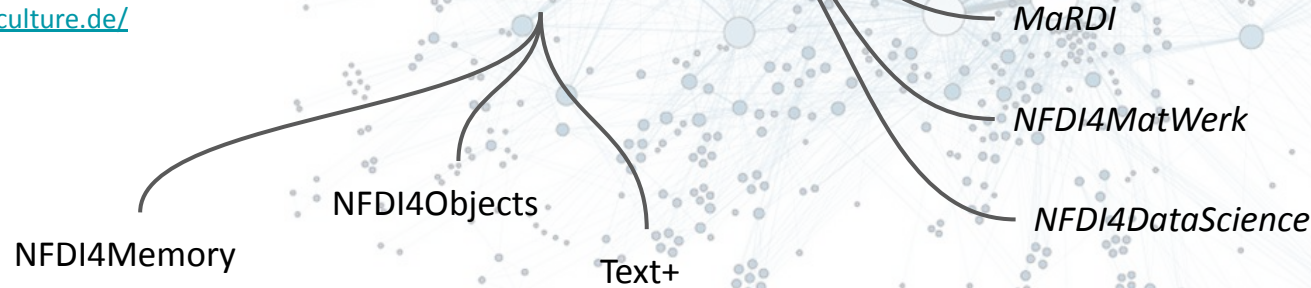
Vielen Dank für Ihre Aufmerksamkeit!

Prof. Dr. Harald Sack

Wissensgraphen
Daten - Informationen - Wissen

harald.sack@fiz-karlsruhe.de
twitter: lysander07

Veranstaltungsreihe #zukunftDerKunstgeschichte
LMU, 17. Mai 2021

Giorgio Vasari and the 6 Degrees of Separation

foaf:depicts

DNB http://d-nb.info/576752681

fabio:isManifestationOf

DNB http://d-nb.info/gnd/4383495-4
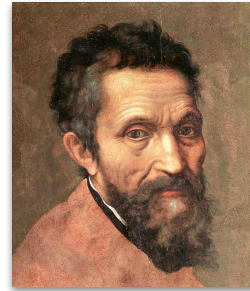
frbr:isPartOf

WIKIDATA Michelangelo (Q5592)
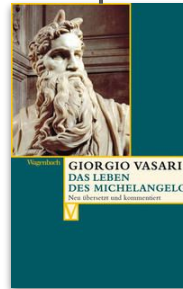
dct:subject

WIKIDATA The Agony and the Extasy (Q1824915)

wdt:P161 (cast member)

WIKIDATA Charlton Heston (Q80739)

wdt:P161 (cast member)

WIKIDATA Planet of the Apes (Q59534)

DNB http://d-nb.info/1078075875

frbr:isPartOf

DNB http://d-nb.info/997015942

Knowledge Graphs

Prof. Dr. Harald Sack, Dr. Mehwish Alam

Self-paced course

📋 Learnings   💬 Discussions   📈 Progress   👥 Collab Space   ⓘ Course Details   📡 Announcements   💡 Recap

f Share   🐦 Tweet   in Share   ✉ Mail

Even though it affects our lives every single day, most of us have no idea what a knowledge graph is. Asking Alexa about the weather tomorrow or searching for the latest news on climate change via Google, knowledge graphs constitute the backbone of today's state-of-the-art information systems. From improving search results over question answering and recommender systems up to explainable AI systems, the applications of knowledge graphs are manifold.

📅 Self-paced

🌐 Language: English

🏷 Big Data and AI, Expert

▶▶ Enroll me for this course

https://open.hpi.de/courses/knowledgegraphs2020

Course information

In this course you will learn what is necessary to design, implement, and use knowledge graphs. The focus of this course will be on basic semantic technologies including the principles of knowledge representation and symbolic AI. This includes information encoding via RDF triples, knowledge representation via ontologies with OWL, efficiently querying knowledge graphs via SPARQL, latent representation of knowledge in vector space, as well as knowledge graph applications in innovative information systems, as e.g., semantic and exploratory search.

Enroll me for this course

The course is free. Just register for an account on openHPI and take the course!

Enroll me now

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Image References:

[1] Giorgio Vasari, Six Tuscan Poets, 1544, [public domain],
https://commons.wikimedia.org/wiki/File:Giorgio_Vasari_-_Six_Tuscan_Poets_-_Google_Art_Project.jpg

[2] Matrix Computer Screen, pixabay license https://pixabay.com/illustrations/matrix-code-computer-pc-data-356024/

[3] UBC Library Card Catalog, Paul Joseph, cc-by-2.0, https://commons.wikimedia.org/wiki/File:2009_3544505541_card_catalog.jpg

[4] Tree of knowledge based on the French Encyclopedie from 1780, public domain,
https://commons.wikimedia.org/wiki/File:Essai_d%27une_distribution_g%C3%A9n%C3%A9alogique_des_sciences_et_des_arts_principaux,_1780.jpg

[5] Pieter Bruegel the Elder, The Tower of Babel, 1563, public domain,
https://commons.wikimedia.org/wiki/File:Pieter_Bruegel_the_Elder_-_The_Tower_of_Babel_(Vienna)_-_Google_Art_Project_-_edited.jpg

[6] Michelangelo, Adam's Creation Sistine Chapel Ceiling (1508-1512) Rome, Vatican, [public domain],
https://commons.wikimedia.org/wiki/File:%27Adam%27s_Creation_Sistine_Chapel_ceiling%27_by_Michelangelo_JBU33cut.jpg

[7] Niklas Jansson, Touched by His Noodly Appendage, public domain,
https://commons.wikimedia.org/wiki/File:Touched_by_His_Noodly_Appendage_HD.jpg

[8] The Linked Data Cloud, 2019, cc-by, https://lod-cloud.net

[9] Dr. Marcus Gossler (Own work) [GFDL (http://www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0 (http://creativecommons.org/licenses/by-sa/3.0/)]

[10] Carl Spitzweg, Der Bücherwurm, 1850 [public domain], https://commons.wikimedia.org/wiki/File:Carl_Spitzweg_021.jpg

[11] Jacopo Zucchi, Portrait of Giorgio Vasari, c.1571-1574, [public domain], https://commons.wikimedia.org/wiki/File:Vasari_autoritratto.jpg