

The Evolving Landscape: Generative AI, Ontologies, and Knowledge Graphs

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October 11, 2023

Ontology Summit 2024 – Setting the Stage Series

Ontolog Forum



The Rensselaer IDEA

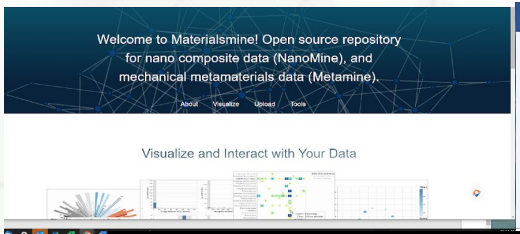
Institute for Data Exploration and Applications

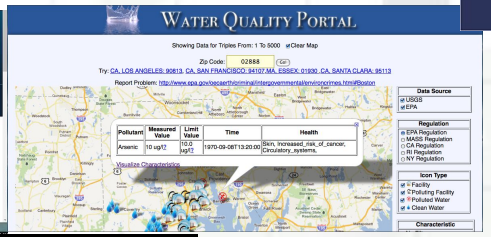
DLM Background: Ontologies, Knowledge Graphs, Provenance, Knowledge Portals, Hybrid AI Solutions…)

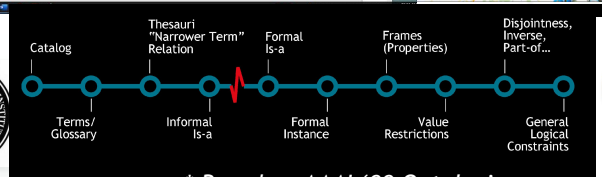


Formal Foundations with application focus;

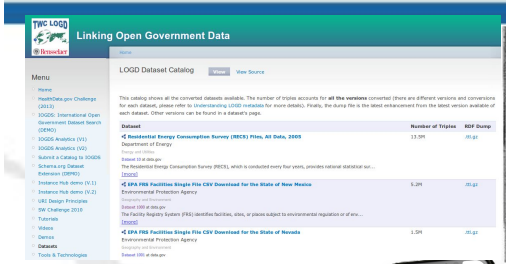
Often hybrid, often / usually highly interdisciplinary

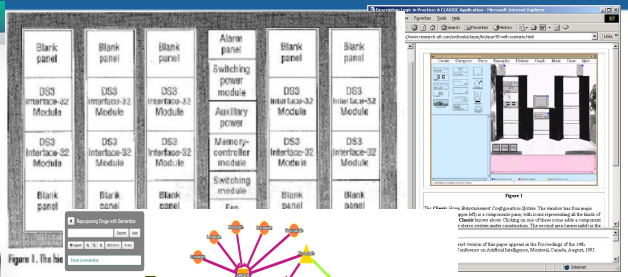


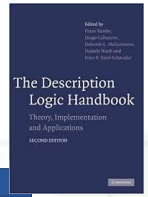


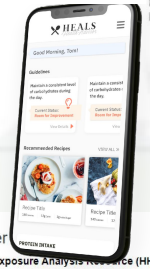


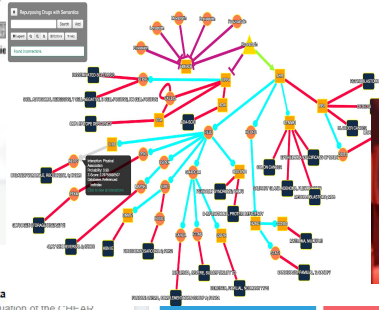














HHEAR Data Center

In 2019 the **Human Health Exposure Analysis Resource (HHEAR) Data** School of Medicine at Mount Sinai was established by NIEHS as a continuation of the CHEAR Data Center expanding to include health outcomes at all ages. The goal is to provide approved HHEAR investigators their laboratory analysis results and incorporate them in statistical analyses of their study data. We then make that data publicly available as a means to improve our knowledge of the comprehensive effects of environmental exposures on human health throughout the life course.

The HHEAR Data Center goals are to catalyze new scientific insight from the colocation, integration and advanced statistical and data science analysis of multimodal data sets.

Number of Studies 40	Number of Specimens Analyzed 66,924
Number of Subjects 28,856	Number of Chemicals Targeted 139

We will provide:

- A data repository for storing epidemiologic and biomarker data for CHEAR and HHEAR

AT&T Bell Laboratories

Stanford University

Rensselaer

The AI Landscape is Changing

VentureBeat

Security | Data Infrastructure | Automation

Guest

The language revolution: How LLMs could transform the world



Language Models are Changing AI We Need to Understand Them

Scholars benchmark 30 prominent language models across a wide range of scenarios and for a broad range of metrics to elucidate their capabilities and risks.

Nov 17, 2022 | Rishi Bommasani, Percy Liang, and Tony Lee

CNN BUSINESS

Markets →

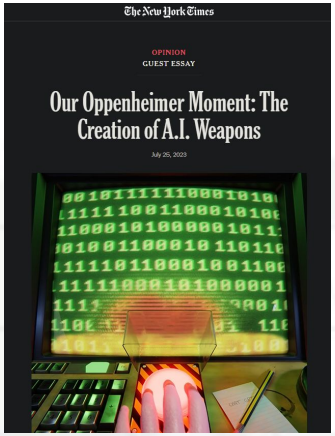
DOW	33,505.06	1.14% ▲
S&P 500	4,117.52	1.39% ▲
NASDAQ	12,168.58	1.69% ▲

The way we work is about to change

By Samantha Murphy Kelly, CNN

Published 9:14 AM EDT, Sun March 19, 2023

The Oppenheimer Moment in AI: How Generative AI and LLMs are Changing the World



ChatGPT Changes Everything Summary – Part I

In the same way that Netflix, Google, Spotify, Waze, Amazon, and others changed our expectations about AI-powered recommendations, ChatGPT and Generative AI will change our expectations with respect to how we want to engage with AI-infused apps and their associated operating environment.

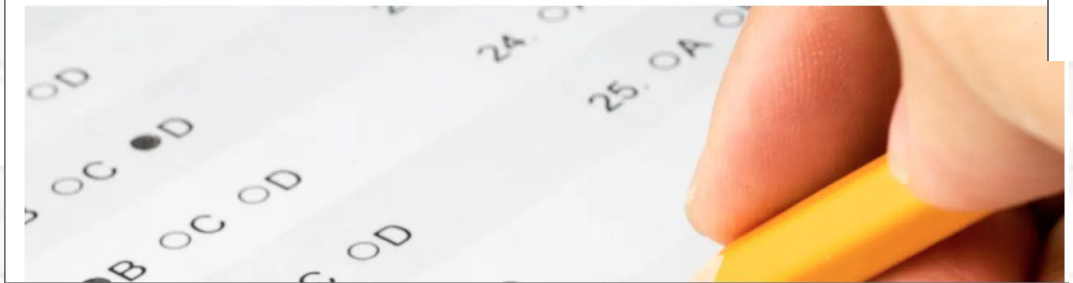
Surprising Speed and Accomplishments

The newest version of ChatGPT passed the US medical licensing exam with flying colors — and diagnosed a 1 in 100,000 condition in seconds

HOME > TECH

OpenAI just announced GPT-4, an updated chatbot that can pass everything from a bar exam to AP Biology. Here's a list of difficult exams both AI versions have passed.

Lakshmi Varanasi Mar 21, 2023, 1:36 PM EDT



- A doctor and Harvard computer scientist says GPT-4 has better clinical judgment than "many doctors."
- The chatbot can diagnose rare conditions "just as I would," he said.
- But GPT-4 can also make mistakes, and it hasn't taken the Hippocratic oath.

But What Does Passing Test Really Mean ?

CNET Your guide to a better future

Tech

ChatGPT Can Pass the Bar Exam. Does That Actually Matter?

The question is what happens next.



"Exams are performances. They don't test how knowledgeable students are -- they test how much students can cram into their brain and regurgitate for a few hours. Much of that information is subsequently forgotten, often with glee. Exams are closer to tests of dedication than they are of knowledge. Of course humans can't compete with software when it comes to aggregating information. But that's not the point of an exam."

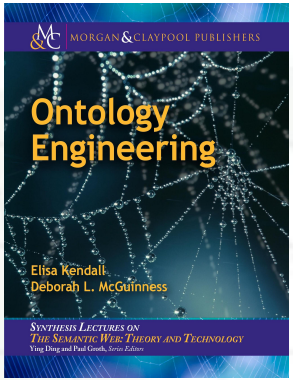
Do They Understand?

When can/should we trust the results of generative AI?
Can they tell us how they came to an answer?
Can they provide the context in which their recommendations are reliable?

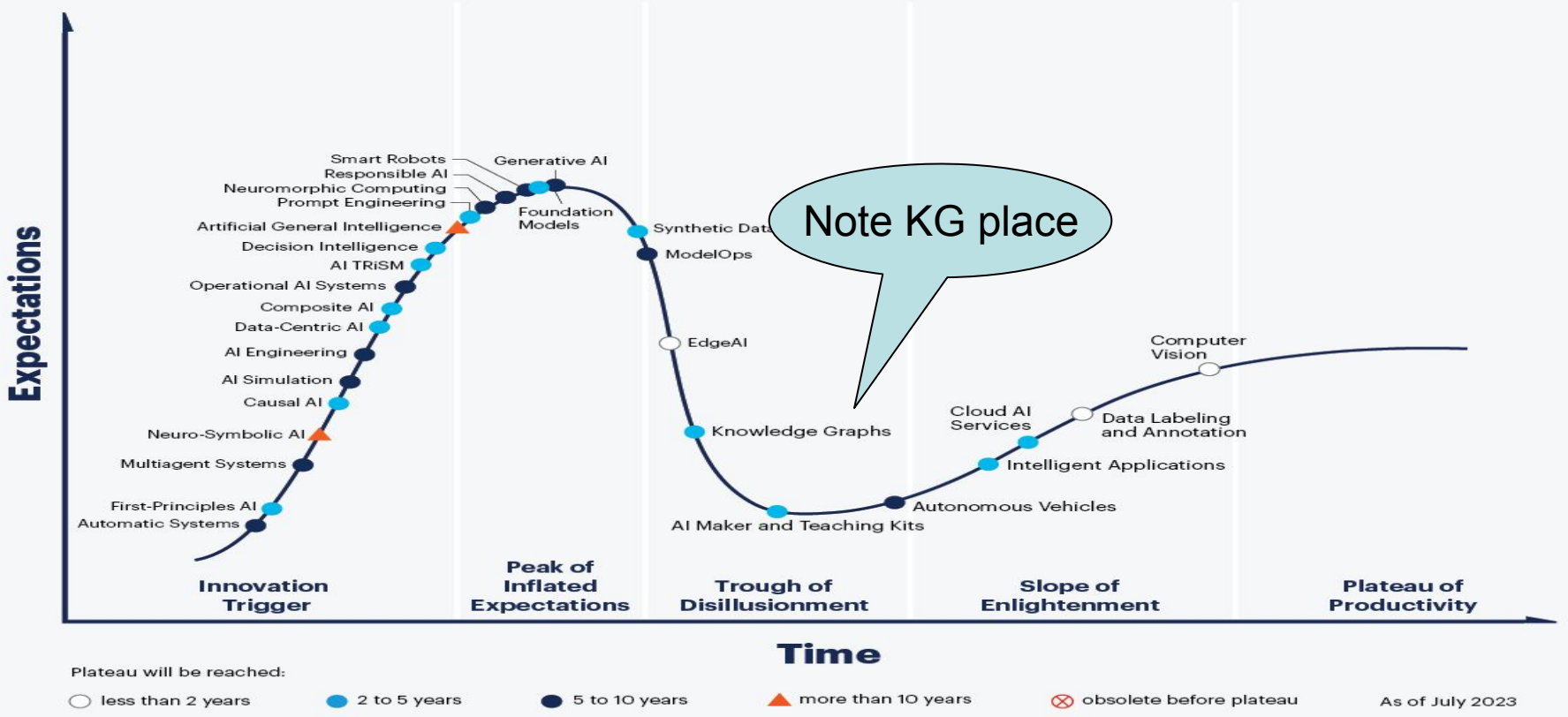
There are many opportunities for semantic approaches , especially ontologies and knowledge graphs

A Few Questions to Ponder…

- Where are we on the “Hype Cycle”? And how might it inform our research?
- How might we leverage LLMs for Ontology and Knowledge Graph work?
- How might we create “sandboxes” in which to explore?
- Should we update many of our writings, e.g., Ontology Engineering?



Hype Cycle for Artificial Intelligence, 2023



gartner.com

Source: Gartner
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Gartner

Collaborative KG Generation

What if we use McGuinness' and Aasman's explorations on building a Wines Ontology and the associated Knowledge graph, without and with LLMs as a thought experiment

ACM TECHNEWS

A Semantic Sommelier: Wine Application Highlights the Power of Web 3.0

Rensselaer Polytechnic Institute News

February 24, 2011



Photo courtesy of Rensselaer Polytechnic Institute

Rensselaer Polytechnic Institute professor Deborah McGuinness has developed a group of applications designed to enhance wine knowledge and appreciation. The applications are based on the Web Ontology Language (OWL), which uses a standard set of symbols to create a code that different applications can interpret, enabling devices to operate more efficiently, and potentially leading to a new generation of smart search technologies.

The wine applications are preloaded with information about wine, including body types, color, sweetness and flavor, and food, including the course and ingredient type and its relative spiciness. The applications also can be used to make home wine suggestions.

"With semantic technologies, we can offload more of the searching and reasoning required to locate and share information to the computer while still maintaining personal control over our information and how we use it," McGuinness says.



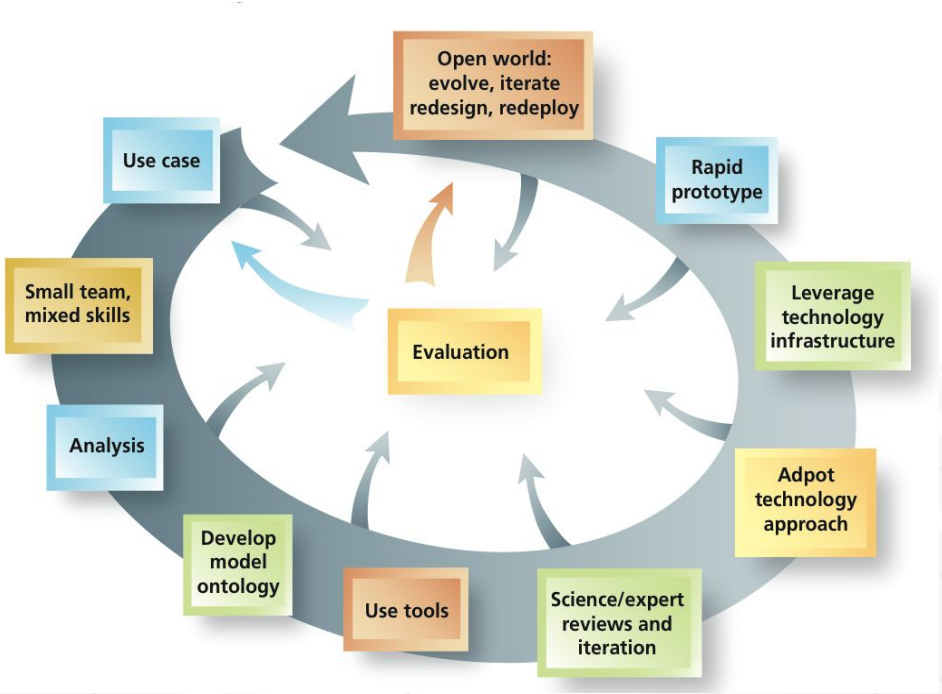
From Ontologies Come of Age (2011)

Base ontology is very simple

- Wine, Winery, Grape, Flavor, Body, Color, Sugar
- Stood the test of time: Living with Classic (1991), CLASSIC tutorials, Ontologies 101(2001), OWL Guide (2004), … numerous translations, >8k citations
- To scale however, needs to be compatible with WIDE range of menus, wine lists, vocabularies. Not hard to obtain but significant enhancement required.
- Needs more ecosystem support – explanation, provenance, validation, inconsistency detection, prioritization scheme, UI considerations, additional social connections, citizen-oriented maintenance and evolution schemes, scale, partitioning, …

www.ksl.stanford.edu/people/dlm/papers/living-with-classic-abstract.html

How was it built?



Use Case Template from Deborah McGuinness and Elisa Kendall used in Ontology Engineering course - https://tw.rpi.edu/courses/Ontologies and our book by the same name - https://link.springer.com/book/10.1007/978-3-031-79486-5

I. Use Case Description	
Use Case Name	*Consider a goal-driven use case name*
Use Case Identifier	*A unique identifier for the use case*
Source	*The organization / department providing the use case*
Point of Contact	*Name, email address, affiliation if not obvious from email, other relevant details*
Creation / Revision Date	*Date that this use case was created or most recently revised*
Associated Documents	*Requirements documentation, traceability matrix if applicable*

II. Use Case Summary	
Goal	*Describe briefly the goal the use case is intended to satisfy*
Requirements	*State any requirement(s)specific to this use case, including any capabilities from a business architecture or process model that the use case supports, any metrics or other reporting requirements, etc., including any reference identifier for the requirement(s), as applicable*
Scope	*Identify any known boundaries and the intended scope of the use case*
Priority	*Identify the priority of the use case (with respect to other use cases for the project)*
Stakeholders	*Identify all known stakeholders for the use case*
Description	*Summarize the use case, capturing the essential objectives (no longer than a page), including a quick overview, restated goals, and principal actor(s).* *User stories, if applicable, and any narrative mapped from those user stories to usage scenarios should be included in the Usage Scenarios section, below.*
Actors / Interfaces	*List actors: people, systems, knowledge bases, repositories, and other data resources, services, sensors, or other "things" outside the system that either act on the system (primary actors) or are acted on by the system (secondary actors). Primary actors are those that invoke the use case and benefit from the result. Identify the primary actor and briefly describe role.* *Any actor that is external to or outside the control of the use case owner should be further described under Resources, below.*
Pre-conditions	*Identify any assumptions about the state of the system that must be met for the trigger (below) to initiate the use case. Any assumptions about the state of other related systems can also be stated here. List all preconditions.*
Post-conditions	*Provide any conditions that will be true of the state of the system after the use case has been completed.*

What if LLMs are used?



what would be a possible ontology for a wine

An ontology for a wine could include the following classes and properties:

Classes:

- Wine: the overarching class that encompasses all types of wines
- Red Wine: a subclass of Wine that includes all red wines
- White Wine: a subclass of Wine that includes all white wines
- Rosé Wine: a subclass of Wine that includes all rosé wines
- Sparkling Wine: a subclass of Wine that includes all sparkling wines
- Fortified Wine: a subclass of Wine that includes all fortified wines, such as port and sherry
- Grape Variety: a class that represents the specific grape variety used in a wine
- Vineyard: a class that represents the vineyard where the grapes for a wine were grown
- Winery: a class that represents the winery that produced a wine
- Region: a class that represents the region where a wine was produced



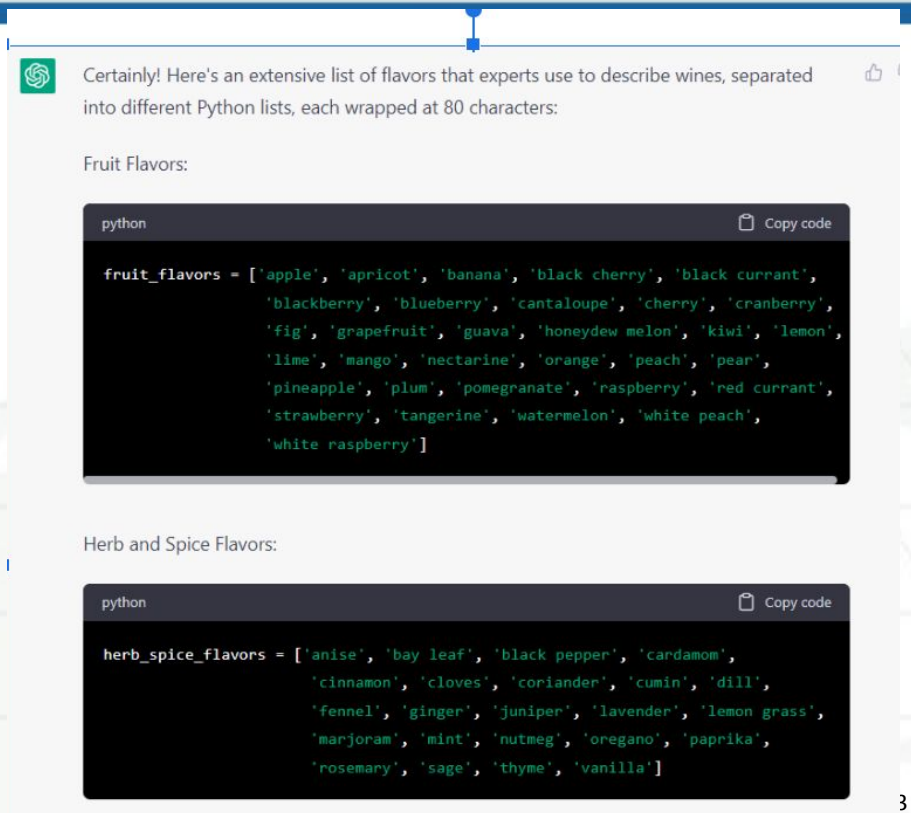
What if LLMs are used (cont)?

Properties:

- hasColor: a property that links a wine to its color (red, white, rosé)
- hasFlavor: a property that links a wine to its flavor profile, which can include notes of fruit, spice, and other flavors
- hasBody: a property that links a wine to its body, which can be described as light, medium, or full
- hasTanninLevel: a property that links a wine to its tannin level, which can be described as low, medium, or high
- hasAcidity: a property that links a wine to its acidity level, which can be described as low, medium, or high
- hasAlcoholContent: a property that links a wine to its alcohol content, which is typically expressed as a percentage by volume
- hasGrapeVariety: a property that links a wine to the specific grape variety used to produce it
- hasVineyard: a property that links a wine to the vineyard where the grapes for the wine were grown
- hasWinery: a property that links a wine to the winery that produced it
- hasRegion: a property that links a wine to the region where it was produced, which can have an impact on the wine's flavor profile and characteristics.

LLMs and refinement

- It appears that it is essentially my ontology (from Living with CLASSIC (1989) and the expanded version of the Stanford Tech report
- Jans wanted more information about flavors



Certainly! Here's an extensive list of flavors that experts use to describe wines, separated into different Python lists, each wrapped at 80 characters:

Fruit Flavors:

python Copy code

```
fruit_flavors = ['apple', 'apricot', 'banana', 'black cherry', 'black currant',
                 'blackberry', 'blueberry', 'cantaloupe', 'cherry', 'cranberry',
                 'fig', 'grapefruit', 'guava', 'honeydew melon', 'kiwi', 'lemon',
                 'lime', 'mango', 'nectarine', 'orange', 'peach', 'pear',
                 'pineapple', 'plum', 'pomegranate', 'raspberry', 'red currant',
                 'strawberry', 'tangerine', 'watermelon', 'white peach',
                 'white raspberry']
```

Herb and Spice Flavors:

python Copy code

```
herb_spice_flavors = ['anise', 'bay leaf', 'black pepper', 'cardamom',
                      'cinnamon', 'cloves', 'coriander', 'cumin', 'dill',
                      'fennel', 'ginger', 'juniper', 'lavender', 'lemon grass',
                      'marjoram', 'mint', 'nutmeg', 'oregano', 'paprika',
                      'rosemary', 'sage', 'thyme', 'vanilla']
```



Population with LLMs

- Find important wine grapes

Sure, here's an example of a Python list containing 30 of the most important grapes used for making wine, wrapped at 80 characters:

python Copy code

```
grape_varieties = [
    "Cabernet Sauvignon", "Merlot", "Pinot Noir", "Syrah/Shiraz", "Zinfandel",
    "Chardonnay", "Sauvignon Blanc", "Riesling", "Pinot Grigio/Pinot Gris", "Viogni
    "Grenache", "Tempranillo", "Sangiovese", "Malbec", "Cabernet Franc",
    "Petit Verdot", "Nebbiolo", "Barbera", "Mourvèdre/Monastrell", "Touriga Naciona
    "Carmenère", "Verdejo", "Albariño", "Godello", "Torrontés",
    "Chenin Blanc", "Moscato/Muscat", "Gewürztraminer", "Semillon", "Fiano"
]
```

Regenerate response

Population with LLMs continued

- Find grapes for each type of wine – example Bordeaux

python Copy code

```
bordeaux_grapes = [
    "Cabernet Sauvignon", "Merlot", "Cabernet Franc", "Petit Verdot", "Malbec",
    "Sauvignon Blanc", "Sémillon", "Muscadelle"
]
```



Population with LLMs continued

- Find particular wines

Sure, here's an example of a Python list containing 20 important Bordeaux wines, wrapped at 80 characters:

python Copy code

```
bordeaux_wines = [
    "Château Margaux", "Château Latour", "Château Lafite Rothschild",
    "Château Mouton Rothschild", "Château Haut-Brion", "Château Cheval Blanc",
    "Château Ausone", "Château Pétrus", "Château Yquem", "Château d'Yquem",
    "Château Figeac", "Château Palmer", "Château Leoville Las Cases",
    "Château Ducru-Beaucaillou", "Château Cos d'Estournel", "Château Angelus",
    "Château Pavie", "Château Pichon Longueville Comtesse de Lalande",
    "Château Pichon Longueville Baron", "Château Lynch-Bages"
]
```



Jans' Exploration continued

- His approach provides one example of human-LLM pairing
  - Leverage ontologies as starting points
  - Human driven refinement (example adding flavors)
  - Good use of LLMs for population – both for value restrictions (grape type per region) and instances (example prominent Bordeaux wines)
  - It continued to populate values (for flavors)
  - Further continued for (some) validation (using e.g., webchatGPT



Lessons? Discussion

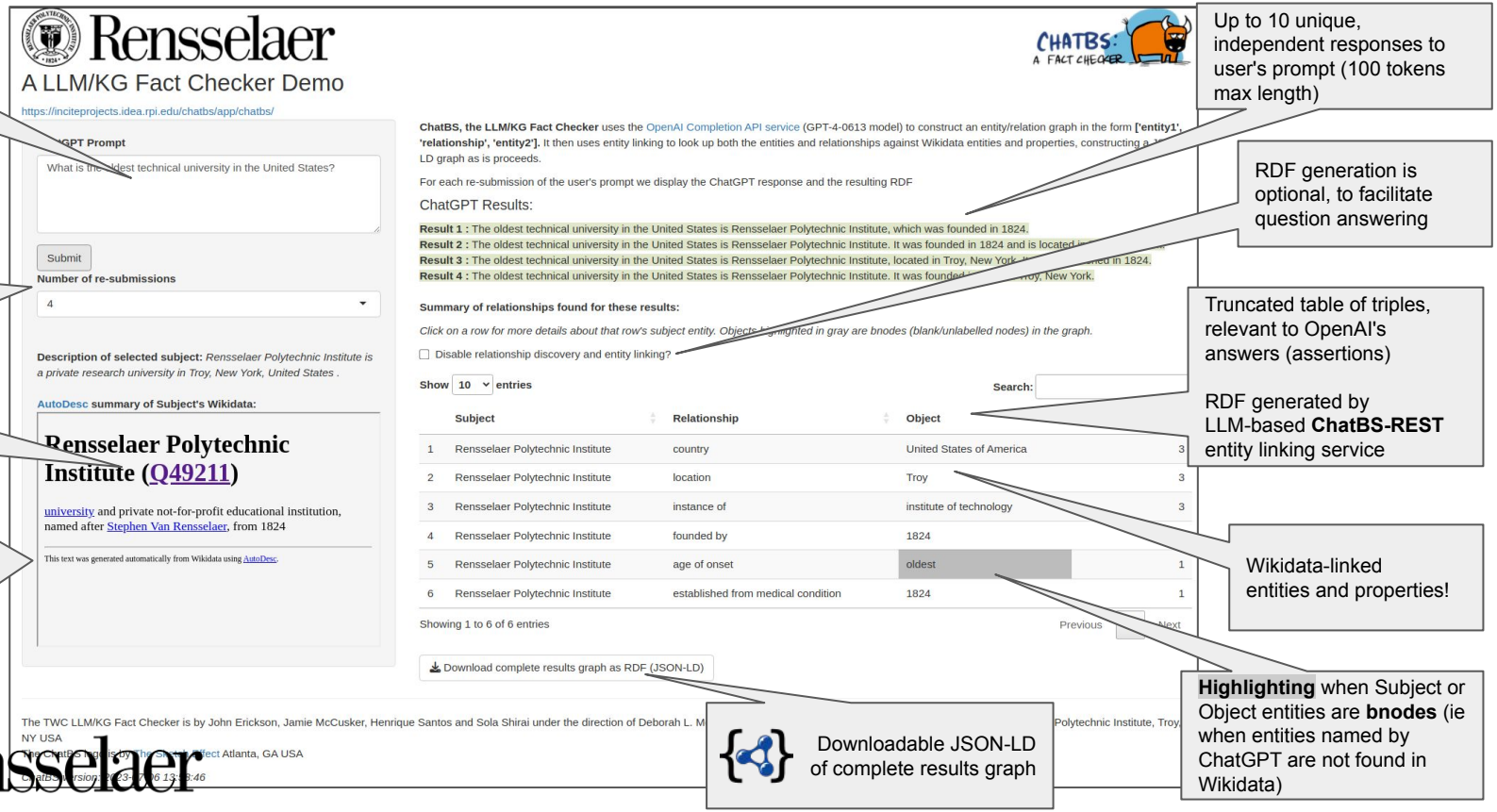
- LLMs can greatly enhance some aspects of KG design and population
- Having the (somewhat skilled) human in partnership with the LLM may be an optimal plan
- We may discuss other ways to leverage LLMs – for example we might consider pain points in ontology design and ontology-enabled application build out
- Designing and building collaborative processes I think is in our future. Next one more “sandbox” for exploration

ChatBS: TWC's LLM/KG FactChecker Demo

App Version: 2023-07-06 13:58:46 (GPT-4-0613)

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatBS, the LLM/KG Fact Checker uses the OpenAI Completion API service (GPT-4-0613 model) to construct an entity/relation graph in the form **['entity1', 'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, constructing a JSON-LD graph as is proceeds.



Submit questions to OpenAI Completion API

Up to 10 question re-submissions

Link to Wikidata Wiki for selected Subject entity (opens new tab)

Embedded Wikidata entity summary (using **AutoDesc API**) of selected entity…to aid in human fact checking!

Up to 10 unique, independent responses to user's prompt (100 tokens max length)

RDF generation is optional, to facilitate question answering

Truncated table of triples, relevant to OpenAI's answers (assertions)

RDF generated by LLM-based **ChatBS-REST** entity linking service

Wikidata-linked entities and properties!

Highlighting when Subject or Object entities are **bnodes** (ie when entities named by ChatGPT are not found in Wikidata)

Downloadable JSON-LD of complete results graph

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A LLM/KG Fact Checker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

Who is Deborah McGuinness?

Submit

Number of re-submissions

4

Description of selected subject: *Deborah McGuinness is a Computer scientist, professor .*

AutoDesc summary of Subject's Wikidata:

Deborah L. McGuinness (Q5248328)

computer scientist, artificial intelligence researcher, university teacher, and information scientist (*2000) ♀; Fellow of the American Association for the Advancement of Science and Knowledge Graph Conference Lifetime Achievement Award

This text was generated automatically from Wikidata using AutoDesc.

CHATBS: A FACT CHECKER

Each of these responses is essentially correct, yet each is distinct.

This demonstrates why it is important to submit questions multiple times when studying GTP-4-generated "explanations."

ChatBS, the LLM/KG Fact Checker uses the OpenAI Completion API service (GPT-4-0613 model) to construct an entity/relation graph in the f
'relationship', 'entity2']. It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, constru
LD graph as is proceeds.

For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Result 1 : Deborah McGuinness is a leading expert in the field of artificial intelligence, specifically in knowledge representation and reasoning, ontologies, and the Semantic Web. She is a professor in the Tetherless World Constellation at Rensselaer Polytechnic Institute and has also worked extensively in industry, including roles at AT&T Labs and Bell Labs. McGuinness is known for her pioneering work developing languages and environments for the Semantic Web, including OWL, the Web Ontology Language. She is also a co-director of the Web Science Research Center at Rensselaer.
Result 2 : Deborah McGuinness is a renowned American computer scientist known for her work in the field of artificial intelligence. She has made notable contributions in areas like knowledge representation and reasoning, ontology development, and the semantic web. McGuinness is a Tetherless World Senior Constellation Chair and Professor of Computer, Cognitive, and Web Sciences at the Rensselaer Polytechnic Institute in New York. She co-developed the Ontology Inference Layer (OIL) and its description logic-based successor, and a component of the W3C recommendations for the Semantic Web standards.
Result 3 : Deborah McGuinness is a notable figure in the field of artificial intelligence and semantic web technology. She is a Professor of Computer and Cognitive Science at Rensselaer Polytechnic Institute (RPI). McGuinness is known for her work in knowledge representation and reasoning environments, ontology creation, and the development and deployment of semantic web applications. She is particularly recognized for her contributions to the development of the Web Ontology Language (OWL), a semantic web language standard used to represent rich and complex knowledge about things, groups of things, and relations between things.
Result 4 : Deborah McGuinness is a well-known American computer scientist who is recognized for her work in the field of artificial intelligence, particularly in knowledge representation and reasoning, description logics, ontologies, and the Semantic Web. She has contributed significantly to helping computers and humans to use data and information more effectively. She's been associated with prestigious institutions like Stanford University and Rensselaer Polytechnic Institute. McGuinness is also a co-inventor of the Web Ontology Language (OWL), a language for creating web-based ontologies, which is widely used in data management, data integration, and business intelligence applications.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity. Objects highlighted in gray are bnodes (blank/unlabelled nodes) in the graph.

☐ Disable relationship discovery and entity linking?

Show 10 entries

Search:

	Subject	Relationship	Object	Occurrences
1	Deborah McGuinness	occupation	computer scientist	2
2	Deborah McGuinness	translation contribution URL	knowledge representation and reasoning	2
3	Deborah McGuinness	translation contribution URL	Semantic Web	2

Rensselaer

A LLM/KG Fact Checker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/



Simple question, widely varying (and all imprecise) answers!!

Correct answer: **1998 - 2007**

ChatGPT Prompt

When did Deborah McGuinness work at Stanford?

Submit

Number of re-submissions

10

Description of selected subject: *Deborah McGuinness is a Computer scientist, professor .*

AutoDesc summary of Subject's Wikidata:

Deborah L. McGuinness (Q5248328)

computer scientist, artificial intelligence researcher, university teacher, and information scientist (*2000) ♀; Fellow of the American Association for the Advancement of Science and Knowledge Graph Conference Lifetime Achievement Award

This text was generated automatically from Wikidata using AutoDesc.

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For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Result 1 : Deborah McGuinness was a faculty member at Stanford University from 2001 to 2006.
Result 2 : Deborah McGuinness was a Senior Research Scientist/Research Scientist at Stanford University from 1995 to 2007.
Result 3 : Deborah McGuinness worked at Stanford University's Knowledge Systems Laboratory, as a senior research scientist and co-director, between 1997 to 2002.
Result 4 : Deborah McGuinness was a senior research scientist at Stanford University from 1999 to 2007.
Result 5 : Deborah McGuinness worked at Stanford University from 2001 to 2006 as the co-director of the Knowledge Systems AI Lab.
Result 6 : Deborah McGuinness was a Senior Research Scientist at Stanford University from 2000 to 2006.
Result 7 : Deborah McGuinness was a Senior Research Scientist at Stanford University from 2000-2007.
Result 8 : Deborah McGuinness worked at Stanford University from 2001 to 2007. She was part of the Knowledge Systems Laboratory in the Department of Computer Science.
Result 9 : Deborah McGuinness was a Senior Research Scientist and co-director of the Knowledge Systems Laboratory at Stanford University from 1999 to 2007.
Result 10 : Deborah McGuinness worked at Stanford University from 2000 to 2007 as a Senior Research Scientist and co-director of the Knowledge Systems Laboratory in the Computer Science Department.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity. Objects highlighted in gray are bnodes (blank/unlabelled nodes) in the graph.

☑ Disable relationship discovery and entity linking?

Download complete results graph as RDF (JSON-LD)

NOTE: ChatBS may have been updated since these screenshots were captured…

Data INCITE Shiny Proxy

Restart app | Stop app

Rensselaer

LLM/KG FactChecker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

What awards has Deborah McGuinness won?

Submit

Number of re-submissions

4

Description of selected entity:

Deborah McGuinness is a Computer scientist, professor .



The LLM/KG FactChecker uses the OpenAI Completion API service to construct an entity/relation … es entity linking to look up both the entities and relationships against Wikidata entities and properties, constructing a JS…

For each re-submission of the user's prompt we display the ChatGPT response and the res…

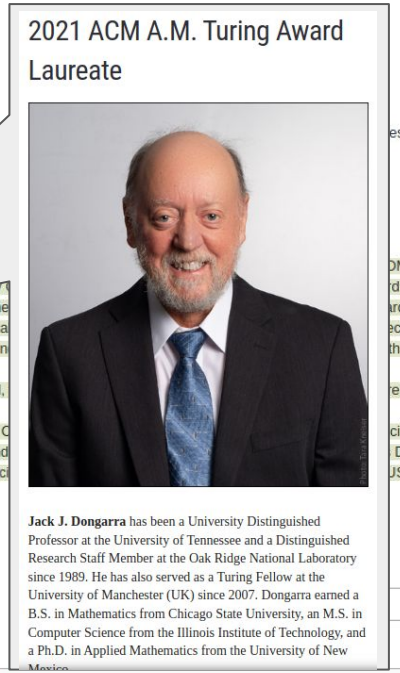
ChatGPT Results:

Limited to 100 tokens...

Result 1 : Deborah McGuinness has won many awards for her work in the ac… DM Research Contributions Award, the Insitu Leadership Award, the National Science Fo… d, the American Association for Artificial Intelligence Research Excellence Award, the D… ard. **Result 2 :** Deborah McGuinness has won the 2021 Turing Award, the 2017 Faith Manchester Memoria… echnologies Excellence Award, and the 2010 Open Source Award. She has also received numerous fellowships and honors, in… the 2012 INRIA International Chair.

Result 3 : Deborah McGuinness has won numerous awards, including the AAAI Classic Paper Award, … reer Award, the IEEE Emerging Technologies award, and the IJCAI Computers and Thought Award.

Result 4 : Deborah McGuinness has won numerous awards over her long career, including the IEEE C… cience Foundation CAREER award, the Association for the Advancement of Artificial Intelligence's Feigenbaum Prize, and … Distinguished Paper Award. She has also been honored with appointments to the President's Advisory Committee on Artifici… US National Committee on be iRobotics.



Summary of relationships found for these results:

Click on a row for more details about that row's subject entity

Show 10 entries

	Subject	Predicate	Object	Occurrences
1	Deborah McGuinness	award received	National Science Foundation CAREER Awards	2
2	Deborah McGuinness	fellowship		1
3	Deborah McGuinness	award received	IJCAI Computers and Thought Award	1
4	Deborah McGuinness	award received	Faith Manchester Memorial Award	1
5	Deborah McGuinness	award received	INRIA International Chair	1
6	Deborah McGuinness	award received	International Open Knowledge award	1
7	Deborah McGuinness	award received	Kristin Jenni Award	1

Data INCITE Shiny Proxy

Restart app | Stop app

Rensselaer

LLM/KG FactChecker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

Has Deborah McGuinness won the ACM Turing Award?

Submit

Number of re-submissions

10

Description of selected entity:

Deborah McGuinness is a Computer scientist, professor .



The LLM/KG FactChecker uses the OpenAI Completion API service to construct an entity/relation graph in the form **['entity1', 'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, constructing a JSON-LD graph as is proceeds.

For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Limited to 100 tokens...

Result 1 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 2 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 3 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 4 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 5 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 6 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 7 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 8 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 9 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 10 : No, Deborah McGuinness has not won the ACM Turing Award.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity

Show 10 entries

Search:

	Subject	Predicate	Object	Occurrences
1	Deborah McGuinness	award received	Turing Award	3
2	Deborah McGuinness	canonization status	not won	1

Showing 1 to 2 of 2 entries

Previous 1 Next

Download complete results graph as RDF (JSON-LD)

Rensselaer

A LLM/KG Fact Checker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

What awards has Deborah McGuinness won?

Submit

Number of re-submissions

5

Description of selected subject: *Deborah McGuinness is a Computer scientist, professor .*

AutoDesc summary of Subject's Wikidata:

Deborah L. McGuinness (Q5248328)

computer scientist, artificial intelligence researcher, university teacher, and information scientist (*2000) ♀; Fellow of the American Association for the Advancement of Science and Knowledge Graph Conference Lifetime Achievement Award

This text was generated automatically from Wikidata using AutoDesc.

ChatBS, the LLM/KG Fact Checker uses the OpenAI Completion API service (GPT-4-0613 model) to construct an entity/rela **'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and LD graph as is proceeds.

For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Result 1 : I'm sorry, but I couldn't find specific information on awards won by Deborah McGuinness. However, Deborah L. McGuinness is a well-known American computer scientist recognized for her work in knowledge representation and reasoning, description logic and the semantic web, among others. She has contributed to several notable projects and holds distinguished positions at various institutions which in itself is a significant achievement. It's possible that she has received awards or honors that are not publicly listed or widely known.

Result 2 : I'm afraid I couldn't find specific information on any awards that Deborah McGuinness may have won. She is a well-respected figure in the field of artificial intelligence and semantic web technology, and she's made significant contributions to the field. However, not all recognition comes in the form of awards and it's possible her achievements haven't been formally recognized with specific awards, or such information just isn't publicly available.

Result 3 : Deborah L. McGuinness is a renowned American Computer Scientist and Artificial Intelligence professional, mostly recognized for her work in knowledge representation and reasoning, and the semantic web. While specific awards may not be listed, her work has strongly contributed to the fields of artificial intelligence and computer science. As per available information, she's a fellow of the American Association for Artificial Intelligence and the Web Science Research Initiative. Please keep in mind that the information could have been changed, and I recommend checking her latest biographical information for the most accurate data.

Result 4 : Deborah McGuinness is a recognized leader in the field of artificial intelligence and semantic web technologies, but information regarding specific awards she may have received is not prominently listed or readily available. Her professional accomplishments, however, are notable and numerous. These include co-developing important ontology languages such as OWL and RDFS, and various leadership roles in scientific and research organizations. If she has won specific awards, you may need to consult more specialized or direct resources to find details.

Result 5 : Deborah McGuinness is a well-recognized figure in the field of artificial intelligence, semantic web, and knowledge representation. However, specific information about any awards she has won might not be readily available or publicized. For the most accurate information, it's best to refer to her biography or CV on her official webpage or professional network.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity. Objects highlighted in gray are bnodes (blank/unlabelled nodes) in the graph.

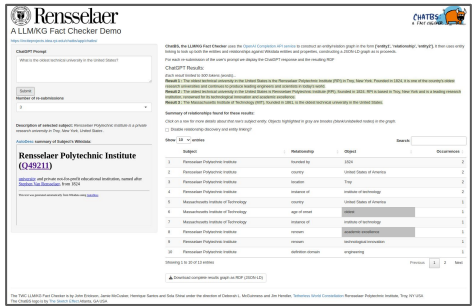
☑ Disable relationship discovery and entity linking?

Download complete results graph as RDF (JSON-LD)

Deborah's honors and awards *are* listed on her Wikipedia page and personal web site(s), but GPT-4's training appears not to have caught those… so it tap-dances!

NOTE: ChatBS may have been updated since these screenshots were captured…

ChatBS: TWC's LLM/KG FactChecker Demo



The LLM/KG FactChecker uses the OpenAI Completion API service to construct an entity/relation graph in the form **['entity1', 'relationship', 'entity2'].** It then uses **entity linking** to look up both the entities and relationships against Wikidata entities and properties, constructing a JSON-LD graph as is proceeds.

GPT model used:
GPT-4-0613

User prompt

Prompt submits [1:n]

Continuation Responses [1:n]

ChatBS Web App

ChatGPT-asserted relationships (RDF triples)

JSON-LD

continuation API*

OpenAI

prompt + text

label-based JSON Triple Array

Build labeled entity graph

Link Entities and Properties

Generate JSON-LD

labels URIs

WIKIDATA

ChatBS-REST Service

* https://platform.openai.com/docs/api-reference/completions

Rensselaer



Lessons? Discussion

- Our Context-aware LLM exploratory sandbox is just one example of an architecture
- More sandboxes and evaluation harnesses may benefit our field
- We can ask ChatGPT for some suggestions….



What are unsolved problems in formal ontology research? (by Chatgpt)

- Ontology alignment: Integrating multiple ontologies or aligning different parts of a single ontology is a challenging task. Developing techniques to automatically align ontologies, resolve semantic heterogeneity, and handle inconsistencies is …needed
- Ontology evolution: Ontologies are dynamic and need to evolve over time to reflect changes in the domain they represent. Managing ontology evolution, including identifying and propagating changes, maintaining consistency, and handling versioning and compatibility… is needed
- Ontology modularization: Large ontologies can become complex and difficult to manage. Techniques for decomposing ontologies into smaller, modular components while preserving important relationships and ensuring coherence are still an active area of research.
- Ontology evaluation: Evaluating the quality and effectiveness of ontologies is essential. Developing objective metrics and evaluation frameworks to assess ontology quality, usability, completeness, and correctness is an ongoing challenge.

What are unsolved problems in formal ontology research? (by Chatgpt)

- Ontology learning and population: Automatically constructing ontologies from unstructured or semi-structured data is …needed Techniques for ontology learning, including concept extraction, relationship identification, and population of ontology instances … are active research areas.
- Reasoning scalability: Efficient reasoning is crucial for utilizing ontologies effectively. Developing scalable reasoning algorithms that can handle large-scale ontologies and complex reasoning tasks while maintaining acceptable performance is a significant challenge.
- Uncertainty and vagueness in ontologies: Ontologies often deal with imperfect or uncertain information. Capturing and representing uncertainty and vagueness in ontologies and developing reasoning techniques that can handle such knowledge …is needed.
- Ontology visualization and user interfaces: Presenting ontologies in a human-readable and intuitive manner is essential for effective knowledge representation and user interaction. Developing visualization techniques and user interfaces that facilitate ontology exploration, editing, and understanding is an area of active research.



Brainstorming – Lets Leverage LLMs

- Ontology alignment
- Ontology evolution
- Ontology modularization
- Ontology evaluation
- Ontology learning and population:
- Reasoning scalability
- Uncertainty and vagueness in ontologies
- Ontology visualization and user interfaces

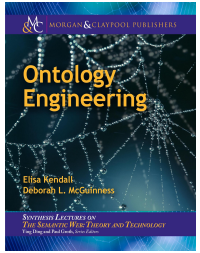
- What are your pain points?
  - Good competency question generation with adequate depth and breadth
  - Good benchmark generation
  - Use case generation in general
  - Exploration for good starting point ontologies

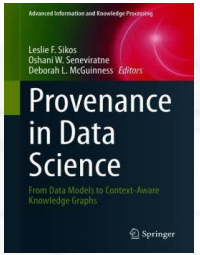


Questions?

Collaboration is key to the future

AI will not replace most knowledge professionals but many knowledge professionals who do not collaborate with generative AI will be replaced





The generative AI explosion provides the Semantic community (Ontologies, Provenance, Web 3, …) with a unique opportunity to shine *AND* a time to rethink our methods

Many people contributed to the projects and ideas mentioned, a few include: Jans Aasman (Franz Inc), the RPI Tetherless World team particularly McCusker, Erickson, Pinheiro, Santos, Rashid, Franklin, Chari, Shirai, Seneviratne, Hendler, … and the broader community particularly: Chorpita, Kendall, Bennett, Qi, Zaki, Stingone, Masters,Teitelbaum, Brinson, Schadler, Daegen, Chen, …
Funding IBM-RPI HEALS AI Horizons, NIEHS HHEAR 0255-0236-4609 / 1U2CES026555-01, NSF HDR ACI-1640840, NIMD 75N95022C00018, DARPA MCS N660011924033, DARPA KAIROS CW3016789, IARPA HIATUS A22-0316… Contact: dlm@cs.rpi.edu and dlmcguinness@gmail.com

EXTRA - FOIS Content



Opportunity Messages (from my FOIS ‘23 talk)

1. LLMs accomplishments should be acknowledged & leveraged
2. Ontologies and KGs may help communicate & interoperate
3. Ontologies and KGs may help large language models move up the Data-Information-Knowledge-Wisdom pyramid
4. Ontologies and KGs may help address policy and accountability needs/requirements
5. Ontologies / KGs and LLMs *could* be a complementary “marriage”
6. COLLABORATE!
7. Explore opportunities, create exploration “sandboxes””
8. Assessment tools are potentially a BIG opportunity
9. Harmonized data portals are still needed
10. Hybrid AI solutions and pipelines are an opportunity
11. Accountability is an opportunity and

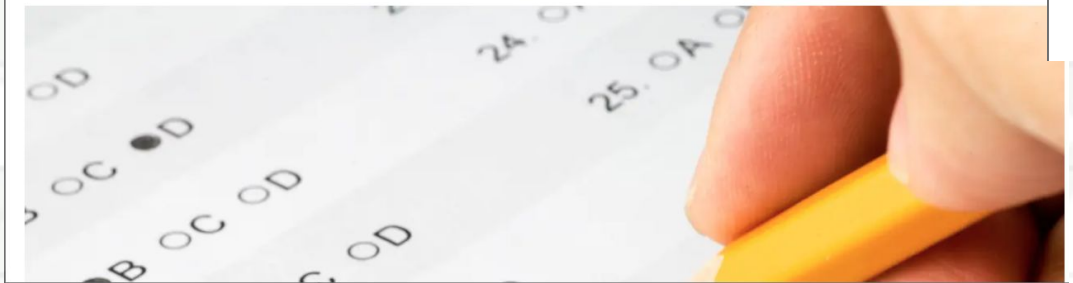
Surprising Speed and Accomplishments

The newest version of ChatGPT passed the US medical licensing exam with flying colors — and diagnosed a 1 in 100,000 condition in seconds

HOME > TECH

OpenAI just announced GPT-4, an updated chatbot that can pass everything from a bar exam to AP Biology. Here's a list of difficult exams both AI versions have passed.

Lakshmi Varanasi Mar 21, 2023, 1:36 PM EDT



- A doctor and Harvard computer scientist says GPT-4 has better clinical judgment than "many doctors."
- The chatbot can diagnose rare conditions "just as I would," he said.
- But GPT-4 can also make mistakes, and it hasn't taken the Hippocratic oath.

Message 1 – LLMs accomplishments should be acknowledged and leveraged



What are ontologies and why are they important? (by Chatgpt)

Ontologies are formal representations of knowledge that define concepts and their relationships within a specific domain. They provide a structured and standardized way to represent and organize knowledge, allowing for effective data integration, reasoning, and communication between different systems and applications.

1. Knowledge representation: Ontologies help capture and organize knowledge in a machine-readable format. … they provide a common understanding of the domain, enabling interoperability and knowledge sharing among different systems and users.
2. Data integration and interoperability: Ontologies act as a bridge between different data sources and systems that may use different terminologies or structures. They facilitate data integration by mapping disparate data to a shared ontology, allowing for seamless information exchange and integration across diverse sources.
3. Semantic reasoning: They enable automated reasoning & inference by specifying the logical relationships between concepts. With the help of reasoning engines, ontologies can infer new knowledge or identify inconsistencies within the existing knowledge, enabling more I ntelligent decision-making and problem-solving.

What are ontologies and why are they important? (by Chatgpt)

1.

4, Search and discovery: Ontologies enhance search and discovery capabilities by providing a structured framework for organizing and classifying information. By leveraging the hierarchical structure and semantic relationships, ontologies enable more precise and context-aware searches, improving the accuracy and relevance of search results.

5. Standardization and reusability: Ontologies promote standardization by providing a shared vocabulary and conceptual model for a particular domain. This standardization encourages consistency and harmonization across different applications and systems, facilitating data exchange, collaboration, and reusability of knowledge resources.

6. Knowledge-based systems: Ontologies serve as a foundation for developing knowledge-based systems, such as expert systems or intelligent agents. By capturing domain-specific knowledge and defining the rules and relationships, ontologies enable the development of intelligent applications that can reason, infer, and provide valuable insights and recommendations.

Overall, ontologies play a crucial role in knowledge management, data integration, reasoning, and Intelligent decision-making, making them essential tools in various fields, including. emantic web, healthcare, e-commerce, and many others.

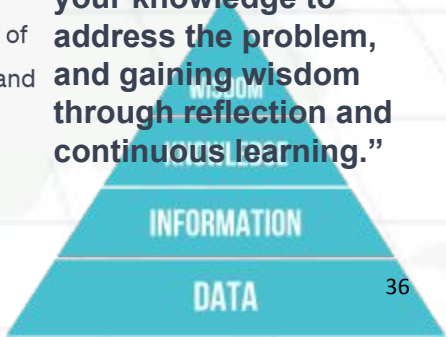
Message 2 – Ontologies may help support communication & interoperation

What does it take to move up the DIKW pyramid?

Moving up the data to information to knowledge to wisdom pyramid involves a process of transforming raw data into actionable insights that can inform decision-making. Here are some key steps that can help you move up the pyramid:

1. Collect and organize data: The first step is to collect and organize the data relevant to the problem you are trying to solve. This can involve gathering data from various sources cleaning and preparing it for analysis.
2. Analyze the data: Once the data is organized, you need to analyze it to extract meaningful information. This can invol applying statistical techniques and data visualization tools uncover patterns and trends in the data.
3. Synthesize information: After analyzing the data, you need to synthesize the information you have gathered and identify the key insights. This involves identifying the relationships and patterns within the data and drawing conclusions from them.
4. Apply knowledge: Once you have identified the key insights, you can start to apply your knowledge to address the problem at hand. This involves using your understanding of the data to develop solutions or strategies that can help you achieve your goals.
5. Gain wisdom: Finally, gaining wisdom involves reflecting on your experiences and using your knowledge to make better decisions in the future. This requires a deep understanding of the problem and a willingness to learn from your mistakes and successes.

"Moving up the data to information to knowledge to wisdom pyramid involves a **process of collecting and organizing data, analyzing it to extract meaningful insights, synthesizing information to identify key insights, applying your knowledge to address the problem, and gaining wisdom through reflection and continuous learning."**



Message 3 - Ontologies and Knowledge Graphs may help move up the DIKW pyramid

Emerging Discussions / Legislation



Message 4 –Ontologies and KGs may help address policy needs / requirements

- Safe and Effective Systems (pre-deployment testing, mitigate unsafe outcomes)
- Algorithmic Discrimination Protections (equitable use of algorithms)
- Data Privacy (protections for data collection/use)
- Notice and Explanations (know when automated system used, how it impacts you/use)
- Human Alternatives, Consideration and Fallback (opt out, remedies)

Presidential Level Continues – PCAST Working Group Launched

- May 13 announcement inviting public input; public meeting May 19

1. In an era in which convincing images, audio, and text can be generated with ease on a massive scale, how can we ensure reliable access to verifiable, trustworthy information? How can we be certain that a particular piece of media is genuinely from the claimed source?
2. How can we best deal with the use of AI by malicious actors to manipulate the beliefs and understanding of citizens?
3. What technologies, policies, and infrastructure can be developed to detect and counter AI-generated disinformation?
4. How can we ensure that the engagement of the public with elected representatives—a cornerstone of democracy—is not drowned out by AI-generated noise?
5. How can we help everyone, including our scientific, political, industrial, and educational leaders, develop the skills needed to identify AI-generated misinformation, impersonation, and manipulation?

https://www.whitehouse.gov/pcast/briefing-room/2023/05/13/pcast-working-group-on-gene

Limitations (According to OpenAI)

- “One challenge with generative AI is to ensure that the generated data is coherent, consistent, and semantically meaningful. This is where knowledge graphs can come in handy.”

- Leads to needs for semantics, provenance, (logical) relationships, …. Well aligned with ontologies and KGs



Opportunistic Challenges / Strengths

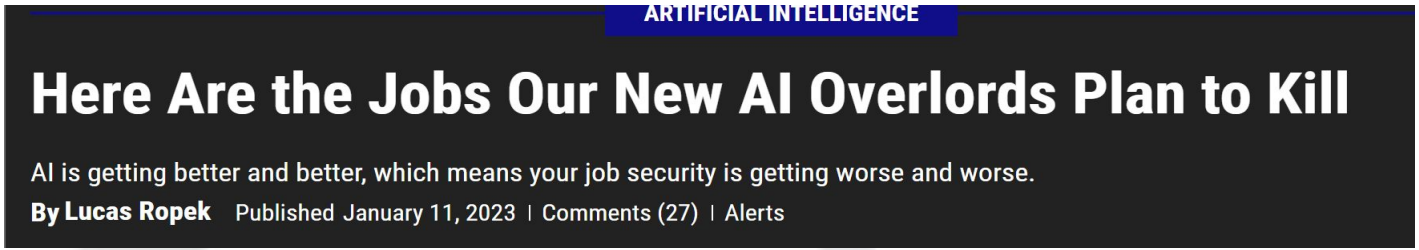
LLMs (selected) challenges

- Coherence
- Provenance
- Semantics
- Explainability

Align well with Ontology capabilities

Message 5 – LLMs and ontologies *could* be a complementary “marriage”

Threat AND Opportunity


ARTIFICIAL INTELLIGENCE

Here Are the Jobs Our New AI Overlords Plan to Kill

AI is getting better and better, which means your job security is getting worse and worse.

By Lucas Ropek Published January 11, 2023 | Comments (27) | Alerts

From Gizmodo:
Artists, Customer Service Agents, Copywriters, Lawyers, Scientists, Computer Programmers, Influencers and Fashion Models, Journalists ?

Message 6 Collaborate!

Generative AI will not replace *most* knowledge professionals, but many knowledge professionals who do not *collaborate* with AI will be replaced

Some Collaboration Areas

- Again asking ChatGPT, it suggested:
  - Transparency / Provenance
  - Accuracy
  - Privacy
  - Fairness
  - Accountability

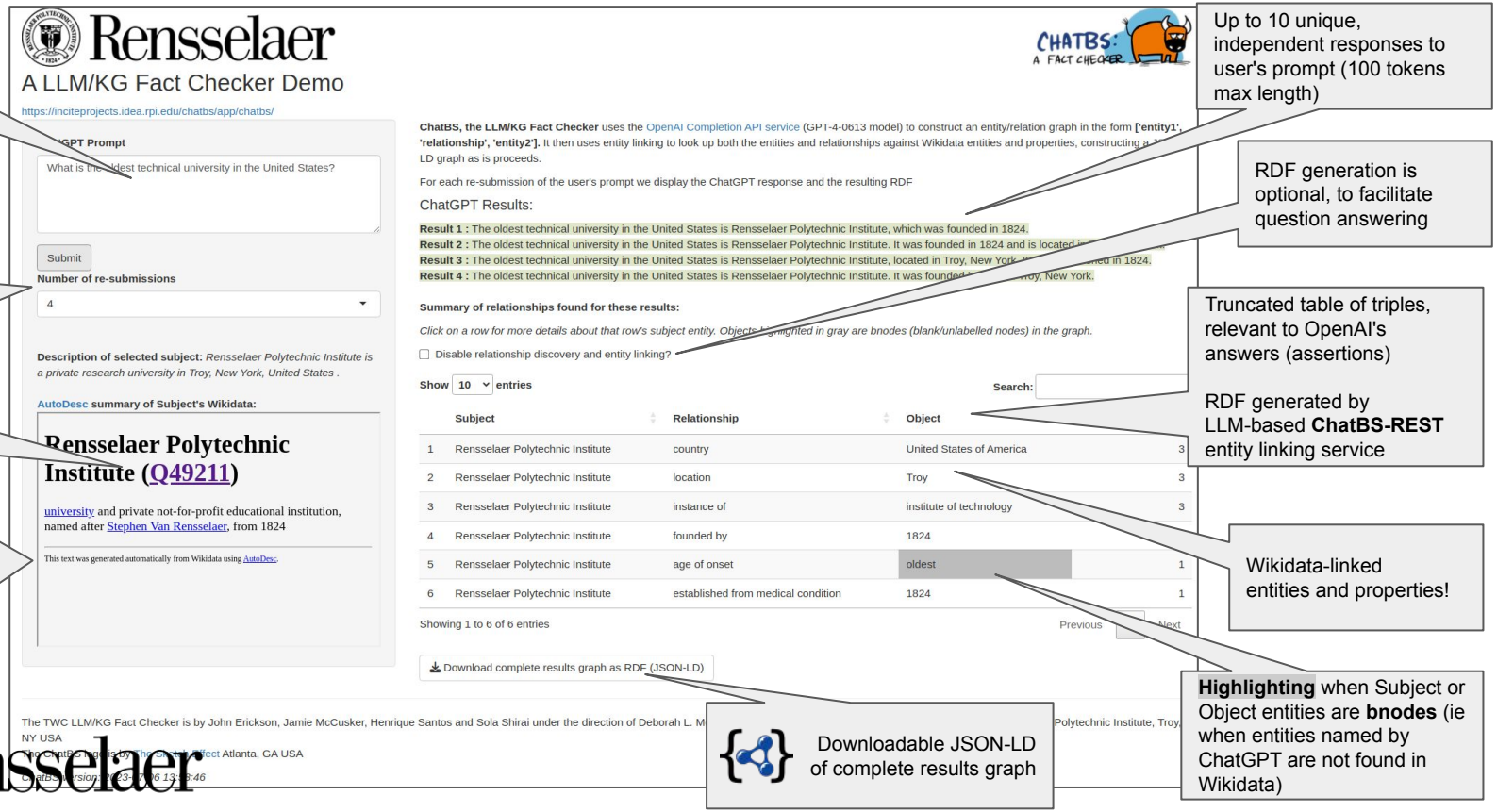
Message 7 – Explore opportunities, create exploration “sandboxes”

ChatBS: TWC's LLM/KG FactChecker Demo

App Version: 2023-07-06 13:58:46 (GPT-4-0613)

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatBS, the LLM/KG Fact Checker uses the OpenAI Completion API service (GPT-4-0613 model) to construct an entity/relation graph in the form **['entity1', 'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, constructing a JSON-LD graph as is proceeds.



Submit questions to OpenAI Completion API

Up to 10 question re-submissions

Link to Wikidata Wiki for selected Subject entity (opens new tab)

Embedded Wikidata entity summary (using **AutoDesc API**) of selected entity…to aid in human fact checking!

Up to 10 unique, independent responses to user's prompt (100 tokens max length)

RDF generation is optional, to facilitate question answering

Truncated table of triples, relevant to OpenAI's answers (assertions)

RDF generated by LLM-based **ChatBS-REST** entity linking service

Wikidata-linked entities and properties!

Highlighting when Subject or Object entities are **bnodes** (ie when entities named by ChatGPT are not found in Wikidata)

Downloadable JSON-LD of complete results graph

Rensselaer

ChatBS: RPI Tetherless World Constellation (TWC) Large Language Model / KG FactChecker Demo

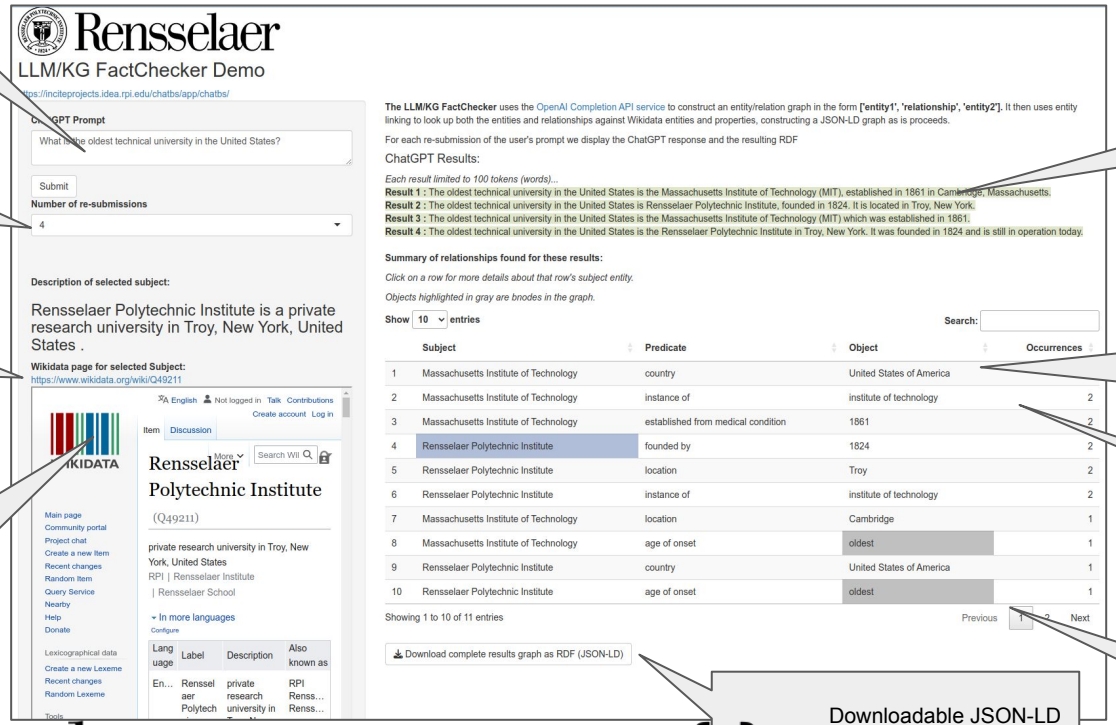
The LLM/KG FactChecker uses the OpenAI Completion API service to construct an entity/relation graph in the form **['entity1', 'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, constructing a JSON-LD graph as is proceeds.

Submit questions to OpenAI Completion API

Up to 10 question re-submissions

Link to Wikidata Wiki for selected Subject entity (opens new tab)

Embedded Wikidata Wiki page of selected entity…to aid for human BS checking!



Up to 10 unique, independent responses to user's prompt (100 tokens max length)

Truncated table of triples, relevant to OpenAI's answers (assertions)

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Wikidata-linked entities and properties!

Highlighting when Subject or Object entities are **bnodes** (ie when entities named by ChatGPT are not found in Wikidata)

Downloadable JSON-LD of complete results graph

Rensselaer

Erickson, McCusker, Santos, Shirai, McGuinness, Hendler, …

Rensselaer

LLM/KG FactChecker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

Who is Deborah McGuinness?

Submit

Number of re-submissions

4

Description of selected entity:

Deborah McGuinness is a Computer scientist, professor .



The LLM/KG FactChecker uses the OpenAI Completion API service to construct an entity/relation graph in the form **['entity1', 'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, constructing a JSON-LD graph as is proceeds.

For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Each result limited to 100 tokens (words)...

Result 1 : Deborah McGuinness is an American computer scientist and professor at Rensselaer Polytechnic Institute who holds the Tetherless World Chair at RPI. She is the founding director of the Rensselaer Institute for Data Exploration and Applications and the Tetherless World Constellation. McGuinness is an expert in the area of Semantic Web, Artificial Intelligence, and cyber-security. She specializes in developing knowledge representation and reasoning systems for decision support and policy management. She has authored

Result 2 : Deborah L. McGuinness is a computer scientist and professor at Rensselaer Polytechnic Institute in upstate New York, USA. She is widely recognized for her innovation in knowledge representation and reasoning, semantic web and linked open data, intelligent information integration, and trustworthiness of AI systems. She is a Fellow of both the Association for the Advancement of Artificial Intelligence and the American Association for the Advancement of Science. She is a leader in creating open standards and vocabular

Result 3 : Deborah McGuinness is an American computer scientist and a professor at Rensselaer Polytechnic Institute. She is widely recognized as a leader in the development of knowledge representation and reasoning capabilities within artificial intelligence programming systems. She has done research in ontologies, semantic web, knowledge systems, and data integration, and is credited with developing the FRODO web services architecture, which is now part of the W3C's Semantic Web standard. She is also the Founding Director of the

Result 4 : Deborah L. McGuinness is an American computer scientist, professor, and advisor in the area of artificial intelligence. She is the founding director of the Tetherless World Constellation at Rensselaer Polytechnic Institute. She is a recognized leader in the areas of knowledge representation, privacy, trust, uncertainty reasoning, and the semantic web.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity

Show 10 entries

Search:

	Subject	Predicate	Object	Occurrences
1	Deborah McGuinness	occupation	computer scientist	2
2	Deborah McGuinness	position played on team / speciality	professor	2
3	Deborah L. McGuinness	expertise	semantic web and linked open data	1
4	Deborah L. McGuinness	expertise	intelligent information integration	1
5	Deborah L. McGuinness	expertise	trustworthiness of AI systems	1
6	Deborah L. McGuinness	expertise	knowledge representation and reasoning	1
7	Deborah L. McGuinness	occupation	computer scientist	1
8	Deborah L. McGuinness	employer	Rensselaer Polytechnic Institute	1
9	Deborah L. McGuinness	location	Upstate New York	1
10	Deborah L. McGuinness	country of citizenship	United States of America	1

Showing 1 to 10 of 47 entries

Previous 1 2 3 4 5 Next

Rensselaer

A LLM/KG Fact Checker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

Who is Deborah McGuinness?

Submit

Number of re-submissions

4

Description of selected subject: *Deborah McGuinness is a Computer scientist, professor .*

AutoDesc summary of Subject's Wikidata:

Deborah L. McGuinness (Q5248328)

computer scientist, artificial intelligence researcher, university teacher, and information scientist (*2000) ♀; Fellow of the American Association for the Advancement of Science and Knowledge Graph Conference Lifetime Achievement Award

This text was generated automatically from Wikidata using AutoDesc.

CHATBS: A FACT CHECKER

Each of these responses is essentially correct, yet each is distinct.

This demonstrates why it is important to submit questions multiple times when studying GTP-4-generated "explanations."

ChatBS, the LLM/KG Fact Checker uses the OpenAI Completion API service (GPT-4-0613 model) to construct an entity/relation graph in the f
'relationship', 'entity2']. It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, constru
LD graph as is proceeds.

For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Result 1 : Deborah McGuinness is a leading expert in the field of artificial intelligence, specifically in knowledge representation and reasoning, ontologies, and the Semantic Web. She is a professor in the Tetherless World Constellation at Rensselaer Polytechnic Institute and has also worked extensively in industry, including roles at AT&T Labs and Bell Labs. McGuinness is known for her pioneering work developing languages and environments for the Semantic Web, including OWL, the Web Ontology Language. She is also a co-director of the Web Science Research Center at Rensselaer.
Result 2 : Deborah McGuinness is a renowned American computer scientist known for her work in the field of artificial intelligence. She has made notable contributions in areas like knowledge representation and reasoning, ontology development, and the semantic web. McGuinness is a Tetherless World Senior Constellation Chair and Professor of Computer, Cognitive, and Web Sciences at the Rensselaer Polytechnic Institute in New York. She co-developed the Ontology Inference Layer (OIL) and its description logic-based successor, and a component of the W3C recommendations for the Semantic Web standards.
Result 3 : Deborah McGuinness is a notable figure in the field of artificial intelligence and semantic web technology. She is a Professor of Computer and Cognitive Science at Rensselaer Polytechnic Institute (RPI). McGuinness is known for her work in knowledge representation and reasoning environments, ontology creation, and the development and deployment of semantic web applications. She is particularly recognized for her contributions to the development of the Web Ontology Language (OWL), a semantic web language standard used to represent rich and complex knowledge about things, groups of things, and relations between things.
Result 4 : Deborah McGuinness is a well-known American computer scientist who is recognized for her work in the field of artificial intelligence, particularly in knowledge representation and reasoning, description logics, ontologies, and the Semantic Web. She has contributed significantly to helping computers and humans to use data and information more effectively. She's been associated with prestigious institutions like Stanford University and Rensselaer Polytechnic Institute. McGuinness is also a co-inventor of the Web Ontology Language (OWL), a language for creating web-based ontologies, which is widely used in data management, data integration, and business intelligence applications.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity. Objects highlighted in gray are bnodes (blank/unlabelled nodes) in the graph.

☐ Disable relationship discovery and entity linking?

Show 10 entries

Search:

	Subject	Relationship	Object	Occurrences
1	Deborah McGuinness	occupation	computer scientist	2
2	Deborah McGuinness	translation contribution URL	knowledge representation and reasoning	2
3	Deborah McGuinness	translation contribution URL	Semantic Web	2

Rensselaer

A LLM/KG Fact Checker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/



Simple question, widely varying (and all imprecise) answers!!

Correct answer: **1998 - 2007**

ChatGPT Prompt

When did Deborah McGuinness work at Stanford?

Submit

Number of re-submissions

10

Description of selected subject: *Deborah McGuinness is a Computer scientist, professor .*

AutoDesc summary of Subject's Wikidata:

Deborah L. McGuinness (Q5248328)

computer scientist, artificial intelligence researcher, university teacher, and information scientist (*2000) ♀; Fellow of the American Association for the Advancement of Science and Knowledge Graph Conference Lifetime Achievement Award

This text was generated automatically from Wikidata using AutoDesc.

ChatBS, the LLM/KG Fact Checker uses the OpenAI Completion API service (GPT-4-0613 model) to construct an entity/relation graph in **'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, c LD graph as is proceeds.

For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Result 1 : Deborah McGuinness was a faculty member at Stanford University from 2001 to 2006.
Result 2 : Deborah McGuinness was a Senior Research Scientist/Research Scientist at Stanford University from 1995 to 2007.
Result 3 : Deborah McGuinness worked at Stanford University's Knowledge Systems Laboratory, as a senior research scientist and co-director, between 1997 to 2002.
Result 4 : Deborah McGuinness was a senior research scientist at Stanford University from 1999 to 2007.
Result 5 : Deborah McGuinness worked at Stanford University from 2001 to 2006 as the co-director of the Knowledge Systems AI Lab.
Result 6 : Deborah McGuinness was a Senior Research Scientist at Stanford University from 2000 to 2006.
Result 7 : Deborah McGuinness was a Senior Research Scientist at Stanford University from 2000-2007.
Result 8 : Deborah McGuinness worked at Stanford University from 2001 to 2007. She was part of the Knowledge Systems Laboratory in the Department of Computer Science.
Result 9 : Deborah McGuinness was a Senior Research Scientist and co-director of the Knowledge Systems Laboratory at Stanford University from 1999 to 2007.
Result 10 : Deborah McGuinness worked at Stanford University from 2000 to 2007 as a Senior Research Scientist and co-director of the Knowledge Systems Laboratory in the Computer Science Department.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity. Objects highlighted in gray are bnodes (blank/unlabelled nodes) in the graph.

☑ Disable relationship discovery and entity linking?

Download complete results graph as RDF (JSON-LD)

NOTE: ChatBS may have been updated since these screenshots were captured…

Data INCITE Shiny Proxy

Restart app | Stop app

Rensselaer

LLM/KG FactChecker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

What awards has Deborah McGuinness won?

Submit

Number of re-submissions

4

Description of selected entity:

Deborah McGuinness is a Computer scientist, professor .



The LLM/KG FactChecker uses the OpenAI Completion API service to construct an entity/relation … es entity linking to look up both the entities and relationships against Wikidata entities and properties, constructing a JS…

For each re-submission of the user's prompt we display the ChatGPT response and the res…

ChatGPT Results:

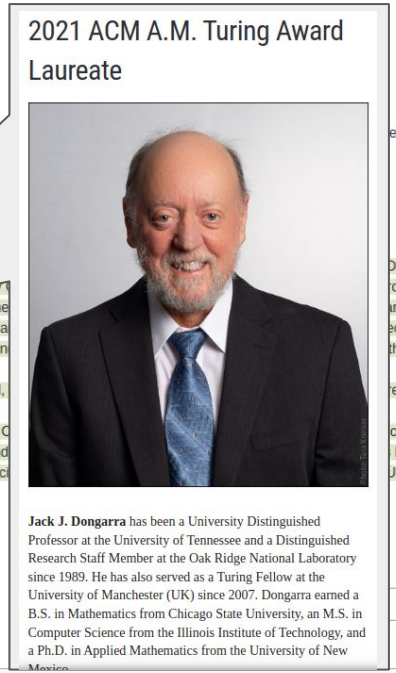
Limited to 100 tokens...

Result 1 : Deborah McGuinness has won many awards for her work in the ac… OM Research Contributions Award, the Insitu Leadership Award, the National Science Fo… d, the American Association for Artificial Intelligence Research Excellence Award, the D… ard.

Result 2 : Deborah McGuinness has won the 2021 Turing Award, the 2017 Faith Manchester Memoria… echnologies Excellence Award, and the 2010 Open Source Award. She has also received numerous fellowships and honors, in… the 2012 INRIA International Chair.

Result 3 : Deborah McGuinness has won numerous awards, including the AAAI Classic Paper Award, … reer Award, the IEEE Emerging Technologies award, and the IJCAI Computers and Thought Award.

Result 4 : Deborah McGuinness has won numerous awards over her long career, including the IEEE C… cience Foundation CAREER award, the Association for the Advancement of Artificial Intelligence's Feigenbaum Prize, and … Distinguished Paper Award. She has also been honored with appointments to the President's Advisory Committee on Artifici… US National Committee on be iRobotics.



Summary of relationships found for these results:

Click on a row for more details about that row's subject entity

Show 10 entries

	Subject	Predicate	Object	Occurrences
1	Deborah McGuinness	award received	National Science Foundation CAREER Awards	2
2	Deborah McGuinness	fellowship		1
3	Deborah McGuinness	award received	IJCAI Computers and Thought Award	1
4	Deborah McGuinness	award received	Faith Manchester Memorial Award	1
5	Deborah McGuinness	award received	INRIA International Chair	1
6	Deborah McGuinness	award received	International Open Knowledge award	1
7	Deborah McGuinness	award received	Kristin Jenni Award	1

Data INCITE Shiny Proxy

Restart app | Stop app

Rensselaer

LLM/KG FactChecker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

Has Deborah McGuinness won the ACM Turing Award?

Submit

Number of re-submissions

10

Description of selected entity:

Deborah McGuinness is a Computer scientist, professor .



The LLM/KG FactChecker uses the OpenAI Completion API service to construct an entity/relation graph in the form **['entity1', 'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and properties, constructing a JSON-LD graph as is proceeds.

For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Limited to 100 tokens...

Result 1 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 2 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 3 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 4 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 5 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 6 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 7 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 8 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 9 : No, Deborah McGuinness has not won the ACM Turing Award.
Result 10 : No, Deborah McGuinness has not won the ACM Turing Award.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity

Show 10 entries

Search:

	Subject	Predicate	Object	Occurrences
1	Deborah McGuinness	award received	Turing Award	3
2	Deborah McGuinness	canonization status	not won	1

Showing 1 to 2 of 2 entries

Previous 1 Next

Download complete results graph as RDF (JSON-LD)

Rensselaer

A LLM/KG Fact Checker Demo

https://inciteprojects.idea.rpi.edu/chatbs/app/chatbs/

ChatGPT Prompt

What awards has Deborah McGuinness won?

Submit

Number of re-submissions

5

Description of selected subject: *Deborah McGuinness is a Computer scientist, professor .*

AutoDesc summary of Subject's Wikidata:

Deborah L. McGuinness (Q5248328)

computer scientist, artificial intelligence researcher, university teacher, and information scientist (*2000) ♀; Fellow of the American Association for the Advancement of Science and Knowledge Graph Conference Lifetime Achievement Award

This text was generated automatically from Wikidata using AutoDesc.

ChatBS, the LLM/KG Fact Checker uses the OpenAI Completion API service (GPT-4-0613 model) to construct an entity/rela **'relationship', 'entity2'].** It then uses entity linking to look up both the entities and relationships against Wikidata entities and LD graph as is proceeds.

For each re-submission of the user's prompt we display the ChatGPT response and the resulting RDF

ChatGPT Results:

Result 1 : I'm sorry, but I couldn't find specific information on awards won by Deborah McGuinness. However, Deborah L. McGuinness is a well-known American computer scientist recognized for her work in knowledge representation and reasoning, description logic and the semantic web, among others. She has contributed to several notable projects and holds distinguished positions at various institutions which in itself is a significant achievement. It's possible that she has received awards or honors that are not publicly listed or widely known.

Result 2 : I'm afraid I couldn't find specific information on any awards that Deborah McGuinness may have won. She is a well-respected figure in the field of artificial intelligence and semantic web technology, and she's made significant contributions to the field. However, not all recognition comes in the form of awards and it's possible her achievements haven't been formally recognized with specific awards, or such information just isn't publicly available.

Result 3 : Deborah L. McGuinness is a renowned American Computer Scientist and Artificial Intelligence professional, mostly recognized for her work in knowledge representation and reasoning, and the semantic web. While specific awards may not be listed, her work has strongly contributed to the fields of artificial intelligence and computer science. As per available information, she's a fellow of the American Association for Artificial Intelligence and the Web Science Research Initiative. Please keep in mind that the information could have been changed, and I recommend checking her latest biographical information for the most accurate data.

Result 4 : Deborah McGuinness is a recognized leader in the field of artificial intelligence and semantic web technologies, but information regarding specific awards she may have received is not prominently listed or readily available. Her professional accomplishments, however, are notable and numerous. These include co-developing important ontology languages such as OWL and RDFS, and various leadership roles in scientific and research organizations. If she has won specific awards, you may need to consult more specialized or direct resources to find details.

Result 5 : Deborah McGuinness is a well-recognized figure in the field of artificial intelligence, semantic web, and knowledge representation. However, specific information about any awards she has won might not be readily available or publicized. For the most accurate information, it's best to refer to her biography or CV on her official webpage or professional network.

Summary of relationships found for these results:

Click on a row for more details about that row's subject entity. Objects highlighted in gray are bnodes (blank/unlabelled nodes) in the graph.

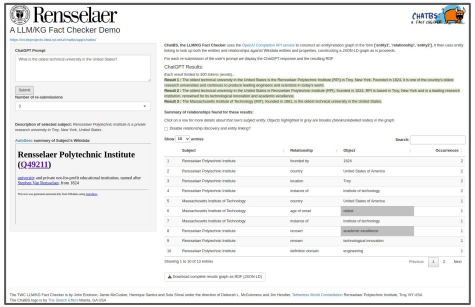
☑ Disable relationship discovery and entity linking?

Download complete results graph as RDF (JSON-LD)

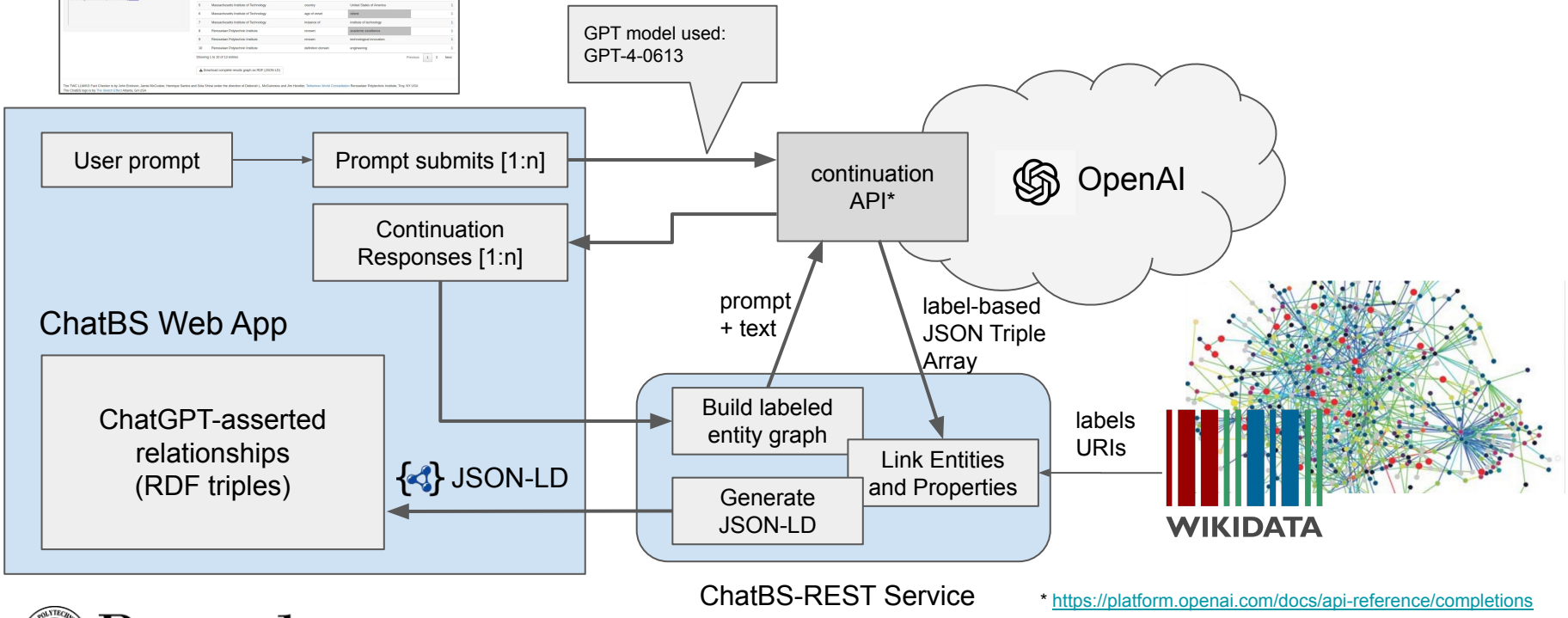
Deborah's honors and awards *are* listed on her Wikipedia page and personal web site(s), but GPT-4's training appears not to have caught those… so it tap-dances!

NOTE: ChatBS may have been updated since these screenshots were captured…

ChatBS: TWC's LLM/KG FactChecker Demo



The LLM/KG FactChecker uses the OpenAI Completion API service to construct an entity/relation graph in the form **['entity1', 'relationship', 'entity2'].** It then uses **entity linking** to look up both the entities and relationships against Wikidata entities and properties, constructing a JSON-LD graph as is proceeds.



* https://platform.openai.com/docs/api-reference/completions

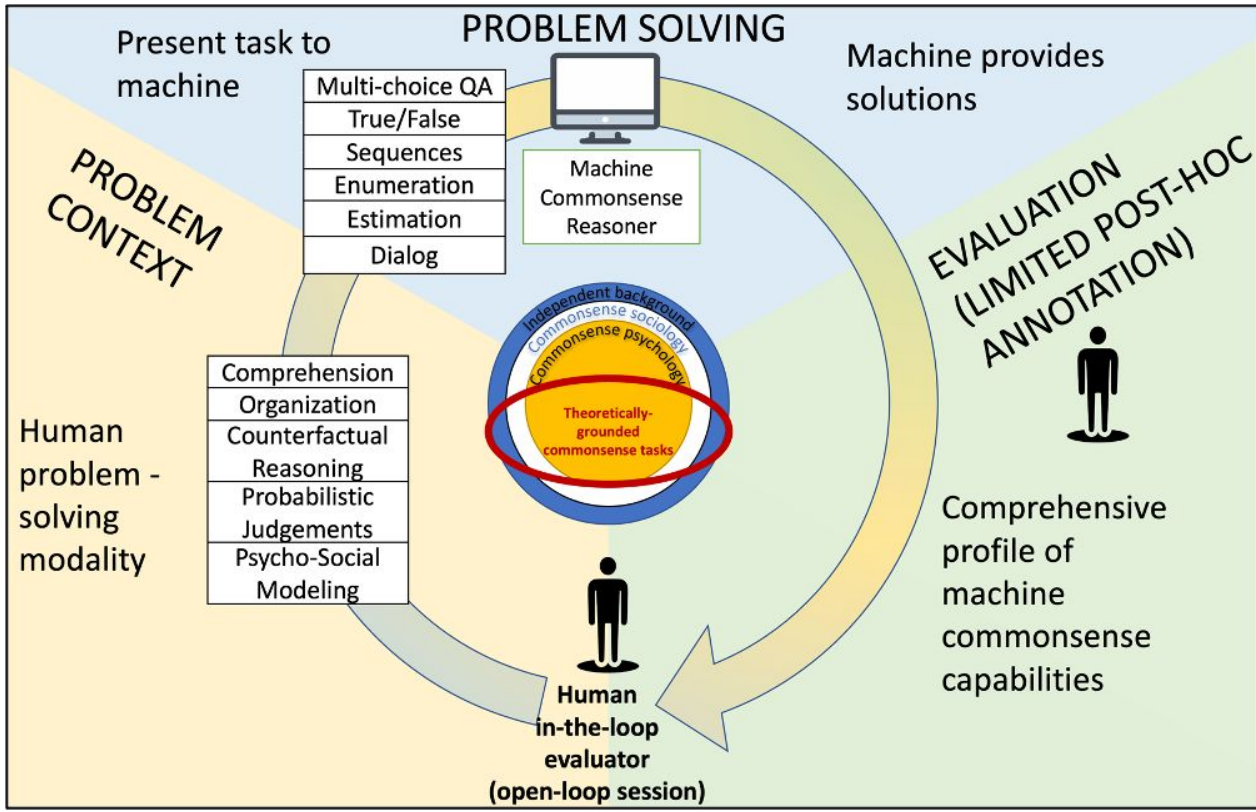
Rensselaer

WARNING: Internal to Rensselaer/TWC!!

Assessment of commonsense proficiency in conversational systems

- Context-aware evaluation
- Different problem solving modalities
- Presentation formats
- Research questions:
  - How does the above affect machine problem solving?
  - What is the benefit of the human-in-the-loop? Can we adapt it to human-in-the-loop instructable systems?

Drive multi-hop machine reasoning, provide feedback on improvements to the dataset [2]



[1] Kejriwal, Santos, Mulvehill, McGuinness. 2022. Designing a strong test for measuring true common-sense reasoning. Nature Machine Intelligence.

[2] Kejriwal, Santos, Mulvehill, McGuinness. 2023. Context-Rich Evaluation of Machine Common Sense. Artificial General Intelligence (AGI-23).

Message 8 – Assessment tools are an opportunity

Partially DARPA MCS

What are unsolved problems in formal ontology research? (by Chatgpt)

- Ontology alignment: Integrating multiple ontologies or aligning different parts of a single ontology is a challenging task. Developing techniques to automatically align ontologies, resolve semantic heterogeneity, and handle inconsistencies is …needed
- Ontology evolution: Ontologies are dynamic and need to evolve over time to reflect changes in the domain they represent. Managing ontology evolution, including identifying and propagating changes, maintaining consistency, and handling versioning and compatibility… is needed
- Ontology modularization: Large ontologies can become complex and difficult to manage. Techniques for decomposing ontologies into smaller, modular components while preserving important relationships and ensuring coherence are still an active area of research.
- Ontology evaluation: Evaluating the quality and effectiveness of ontologies is essential. Developing objective metrics and evaluation frameworks to assess ontology quality, usability, completeness, and correctness is an ongoing challenge.

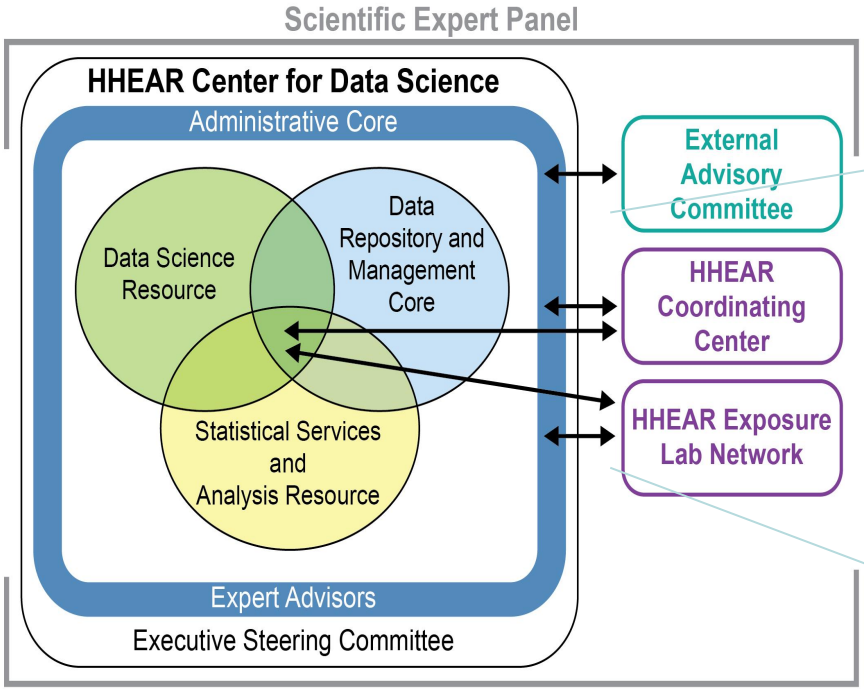
What are unsolved problems in formal ontology research? (by Chatgpt)

- Ontology learning and population: Automatically constructing ontologies from unstructured or semi-structured data is …needed Techniques for ontology learning, including concept extraction, relationship identification, and population of ontology instances … are active research areas.
- Reasoning scalability: Efficient reasoning is crucial for utilizing ontologies effectively. Developing scalable reasoning algorithms that can handle large-scale ontologies and complex reasoning tasks while maintaining acceptable performance is a significant challenge.
- Uncertainty and vagueness in ontologies: Ontologies often deal with imperfect or uncertain information. Capturing and representing uncertainty and vagueness in ontologies and developing reasoning techniques that can handle such knowledge …is needed.
- Ontology visualization and user interfaces: Presenting ontologies in a human-readable and intuitive manner is essential for effective knowledge representation and user interaction. Developing visualization techniques and user interfaces that facilitate ontology exploration, editing, and understanding is an area of active research.

Brainstorming – Lets Leverage LLMs

- Ontology alignment
- Ontology evolution
- Ontology modularization
- Ontology evaluation
- Ontology learning and population:
- Reasoning scalability
- Uncertainty and vagueness in ontologies
- Ontology visualization and user interfaces

Human Health Exposure Analysis Repository (NIEHS)



Provide access to exposure and health outcome data

Enable construction of customized, harmonizable datasets

Facilitate harmonization of HHEAR data with external sources

Support pooling of data for analysis

Message 9: Harmonized Data Portals are Still Needed (perhaps more than ever?)

Partially supported by: NIH/NIEHS 0255-0236-4609 / 1U2CES026555-01

Data Portal

HHEAR Human Health Exposure Analysis Resource

Studies | Harmonized Data | Resources | Login

HHEAR Data Center

In 2019 the **Human Health Exposure Analysis Resource (HHEAR) Data Center** at the Icahn School of Medicine at Mount Sinai was established by NIEHS as a continuation of the CHEAR Data Center expanding to include health outcomes at all ages. The goal is to provide approved HHEAR investigators their laboratory analysis results and incorporate them in statistical analyses of their study data. We then make that data publicly available as a means to improve our knowledge of the comprehensive effects of environmental exposures on human health throughout the life course.

The HHEAR Data Center goals are to catalyze new scientific insight from the colocation, integration and advanced statistical and data science analysis of multimodal data sets.

We will provide:

- A data repository for storing epidemiologic and biomarker data for CHEAR and HHEAR research studies
- Publicly available deidentified datasets downloadable for external users
- A publicly accessible HHEAR ontology that provides a common vocabulary with unambiguous definitions of concepts and variables across studies to allow for pooling of studies

HHEAR Data Repository & Submission Portal

Search and Browse HHEAR studies

Search and Browse Harmonized Data

Resources

Current Data Center Statistics

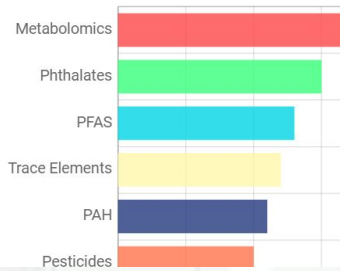
Number of Studies
49

Number of Specimens Analyzed
83,699

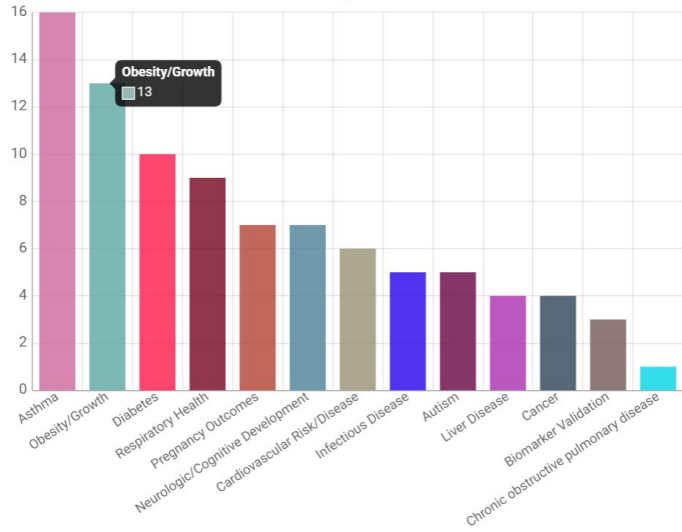
Number of Subjects
43,769

Number of Chemical
139

HHEAR Studies by Chemical Grou



HHEAR Studies by Health Outcome

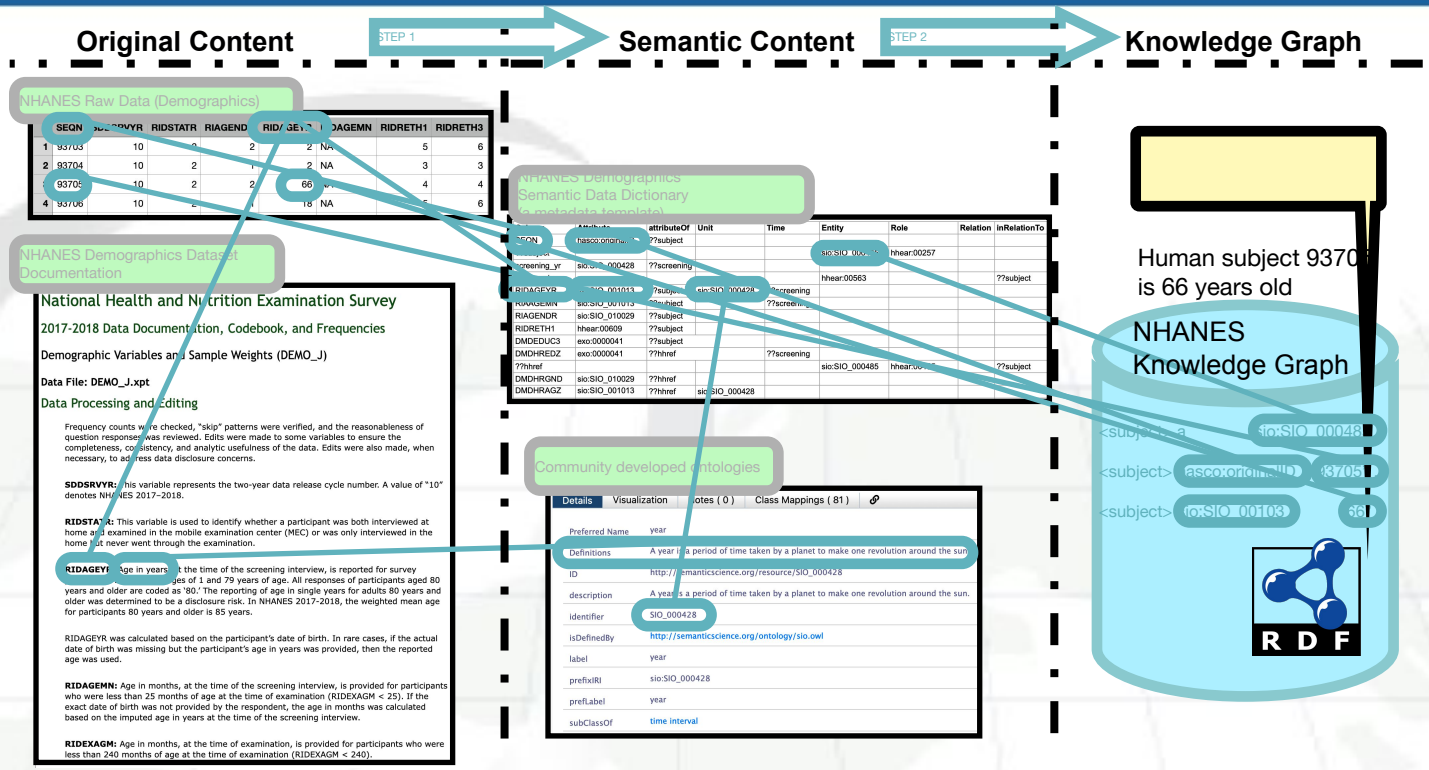


Partially supported by: NIH/NIEHS 0255-0236-4609 / 1U2CES026555-01

McGuinness

Joint with MSSM, Columbia

National Health and Nutrition Survey Knowledge Graph

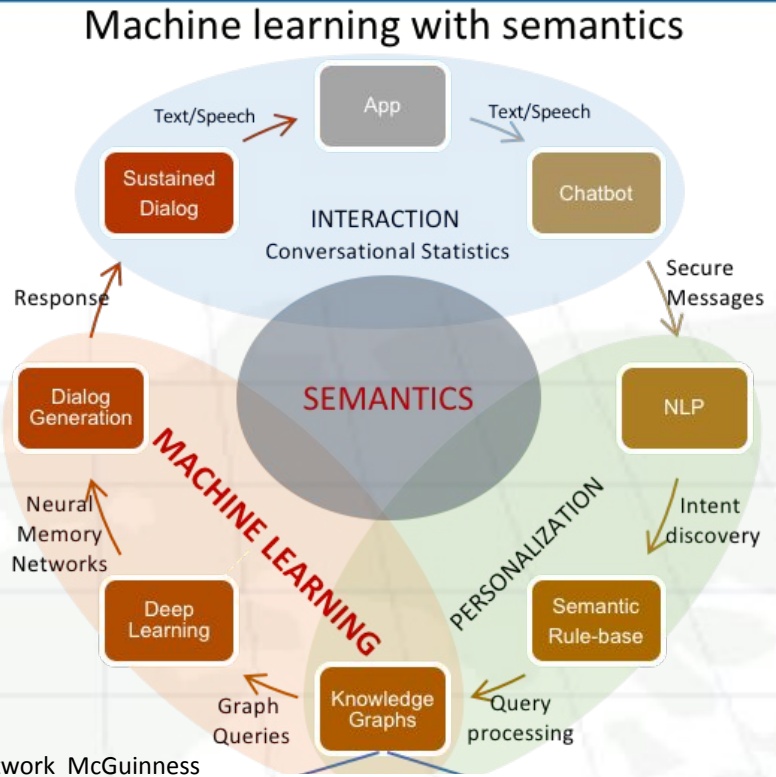


Pinheiro, Santos, Qi, Bennett, McGuinness Partially funded by AI Horizons Network and NIEHS

Message 10: Hybrid AI Solutions and Pipelines are an Opportunity

Health Empowerment by Analytics, Learning, and Semantics

Personal Health Recommendations: Empowering diabetic patients to improve their health behaviors by tailoring health information and recommendations to their lifestyles and preferences.
Semantics for Health and Clinical Reasoning: Enabling provider trust in clinical decision support system recommendations.
Improving health equity through ML, Fairness, and Semantics



Funded by AI Horizons Network McGuinness

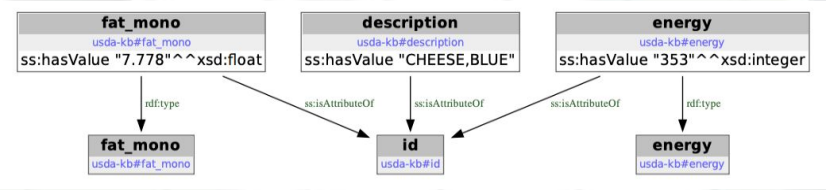
Food Knowledge Graph Construction: Nutrients

id	description	water	energy	protein	lipid	carbohydrate
1001	Butter, With Salt	15.87	717	0.85	81.11	0.06
1009	Cheese, Cheddar	37.1	406	24.04	33.82	1.33

Example USDA data with a few food items and nutrients.

Semantic Data Dictionary

Column	Attribute/Entity	Unit	Label
id	chebi:33290, dbr:Food		USDA Id for the food
description	sio:StatusDescriptor		Short description
water	envo:00002006, chebi:15377, dbr:Water	dbr:Gram, uo:0000021	Water (g)
energy	foodon:03510045	dbr:Kcal	Energy (Kcal)
protein	dbr:Protein	dbr:Gram, uo:0000021	Protein (g)
lipid	dbr:Lipid	dbr:Gram, uo:0000021	Lipid Total (g)
carbohydrate	dbr:Carbohydrate, schema:carbohydrateContent	dbr:Gram, uo:0000021	Carbohydrate (g)
fiber	dbr:Dietary_fiber	dbr:Gram, uo:0000021	Fiber (g)
sugar	dbr:Sugar	dbr:Gram, uo:0000021	Sugar Total (g)
calcium	dbr:Calcium	uo:0000022	Calcium (mg)



Semantic structural representation of a subset of the USDA Data. Extract food products from FoodOn using OntoFox

OntoFox

The resulting knowledge graph, pruned to display context-relevant features

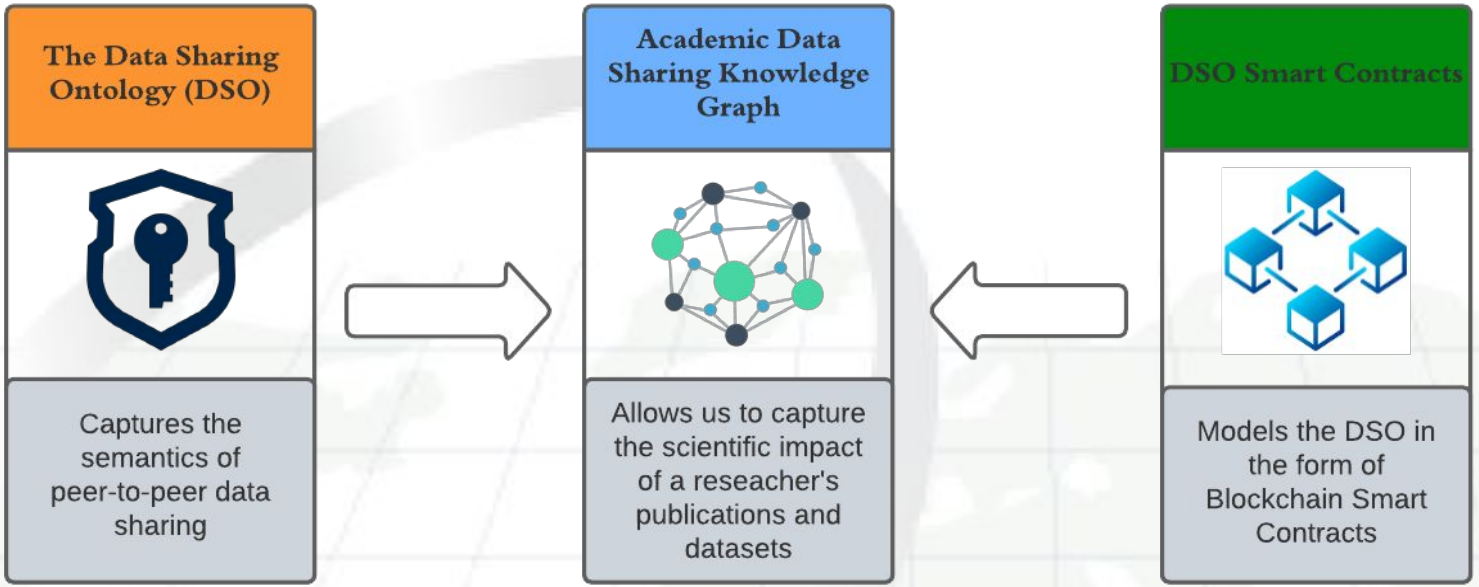
chebi: Chemical Entities of Biological Interest Ontology (http://bio2rdf.org/chebi/)
dbr: DBpedia Resource Ontology (http://dbpedia.org/resource/)
sio: Semanticscience Integrated Ontology (http://semanticscience.org/resource/)
envo: Environment Ontology (http://purl.obolibrary.org/obo/envo.owl#)
foodon: Food Ontology (http://purl.obolibrary.org/obo/foodon.owl#)
schema: Schema.org mappings (https://schema.org/)
uo: Units Ontology (http://purl.obolibrary.org/obo/uo.owl#)

Ontology linkages

Rashid, McCusker, Pinheiro, Bax, Santos, Stingone, Das, McGuinness. The Semantic Data Dictionary–An Approach for Describing and Annotating Data. Data Intelligence, MIT Press pp. 443-486. April 2021 DOI: https://doi.org/10.1162/dint_a_00058

Rensselaer TetherlessWorld IDEA IBM

The Data Sharing Ontology (DSO) – Facilitating Accountable and Credit Maintenance when Sharing Data



Message 11
Accountability is an opportunity



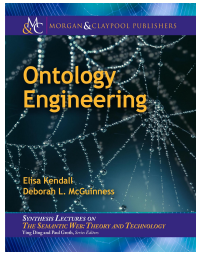
Messages

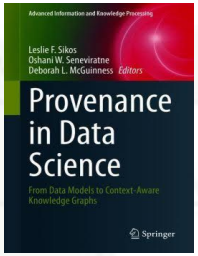
1. LLMs accomplishments should be acknowledged & leveraged
2. Ontologies and KGs may help communicate & interoperate
3. Ontologies and KGs may help large language models move up the Data-Information-Knowledge-Wisdom pyramid
4. Ontologies and KGs may help address policy and accountability needs/requirements
5. Ontologies / KGs and LLMs *could* be a complementary “marriage”
6. COLLABORATE!
7. Explore opportunities, create exploration “sandboxes””
8. Assessment tools are potentially a BIG opportunity
9. Harmonized data portals are still needed
10. Hybrid AI solutions and pipelines are an opportunity
11. Accountability is an opportunity and

Questions?

Collaboration is key to the future

AI will not replace most knowledge professionals but many knowledge professionals who do not collaborate with generative AI will be replaced

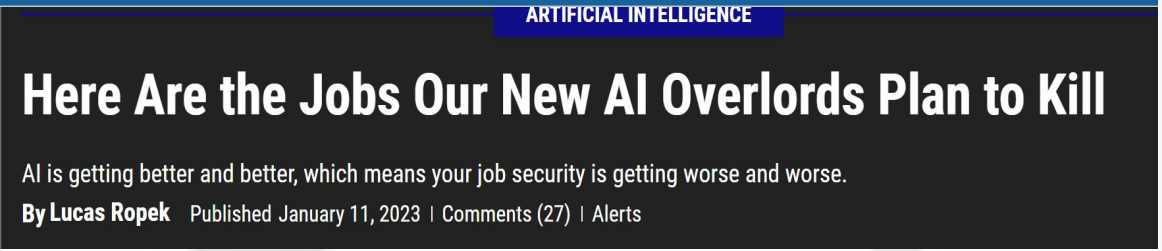




Final Message: The generative AI explosion provides the Semantic community (Ontologies, Provenance, Web 3, …) with a unique opportunity to shine *AND* a time to rethink our methods

Many people contributed to the projects and ideas mentioned, a few include: the RPI Tetherless World team particularly McCusker, Erickson, Pinheiro, Santos, Rashid, Franklin, Chari, Shirai, Seneviratne, Hendler, … and the broader community particularly: Chorpita, Kendall, Bennett, Qi, Zaki, Stingone, Masters,Teitelbaum, Brinson, Schadler, Daegen, Chen, …
Funding IBM-RPI HEALS AI Horizons, NIEHS HHEAR 0255-0236-4609 / 1U2CES026555-01, NSF HDR ACI-1640840, NIMD 75N95022C00018, DARPA MCS N660011924033, DARPA KAIROS CW3016789, IARPA HIATUS A22-0316… Contact: dlm@cs.rpi.edu and dlmcguinness@gmail.com

Threat AND Opportunity


ARTIFICIAL INTELLIGENCE

Here Are the Jobs Our New AI Overlords Plan to Kill

AI is getting better and better, which means your job security is getting worse and worse.

By Lucas Ropek Published January 11, 2023 | Comments (27) | Alerts


Jobs September 14, 2023

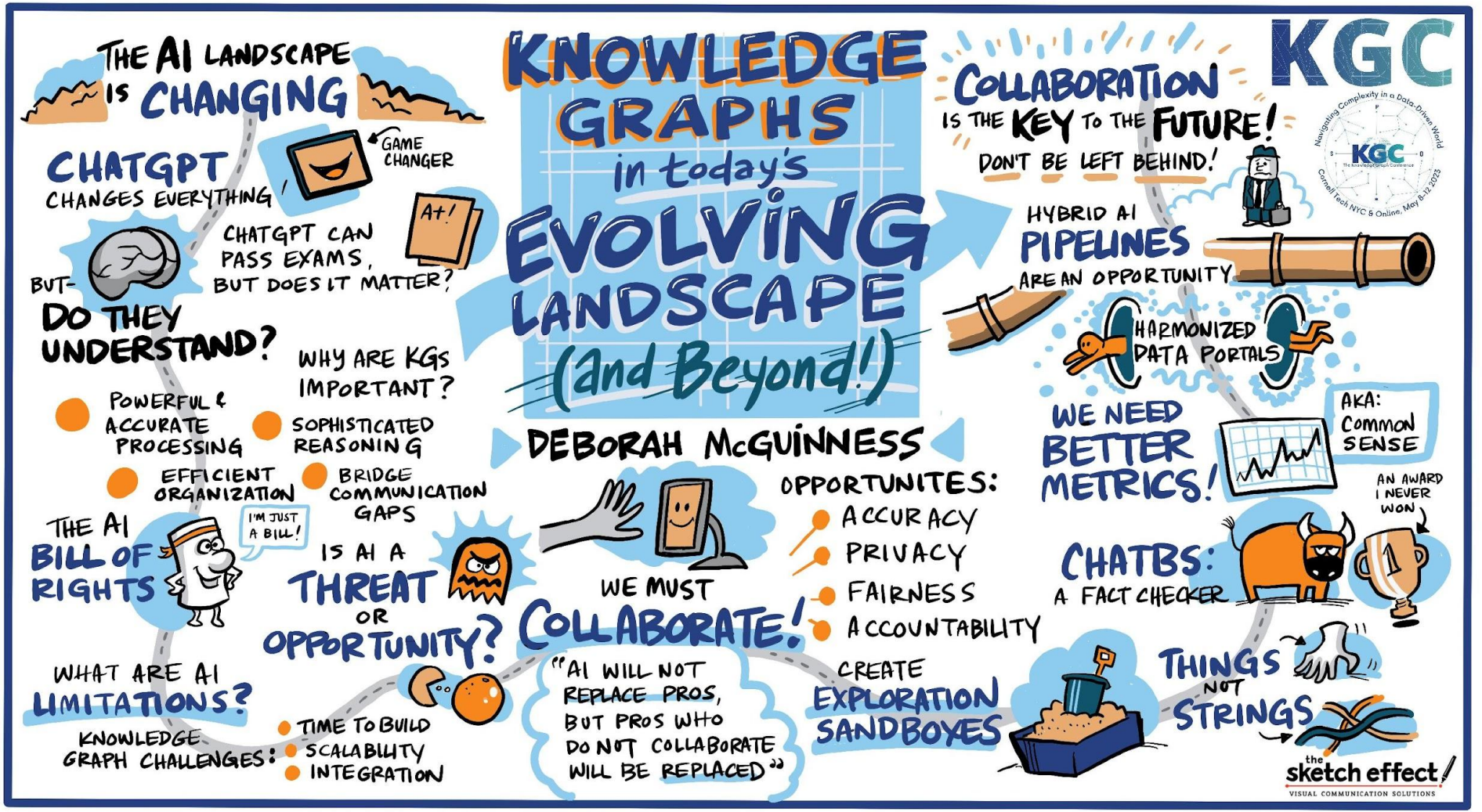
What Careers Will Likely Be Replaced By AI? 20 Jobs to Watch

Are you a working professional seeking to advance your career? Discover how Unmudl can help you transform and upskill, providing you with the tools and pathways to reach new heights in your professional journey.

From Gizmodo:
Artists, Customer Service Agents, Copywriters, Lawyers, Scientists, Computer Programmers, Influencers and Fashion Models, Journalists ?

From Unmudl:
Replace: Data Entry, Telemarketer, Factory Worker, Cashier, Driver, Travel Agent, Bank Teller
Transform: Accountant, Customer Support Representative, Paralegal, Radiologist, Librarian, Market Research, Journalist,
Augment: Retail Salesperson, Stock Trader, Human Resources Administrator, Customer Service Rep, Mortgage Underwriter, Translator, …

65

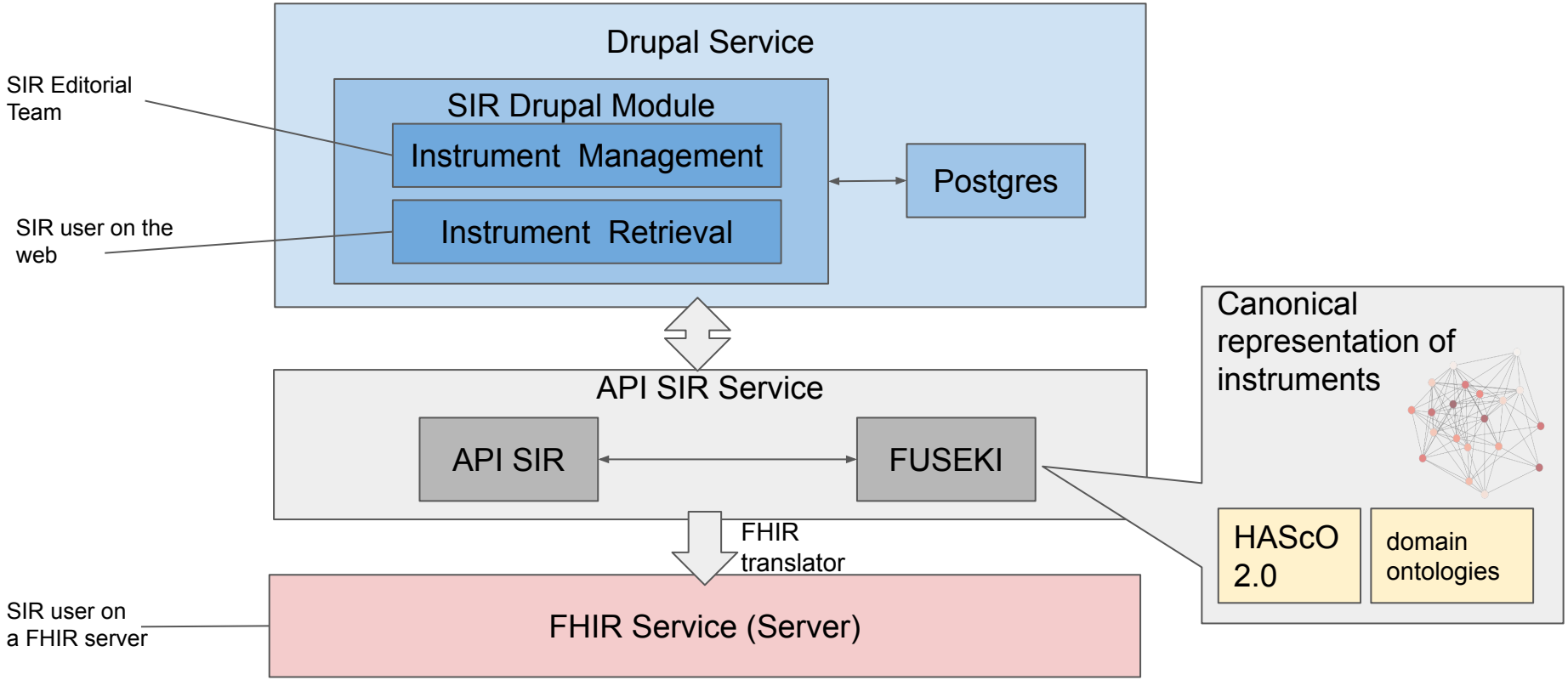

KNOWLEDGE GRAPHS in today's EVOLVING LANDSCAPE (and Beyond!)
DEBORAH McGUINNESS
KGC
Navigating Complexity in a Data-Driven World
KGC The Knowledge Graph Conference
Cornell Tech NYC & Online, May 8-12, 2023
THE AI LANDSCAPE IS CHANGING
CHATGPT CHANGES EVERYTHING
GAME CHANGER
CHATGPT CAN PASS EXAMS, BUT DOES IT MATTER?
A+!
BUT- DO THEY UNDERSTAND?
THE AI BILL OF RIGHTS
I'M JUST A BILL!
WHAT ARE AI LIMITATIONS?
KNOWLEDGE GRAPH CHALLENGES:
TIME TO BUILD
SCALABILITY
INTEGRATION
WHY ARE KGs IMPORTANT?
POWERFUL & ACCURATE PROCESSING
SOPHISTICATED REASONING
EFFICIENT ORGANIZATION
BRIDGE COMMUNICATION GAPS
IS AI A THREAT OR OPPORTUNITY?
WE MUST COLLABORATE!
"AI WILL NOT REPLACE PROS, BUT PROS WHO DO NOT COLLABORATE WILL BE REPLACED"
COLLABORATION IS THE KEY TO THE FUTURE!
DON'T BE LEFT BEHIND!
HYBRID AI PIPELINES ARE AN OPPORTUNITY
HARMONIZED DATA PORTALS
WE NEED BETTER METRICS!
AKA: COMMON SENSE
AN AWARD I NEVER WON
OPPORTUNITES:
ACCURACY
PRIVACY
FAIRNESS
ACCOUNTABILITY
CHATBS: A FACT CHECKER
CREATE EXPLORATION SANDBOXES
THINGS NOT STRINGS
the sketch effect!
VISUAL COMMUNICATION SOLUTIONS

Semantic Instrument Repository-SIR (of Assessment Instruments)

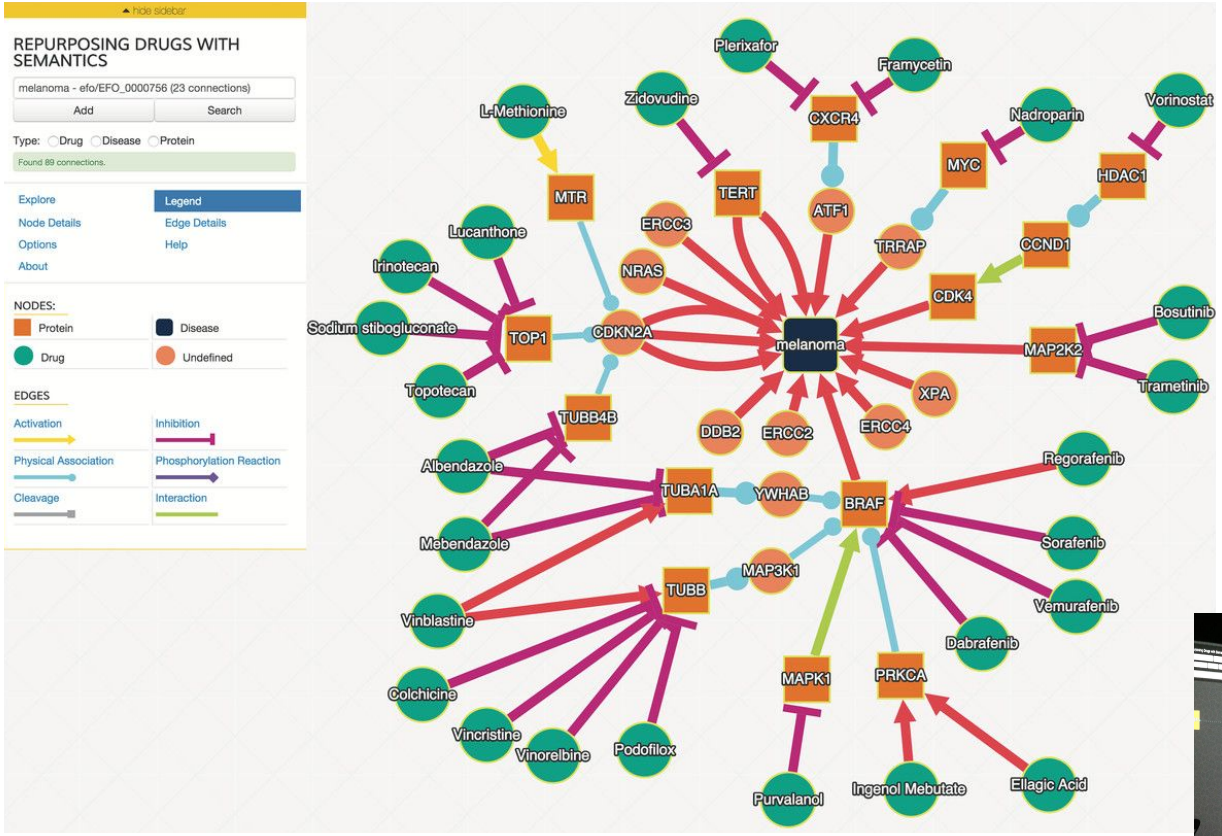
- An infrastructure that manages knowledge graphs about data acquisition instruments
- SIR implements the notion of Semantic Instrument that includes a canonical RDF description of instruments and their building blocks
- SIR is being developed to provide the mapping from canonical descriptions into instrument rendering tools like REDCap and FHIR (Fast Healthcare Interoperability Resources)
- Open-source and freely available to the public.

We are doing this in the setting of Child Anxiety and Depression (joint with Chorpita, Santos, Pinheiro, Gruen, Rook, McGuinness, but this can grow to include a range of assessment instruments).. Partially funded by NIMH

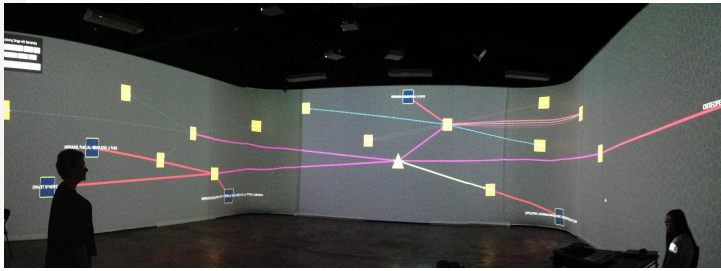
SIR Architecture



Probability Aware Knowledge Exploration: Drug Repurposing Example

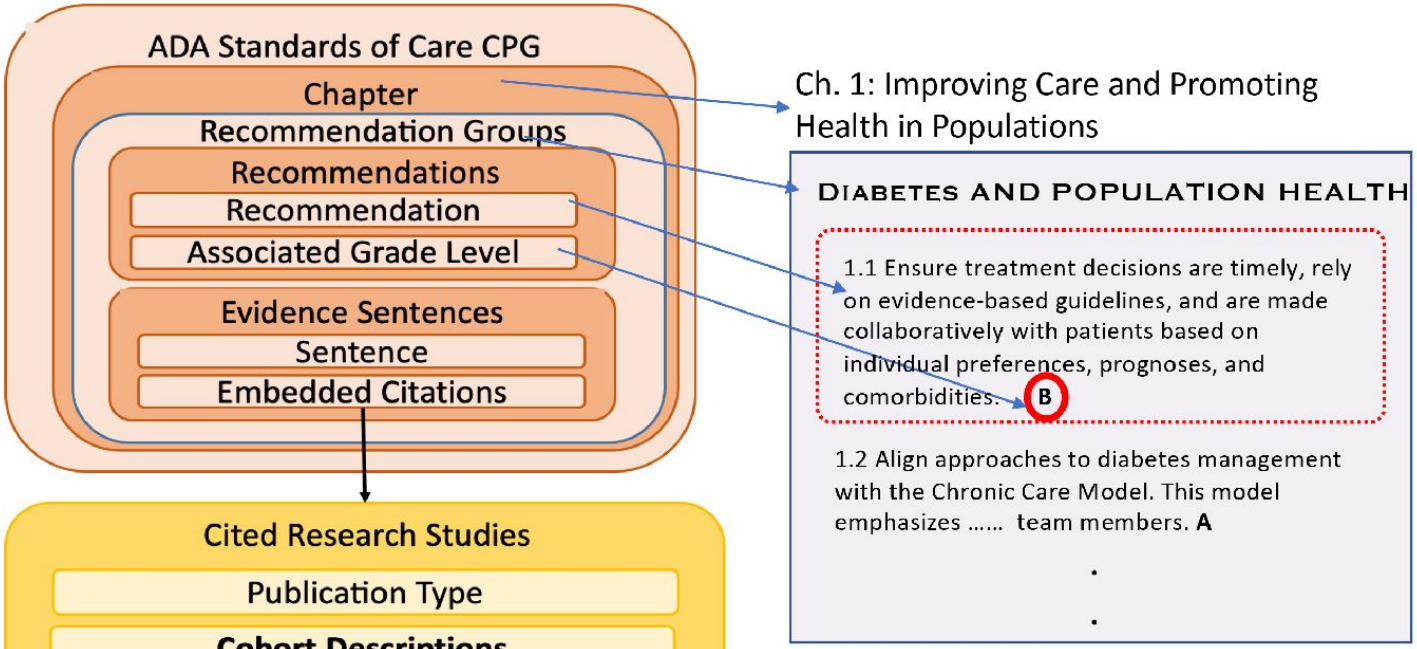


- Knowledge imported from drug, protein, and disease interaction databases.
- Each interaction given an evidence-driven probability.
- Find drugs that could affect melanoma, filtered by interaction probability.
- The best hypotheses were generated using the highest probabilities.
- Being expanded initially for genomics-aware cancer care applications
- Display below showing interactive drug-protein-disease interface



Clinical Practice Guidelines Knowledge

Approach: Provide relevant **context** by a **multi-method approach** to make **available actionable and patient-specific domain knowledge** as answers to a set of pre-canned, clinically relevant questions.

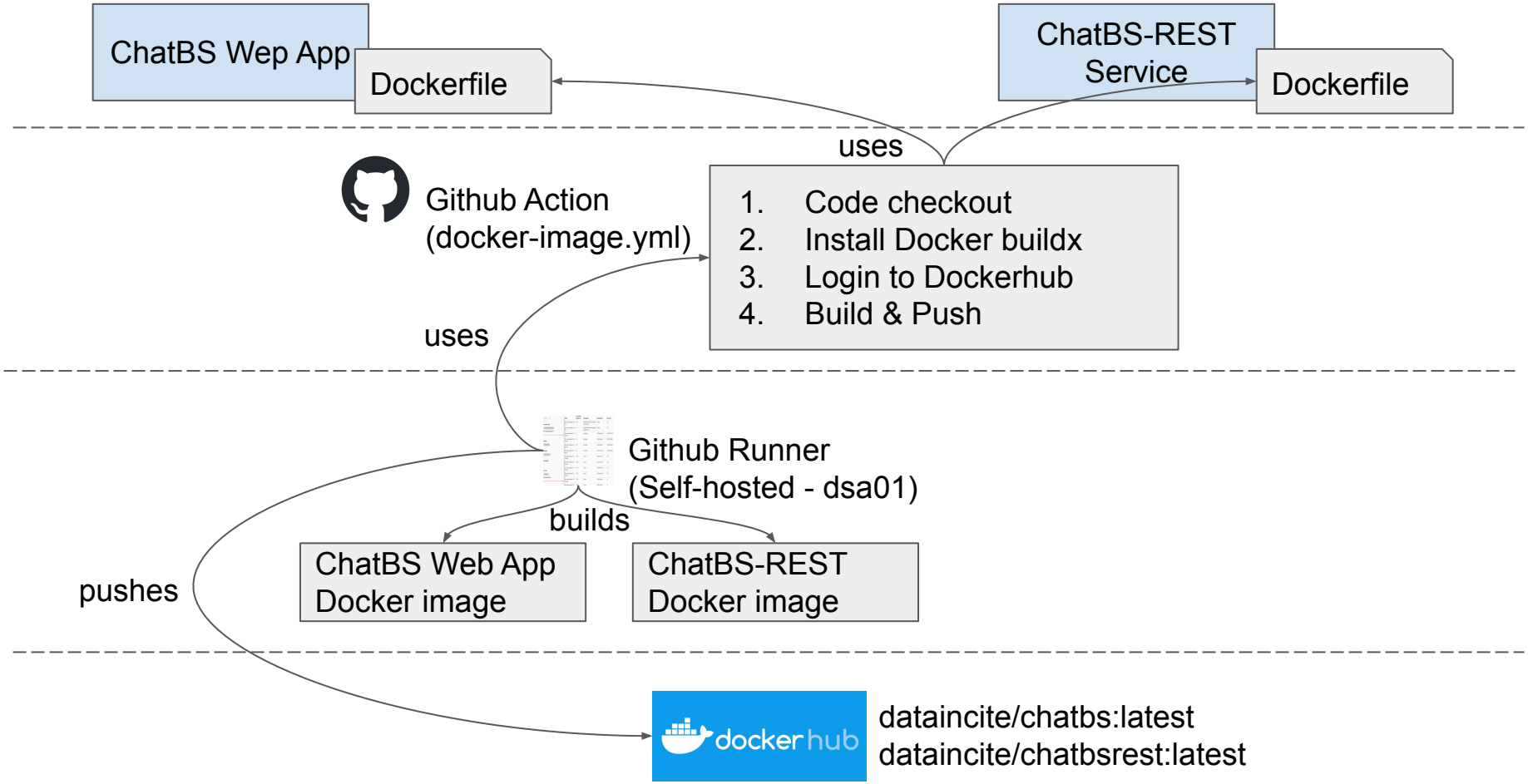


Guinness;
in Healthcare

Context-Aware Explanations for Type 2Diabetes Comorbidity Risk Prediction

Some (of our) ontologies: Explanation ontology, study cohort ontology,
MANY external ontologies, knowledge sources

S Chari, P Acharya, D. Gruen, O. Zhang, E. Eyigoz, M Ghalwash, O Seneviratne, F Siaz, P Meyer, P Chakraborty, DL McGuinness; "Context-based explanation of Risk Prediction Models: A case study from medical guidelines" in preparation.


ChatBS Wep App
Dockerfile
ChatBS-REST Service
Dockerfile
uses
Github Action
(docker-image.yml)
1. Code checkout
2. Install Docker buildx
3. Login to Dockerhub
4. Build & Push
uses
Github Runner
(Self-hosted - dsa01)
builds
ChatBS Web App Docker image
ChatBS-REST Docker image
pushes
docker hub
dataincite/chatbs:latest
dataincite/chatbsrest:latest

Rensselaer

Background: Knowledge Graphs, Ontologies, Provenance, Data/Knowledge Portals…)





Opportunistic Challenges / Strengths

Ontology (selected) challenges

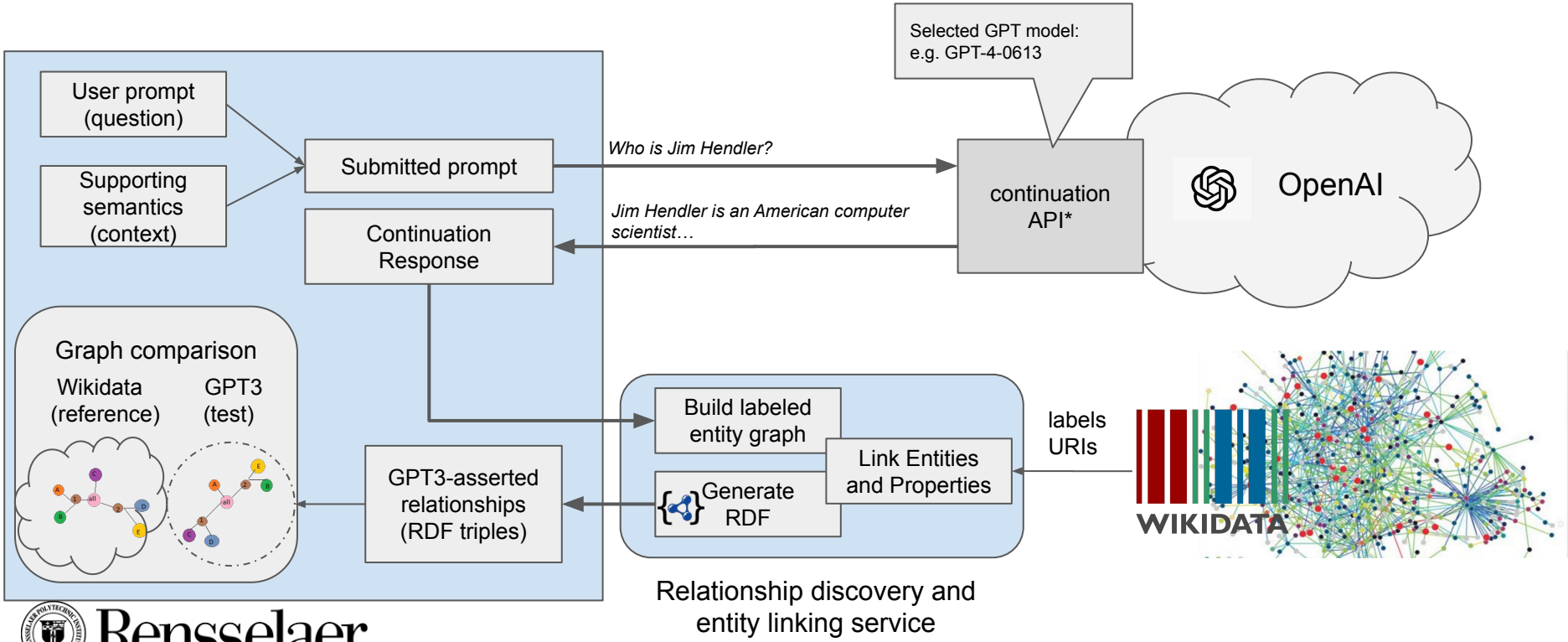
- Coherence
- Provenance
- Semantics
- Explainability

Align well with Ontology capabilities

Message 5 – LLMs and ontologies *could* be a complementary “marriage”

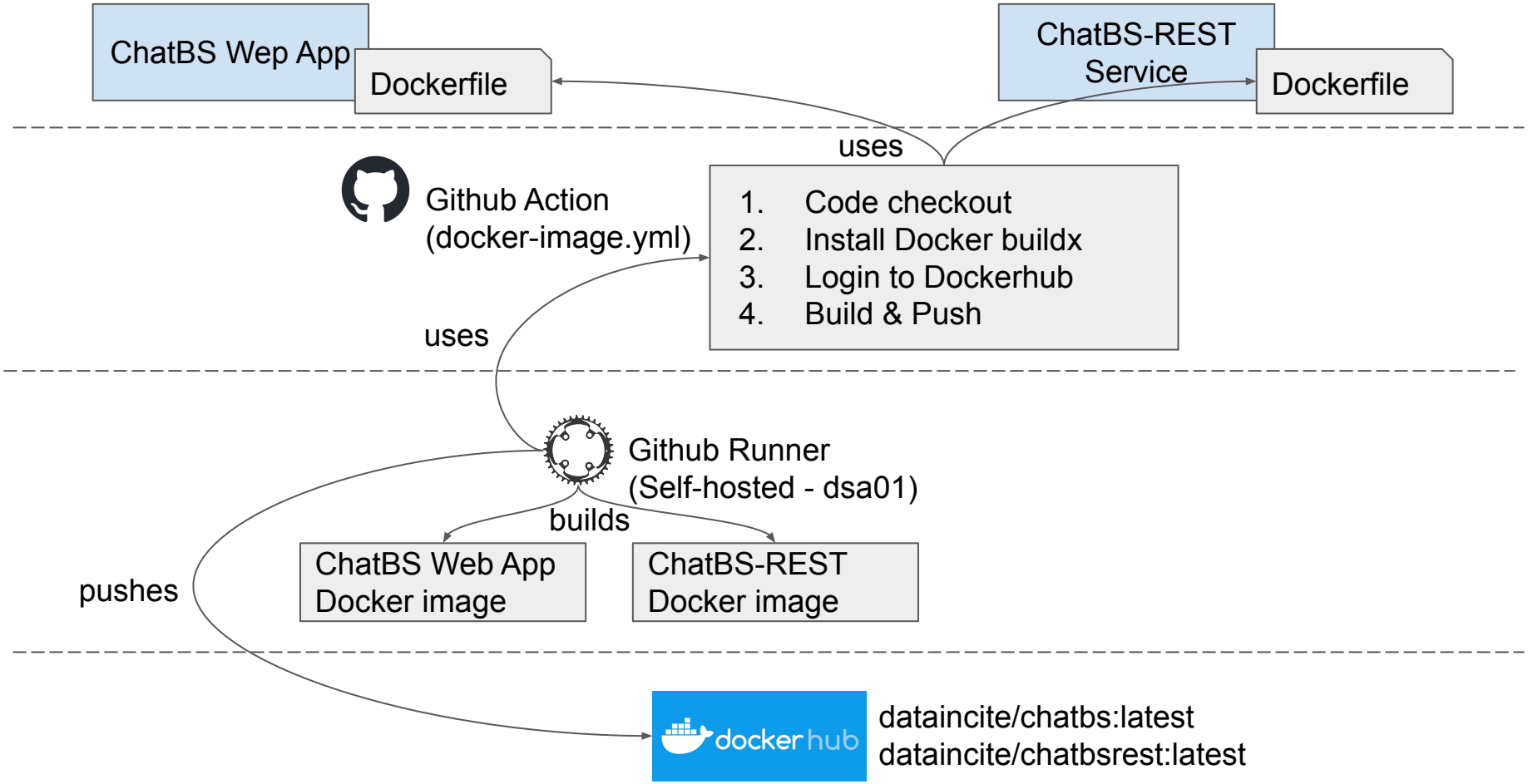
Potential Architecture for a KG-powered Fact Checker

Example: A Wikidata-based GPT3 fact checker



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* https://platform.openai.com/docs/api-reference/completions


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MaterialsMine Knowledge Graph for NanoPolymers to Metamaterials

Curation

Materials Systems
- Polymer nanocomposites
- Metamaterials

Information Types
- **Composition** metadata
- **Processing** metadata
- **Properties** (mechanical, thermal, electrical, viscoelastic…)
- **Characterization** metadata
- **Images** (SEM, TEM)
- **Bibliographic** metadata

Data Storage
- MongoDB
- Blazegraph (Fuseki)

MaterialsMine Knowledge Graph

- RDF data model
- OWL ontology
- ETL from Excel, XML
- Semantic data dictionary

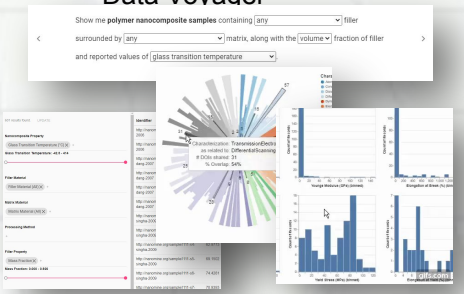
Augmentation

- Extract microstructure descriptors (MCR)
- Chemical name classifier (ChemProps API)

Interaction

Search
- SPARQL endpoint
- Faceted browser
- Parameterized queries

Visualization
- Gallery of Interactive Charts
- Vega-Lite Editor
- Data Voyager



Partially supported by NSF ACI-1640840 Joint with Duke, RPI, Vermont, Northwestern, Caltech

Ontology: Enabling moving to “Things NOT Strings”

An ontology specifies a rich description of the

- Terminology, concepts, nomenclature
- Relationships among concepts and individuals
- Sentences distinguishing concepts, refining definitions & relationships

relevant to a particular domain or area of interest.

- From McGuinness’ invited talk for Semantics for the Web. Dagstuhl, Germany, 2000.
- And following article. McGuinness. Ontologies Come of Age. Fensel, Hendler, Lieberman, Wahlster, eds. Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential. MIT Press, 2003.

