

**DRAFT**

Dr Ravi Sharma

Ontology Summit 2020

June 17, 2020

# Knowledge Graphs Potential Content for Communique' (Inputs from Participants and Speakers)

# Preparation for Communique Ontology Summit 2020

***LOT OF ITEMS TO BE COVERED in this List, just a start...with speakers' points***

- WHAT ARE DIFFERENT VIEWS OF KG?
  - View elements of KG?
  - Theories of what is KG?
  - Minimum essentials of KG?
  - Ontologies and KG?
  - etc.
- HOW DID WE FARE AGAINST JANET SINGER'S SUGGESTED FRAMEWORK
  - Number and topics of speakers
  - Speakers topics directly addressing KGs
  - Speakers own topics of Research with connection or relevance to KGs

# Preparation for Communique Ontology Summit 2020

- Scope:
  - View KG as a whole?
  - View elements of KG?
  - Theories of what is KG?
  - Minimum essentials of KG?
  - Ontologies and KG?
  - etc.
- Content of Presentations and Nuggets
- Diagrams and illustrations
- Analysis of Topics, KG Framework, content to come up with outline of Communiqué!

# What is Knowledge

- Ravi

(within context and purpose)

- Data that can be analyzed to provide useful collection “information”
- “Information” of Value is Knowledge
- There are different ways and views of Representing Knowledge depending again on context and purpose e.g. retrieval
- Knowledge Bases are repositories (graphical or otherwise)
- Knowledge Networks interoperate and harmonize Knowledge Bases
- OKN is for access to all
- Knowledge graphs are instances of Knowledge networks.
- There is no single agreed definition of Knowledge Graphs (Aasman)
-

# Synthesis Summary presented so far

- Start with Ken Baclawski slides Synthesis III - June 10, 2020

[https://ontologforum.s3.amazonaws.com/OntologySummit2020/Synthesis/SummitSynthesis-3\\_20200610.pdf](https://ontologforum.s3.amazonaws.com/OntologySummit2020/Synthesis/SummitSynthesis-3_20200610.pdf)

And previous Synthesis Summaries: Synthesis Session 1, Discussion March 23<sup>rd</sup> and Synthesis Session 2 April 1, 2020 resulting in

Presentations and Summary I -

[https://ontologforum.s3.amazonaws.com/OntologySummit2020/Synthesis/SummitSynthesis-1\\_20200401.pdf](https://ontologforum.s3.amazonaws.com/OntologySummit2020/Synthesis/SummitSynthesis-1_20200401.pdf)

[https://ontologforum.s3.amazonaws.com/OntologySummit2020/Synthesis/What+is+a+Knowledge+Graph--RaviSharma\\_20200331.pdf](https://ontologforum.s3.amazonaws.com/OntologySummit2020/Synthesis/What+is+a+Knowledge+Graph--RaviSharma_20200331.pdf)

Intro Ken Sept 4, 2019

[https://ontologforum.s3.amazonaws.com/OntologySummit2020/Introduction/Welcome-to-Ontology-Summit-2020--KenBaclawski\\_20190904.pdf](https://ontologforum.s3.amazonaws.com/OntologySummit2020/Introduction/Welcome-to-Ontology-Summit-2020--KenBaclawski_20190904.pdf)

Earlier planning sessions in Summer 2019.

# What

- John Sowa Sept 11, 2019 generated Lot of Qs on KGs, and led to AI, Logic, Society of Mind, Cognitive Memory. **CM can support a wide range of AI and NLP methods: formal or informal, crisp or fuzzy, symbolic or subsymbolic. Conceptual Graphs, Ontology and Topological mapping were discussed. CG and CM described by Sowa accomplished Query results quickly. Appeared to accomplish more efficiently than KGs(?). CG-CM learns with SME and updates.**
- Is KG used in Industry Designed to fit a Purpose?
- Are Different KG Engines serving different purposes?
- Google, IBM (Watson!) others discussed in series but few formal design or content of KGs shown

# What

- Issues raised including after Aasman talk – Sept 4, 2019  
[https://ontologforum.s3.amazonaws.com/OntologySummit2020/Introduction/Why-Knowledge-Graphs-Now--JansAasman\\_20190904.pdf](https://ontologforum.s3.amazonaws.com/OntologySummit2020/Introduction/Why-Knowledge-Graphs-Now--JansAasman_20190904.pdf)
- Summarized by Ken  
[https://ontologforum.s3.amazonaws.com/OntologySummit2020/Introduction/KnowledgeGraphIssues--KenBaclawski\\_20190918.pdf](https://ontologforum.s3.amazonaws.com/OntologySummit2020/Introduction/KnowledgeGraphIssues--KenBaclawski_20190918.pdf)

# Knowledge Graphs Visualization attempt





## Knowledge Graphs and Machine Learning

A powerful combination for the semi-automatic generation of insights Nicola Rohrseitz

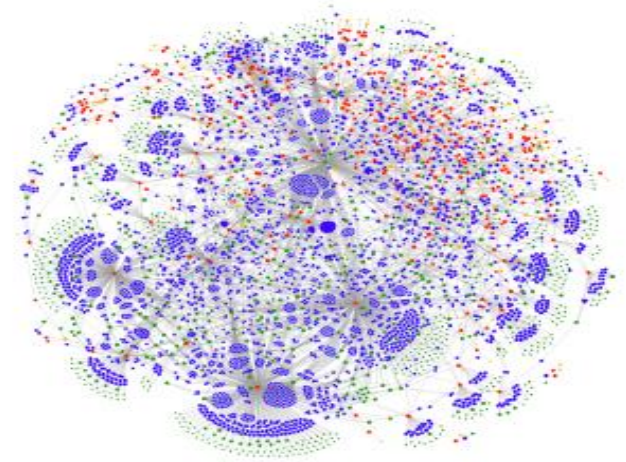
<https://towardsdatascience.com/knowledge-graphs-and-machine-learning-3939b504c7bc>



# Paco Nathan - Rich Search and discovery from Datasets 202003

## Knowledge Graph – why?

- Allow flexibility for metadata representation
- Measure metadata quality
- Prepare features for ML models
- Build recommenders for *experts, topics, tools*, etc.
- Engage the public with automated data inventories
- Recommend configurations to new analysts
- Identify which datasets get used with others
- Quantify impact of datasets on policy



# Composing knowledge graphs, inside and out Spencer Breiner Joint with Blake Pollard, Peter Denno and Eswaran Subrahmanian March 18, 2020

## What's beneath a knowledge graph?

Knowledge Graphs:

*“structured representations of semantic  
knowledge that are stored in a graph”*

What structure? Stored how?

Today, some possible answers from category theory.

Some themes:

Bite-size ontologies

Data/concept duality

Internalized computation/proof

# Prototyping an Open Knowledge Network for Spatial Decision Support

Sean Gordon 2020 April 22

- NSF Convergence Accelerator
- Knowledge Synthesis –Automated
- Tested 4 Language processing models
- Key words > manual topic names
- Discover new relationships
- Map question classes to literature db
- Phase 2 development
- Automated Tools for KG Building
- Participatory Tools for KG Building

# Krzysztof Janowicz April 29 2020

- **KnowWhereGraph:**
- Enriching and Linking Cross-Domain
- Knowledge Graphs using
- Spatially-Explicit AI Technologies to
- Address Pressing Challenges at the
- Human-Environment Nexus
- (Geographic) space and time matter not only for the obvious reason that everything happens somewhere and at some time, but because knowing where and when things happen is critical to understanding why and how they happened or will happen.

# Speakers - examples

- Anirudh Prabhu - Insights from Knowledge Graphs 20200226

Starting from KGs to insights that included Reasoners, Ontology, Analytics, Networks, software languages etc.

- Guha see Cs520 referenced below
- Ernest Davis -Time and Space in Knowledge Graphs May 6, 2020

Spatial pronouns are ambiguous.

“coffee in the cup.”

“milk in the coffee.”

“a nail in the wall.”

“bones in the foot.”

“a car in the parking lot.”

“a dent in the door.”

“a bend in the road” ...

# Ram D Sriram -Standards for Knowledge Graphs & Networks 20200513

- KGs and KNs
- The summit discussed many approaches to knowledge graphs and networks
- The field is reasonably mature as can be seen by use in the industry (Google, etc..)
- A standard representation will aid in increased use
- It will also lead to formal knowledge repositories in number of domains
- Could be developed in a layered manner

- **Current & Emerging Standards for KGs at OMG**

Elisa F. Kendall

Knowledge Graph Infrastructure / Cross-Platform Ontology  
Standards

Ontologies at OMG – FIBO, FIGI, etc.



# Andreas Blumauer - The Knowledge Cookbook

## New Roles: The Rise of the Knowledge Scientist



- ▶ Knowledge scientists combine the more holistic and connected views of the knowledge modelers with the more pragmatic views of the data engineers.
- ▶ Knowledge scientists work closely together with business and understand their actual needs, which are typically centered around business objects and facts about them.
- ▶ Eventually, this results in a more complete and entity-centric view of knowledge graphs.

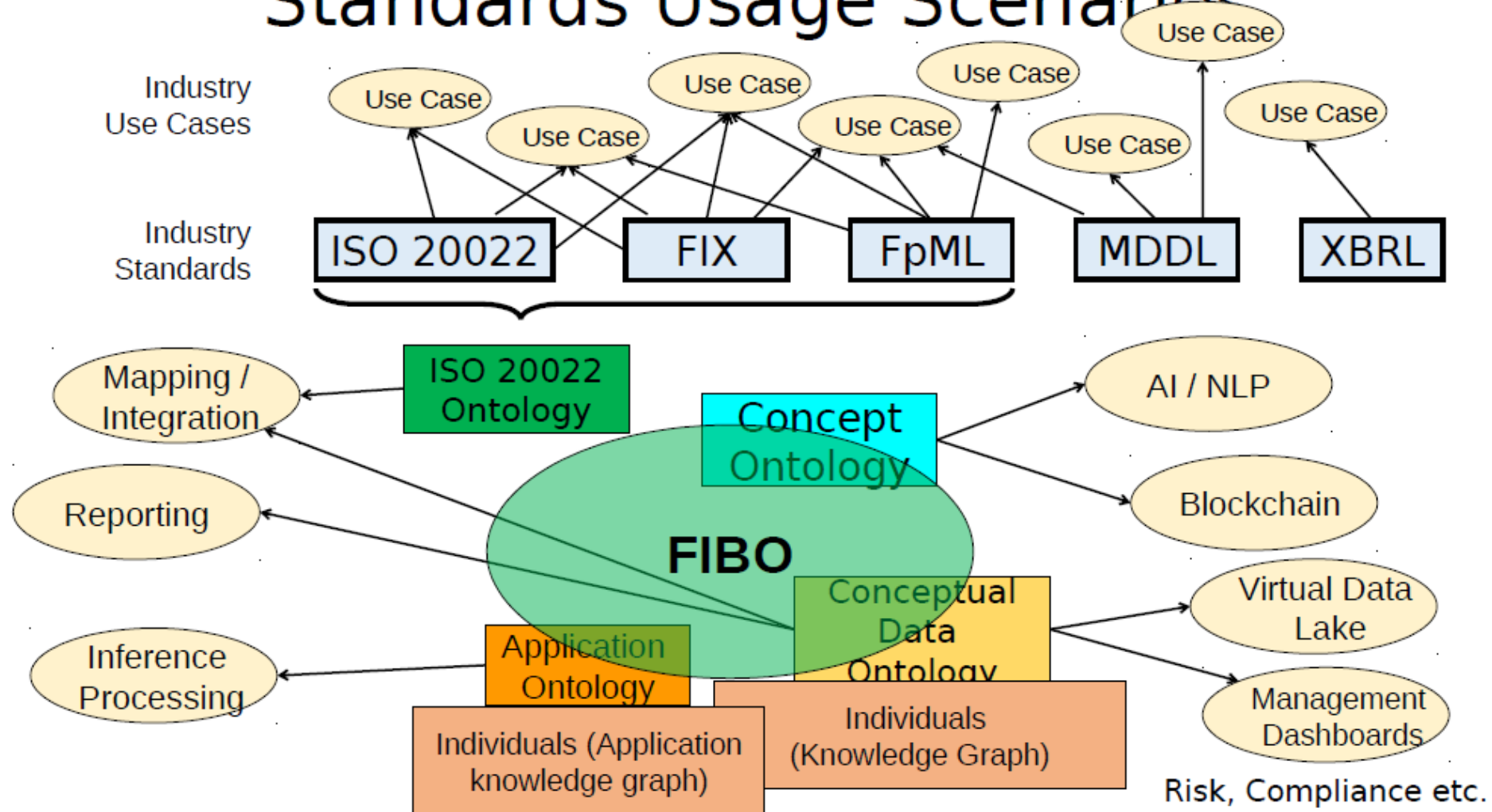
# Mike Bennett -Standards for Knowledge Graphs in the Financial Sector, Hypercube Ltd. 13 May 2020

## Conclusions

- There is no 'one size fits all' style of ontology
- Different usages indicate different ontology styles
  - Data or Things
  - Deep foundational hierarchies or correspondence graphs
- Deep property hierarchy for mapping, restrictions for reasoning
- Novel applications like AI and NLP may require further distinctions

Contd...

## Standards Usage Scenarios



# Yolanda Gil 20200527 Seven Ontologies for Publishing the Scientific Record on the Web

- Science Ontologies
- Scientific Vocabulary Standards
- Controlled Crowdsourcing to Support Continuous Ontology Growth
- Representing Scientific Software Metadata
- The W3C PROV Provenance Standard
- WEST (Workflow Ecosystems through STandards)
- Will AI Write the Scientific Papers of the Future?

Ram D. Sriram 20200603

## Standards for Knowledge Graphs Session 2 - Panelists

Are we ready for standards?

- What is the current state of the art?
- What should the future be?
- What are the roles for various organizations?

- Lisa Carnahan

- NIST

- The IT Standards Process

- Barry Smith

- University of Buffalo

- Michael Grüninger,

- Semantic Technologies Lab, University of Toronto

- Standards and Ontologies

# Todd Schneider: Sections:

- Introduction
- Whence - what brought the use of graphs in as persistence mechanisms (will need to address other non-relational persistence mechanism); historical background; this can include parts of 'why' \_
- Current State - How are graph persistence mechanisms being used
- Problems - what are the differences in the current uses and what problems they may cause going forward
- Whither - Our recommendation of how a the notion 'knowledge graph' should be defined; How standards can help (and maybe a lead in to the next year's summit topic).

# Notes

- Ken - good point what is Knowledge whether OKN or not. At least domain knowledge, knowledge bases and modern Knowledge management systems should have been covered in detail before describing their Graphical views or apps?
- Ken Not sure if your Category Theory Paper fits anywhere for KGs?
- Ravi agreed to use his chat suggested outline and will also use thoughts presented in today's chat to come up with a set of slides that will perhaps help us organize the topics or set of slides next week. sections for Communique. Will start first.

Knowledge Graph related links not presented  
in Ontology Sessions  
(Outside)



# Knowledge Graph related links not presented in Ontology Sessions (Outside)

- <https://web.stanford.edu/class/cs520/>

Knowledge Graphs, How should AI explicitly represent knowledge?

Department of Computer Science, Stanford University, Spring 2020

- Panel: Enterprise-scale knowledge graphs
  - Yuqing Gao, Microsoft
  - Anant Narayanan, Facebook
  - Alan Patterson, eBay
  - Jamie Taylor, Google
  - Anshu Jain, IBM
- What is a Knowledge Graph? Transforming Data into Knowledge (PoolParty.biz, 2020), <https://www.poolparty.biz/what-is-a-knowledge-graph>
- <https://www.poolparty.biz/news-events/new-knowledge-graph-cookbook/>

## (Outside) contd...

- O'Reilly Book, Graph Algorithms Practical Examples in Apache Spark & Neo4j Mark Needham & Amy E. Hodler also paper Power of Graph based Search

- Sparsity and Noise: Where Knowledge Graph Embeddings Fall Short

Jay Pujara and Eriq Augustine and Lise Getoor

Department of Computer Science

University of California, Santa Cruz

[jay@cs.umd.edu](mailto:jay@cs.umd.edu), [eaugustine@ucsc.edu](mailto:eaugustine@ucsc.edu), [getoor@soe.ucsc.edu](mailto:getoor@soe.ucsc.edu)