



The Fusion of Statistical and Symbolic AI

The Odd Couple Becomes the Dream Team

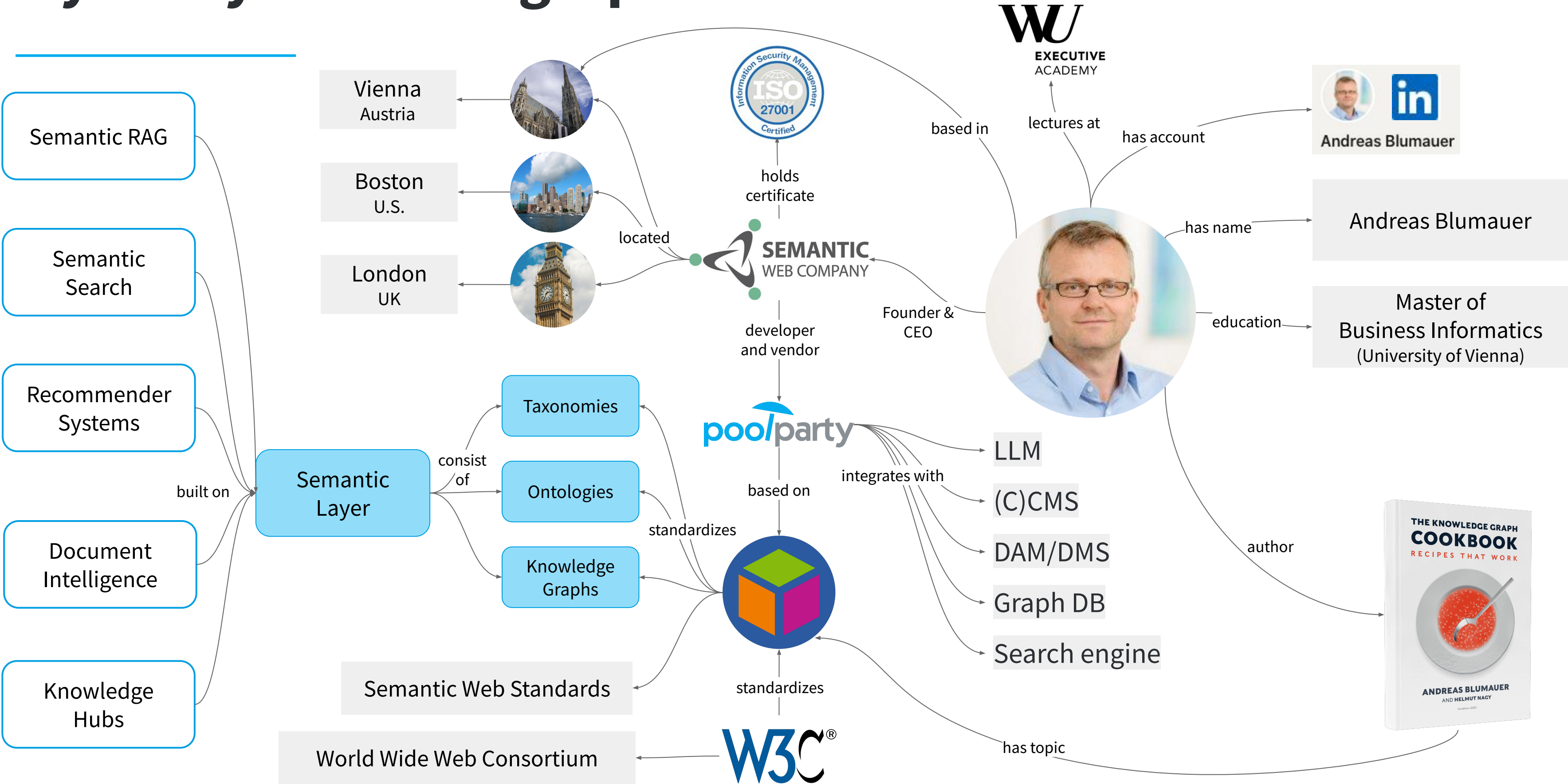
Andreas Blumauer
CEO, Semantic Web Company

How much **human** (or symbolic AI) does statistical **AI** need?

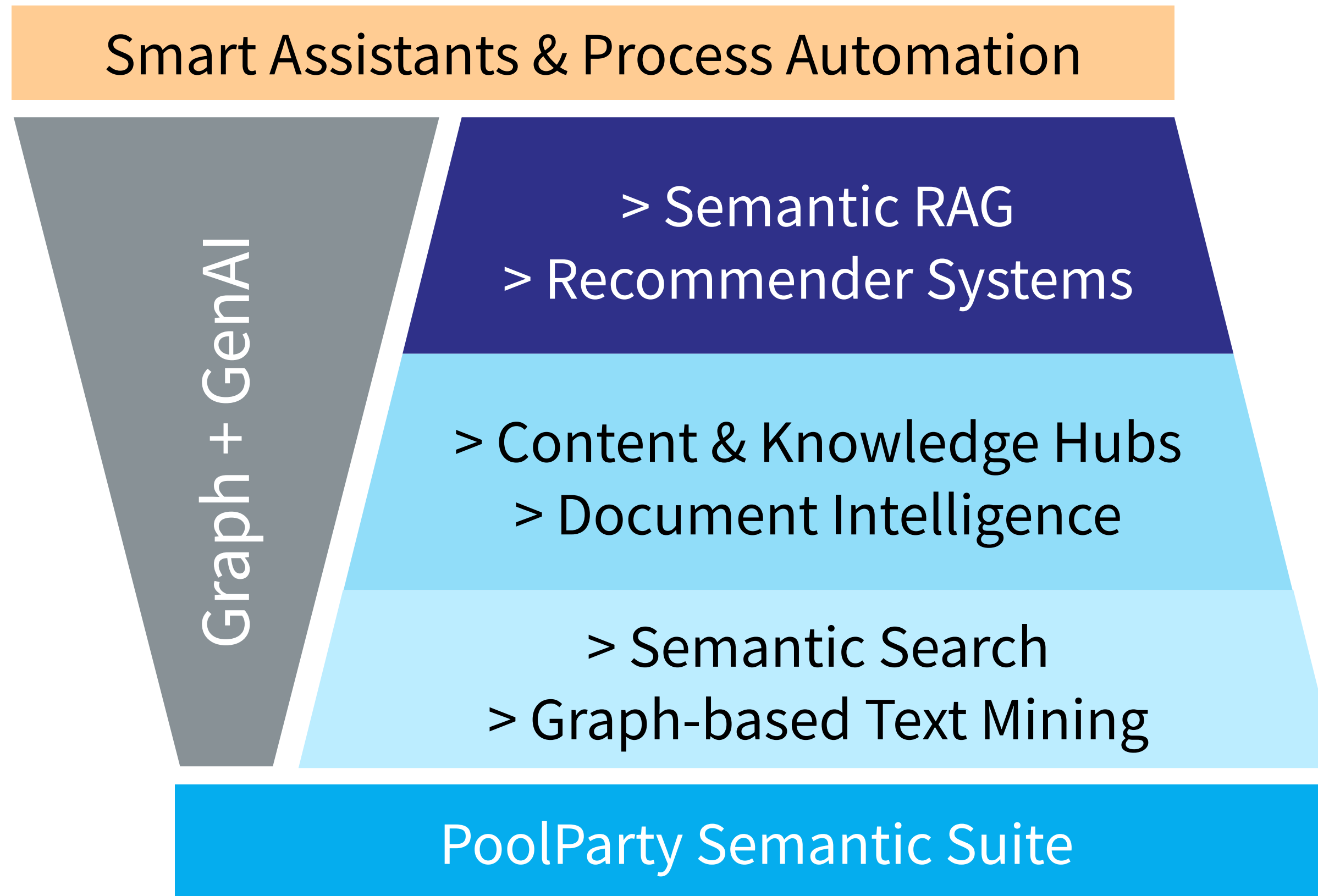
With the introduction of LLMs, have **(causal) knowledge models** finally become obsolete?

Can they now be "simulated" by **correlative models**?

My ecosystem as a graph



How SWC climbs the AI ladder



Why is this important? — Data Security

Mashable

Whoops, Samsung workers accidentally leaked trade secrets via ChatGPT

ChatGPT doesn't keep secrets.

"Samsung employees accidentally shared confidential information while using ChatGPT for help at work. Samsung's semiconductor division has allowed engineers to use ChatGPT to check source code."

April 6, 2023

<https://mashable.com/article/samsung-chatgpt-leak-details>

Why is this important? — Imprecise Results

The Washington Post
Democracy Dies in Darkness

TurboTax and H&R Block now use AI for tax advice. It's awful.

In our tests, new chatbots in popular tax services were unhelpful or wrong as much as half of the time

"What's going on? We've all heard about the incredible possibilities of generative AI. But now we have to wade through a parade of terrible AI"

March 4, 2024

<https://www.washingtonpost.com/technology/2024/03/04/ai-taxes-turbotax-hrblock-chatbot>



Use Case: **ESG Risk Management**

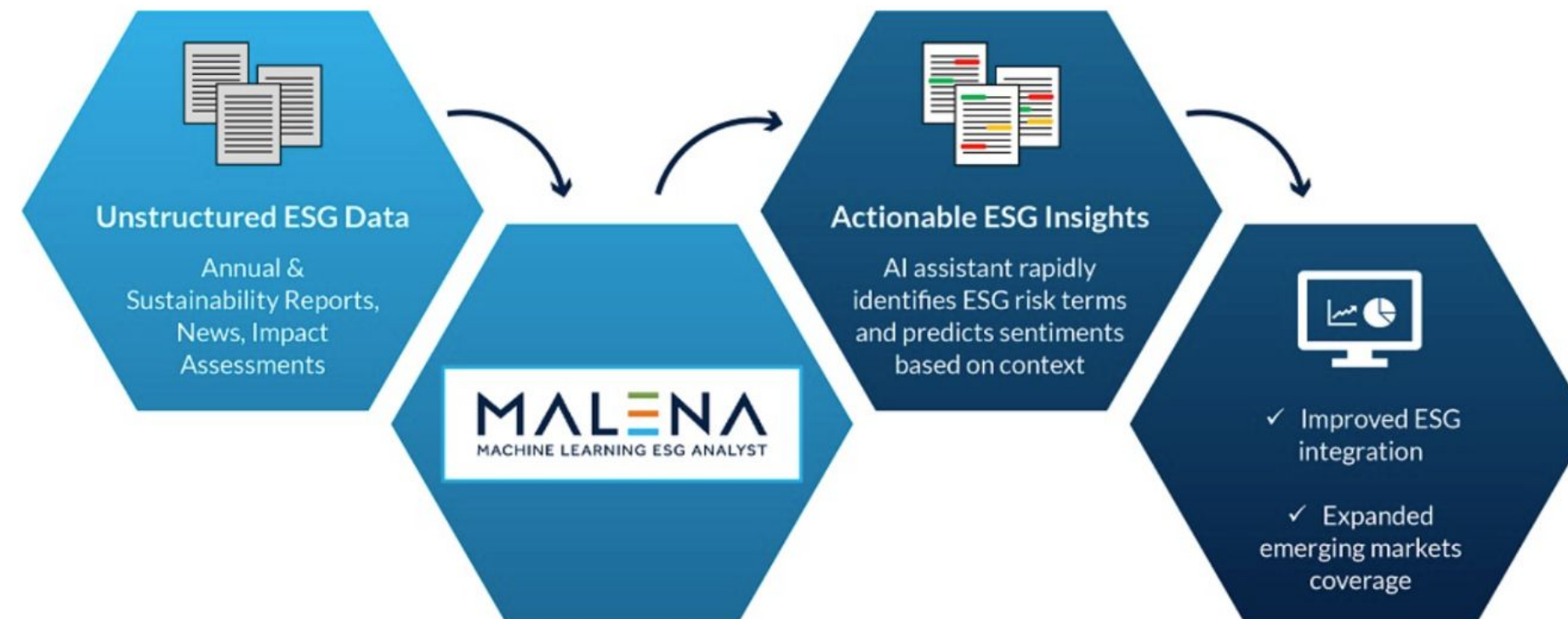
Customer: **International Finance Corporation**

WHAT IS MALENA?

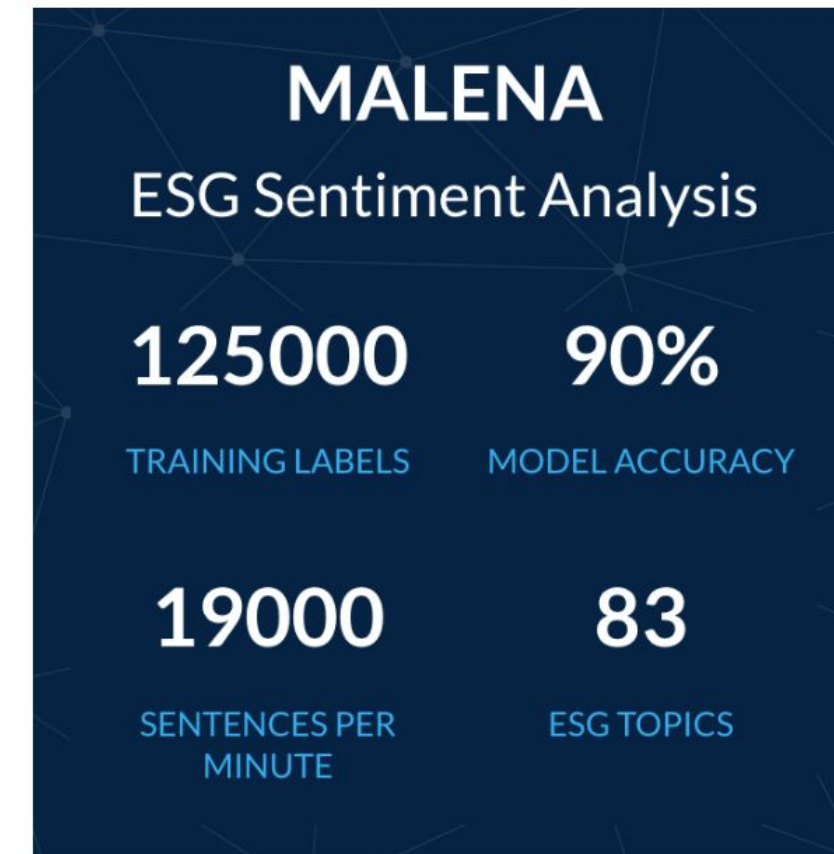
IFC's Machine Learning ESG Analyst (MALENA) is an Artificial Intelligence (AI) powered platform that extracts meaningful insights from unstructured ESG data at scale, enabling rapid analysis, increasing productivity and building investor confidence.

HOW DOES MALENA WORK?

Through Natural Language Processing (NLP) MALENA identifies relevant content using a list of over 1,200 ESG risk terms pre-determined by IFC. The NLP model assigns a positive, negative or neutral sentiment for each risk term based on its context.



- Trained in-house by IFC, leveraging 16 years of unique historical emerging markets ESG data.
- Tested and refined by IFC subject matter experts.
- Performing at 90% accuracy.

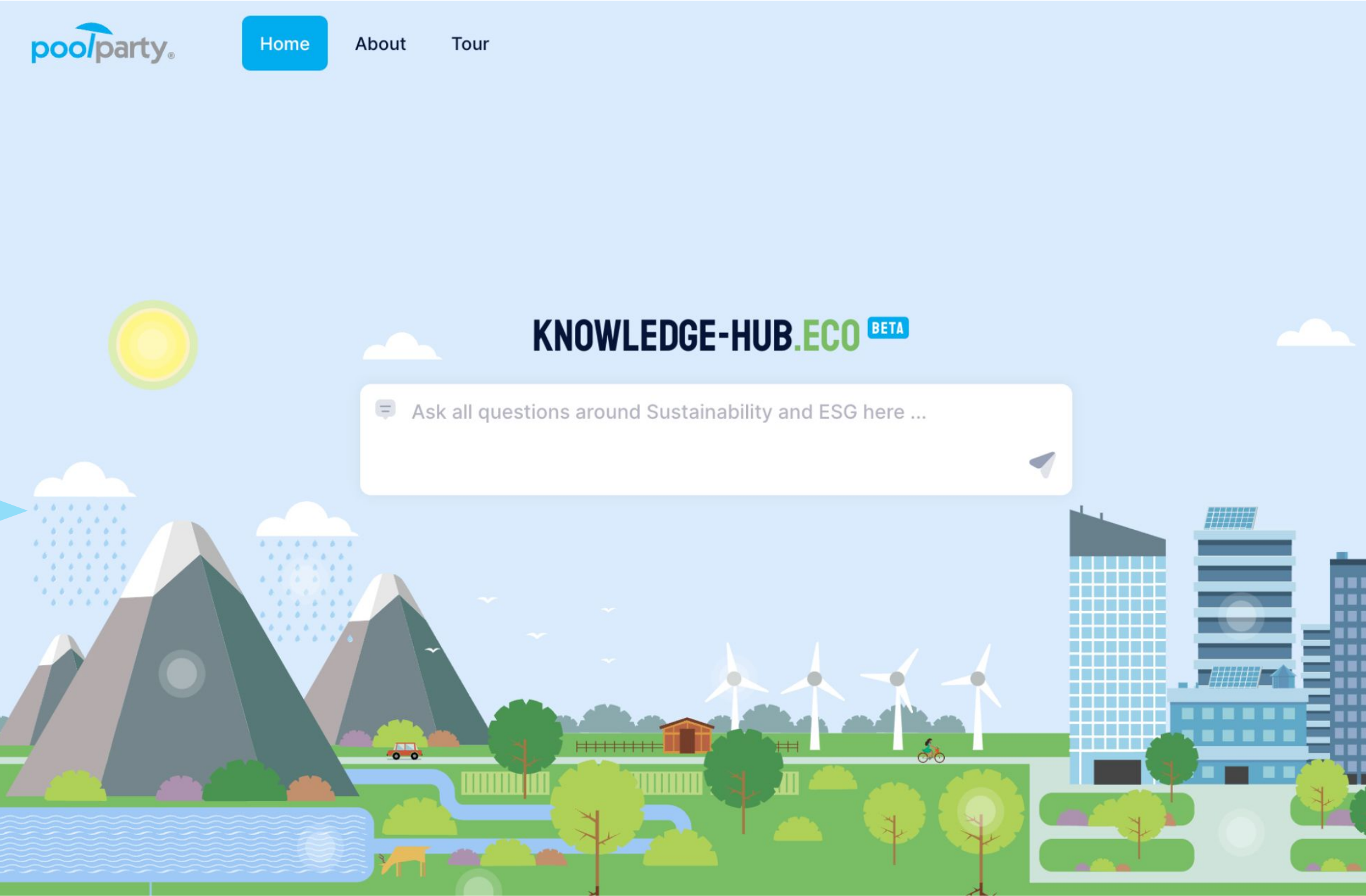


Learn more about MALENA:
<https://malena.ifc.org/>

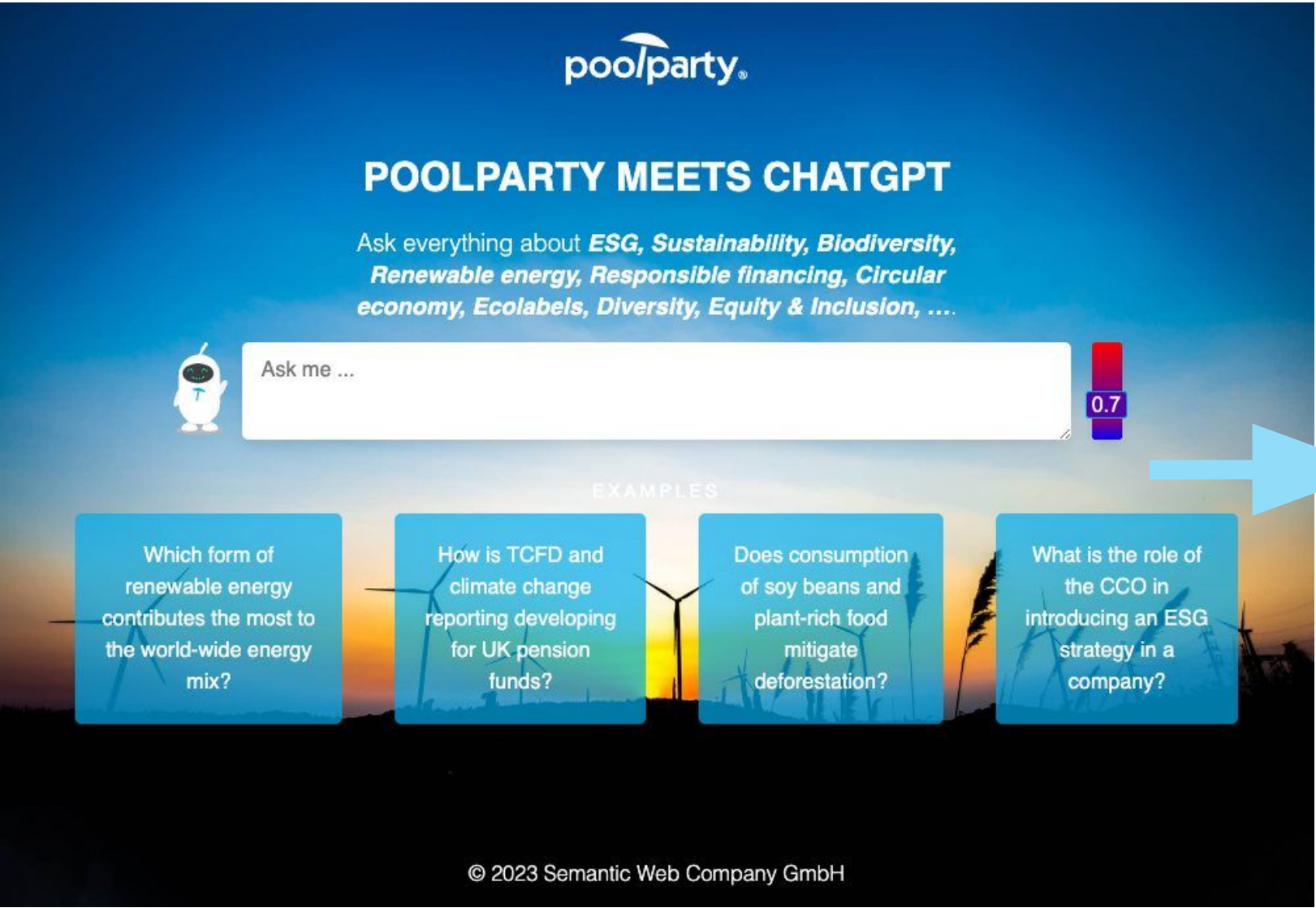
Journey towards Semantic RAG and AI for ESG



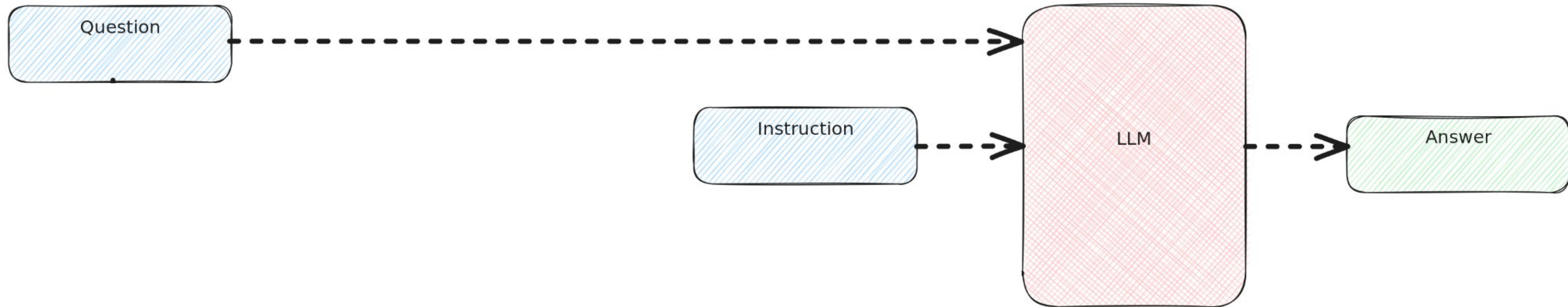
2024



2023

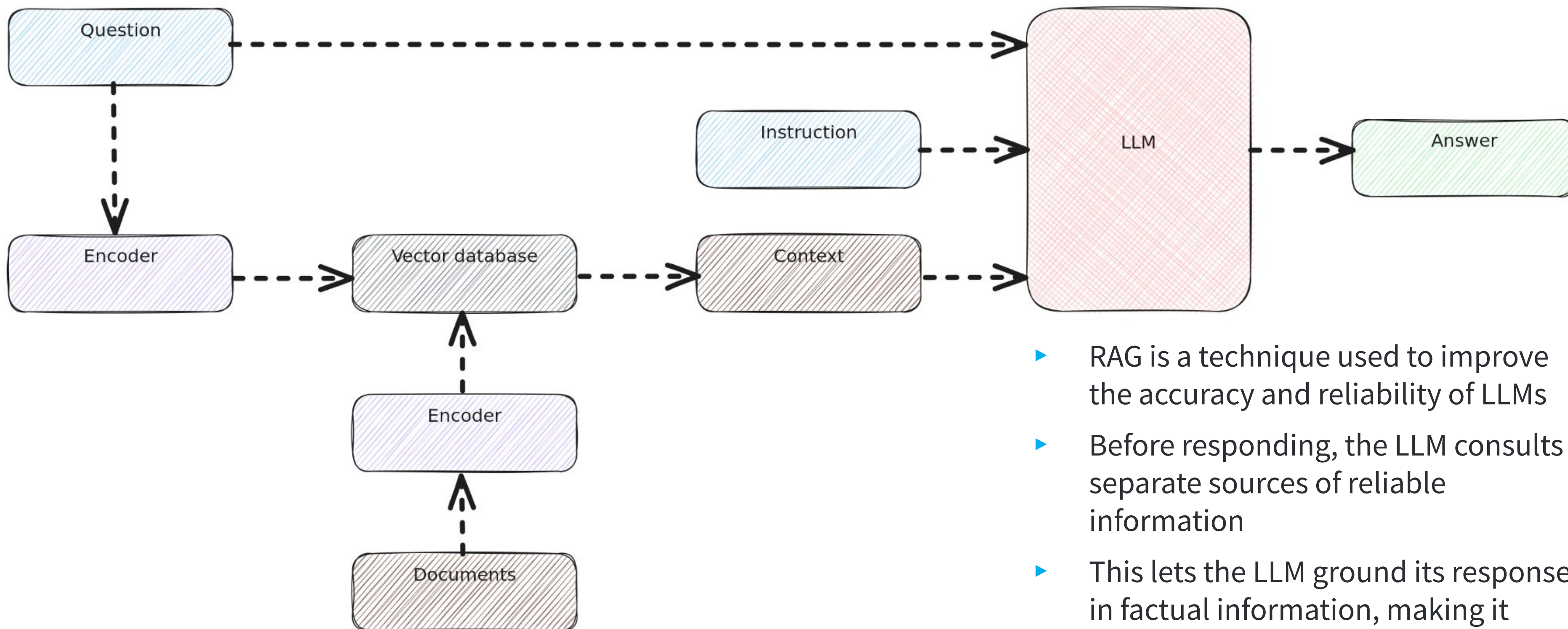


Why Retrieval Augmented Generation (RAG)?



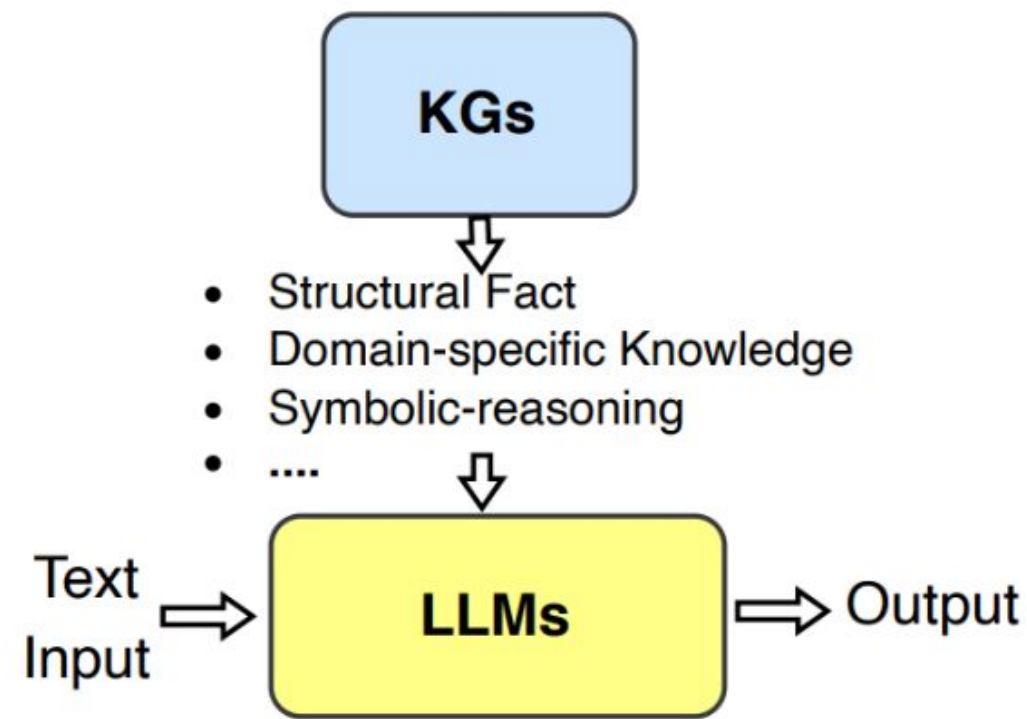
- ▶ LLMs require a lot of contextual information to be accurate and reliable
- ▶ High cost to train LLMs on current enterprise data
- ▶ LLMs should not serve as a knowledge base for the enterprise

Vector RAG solves some issues LLMs have

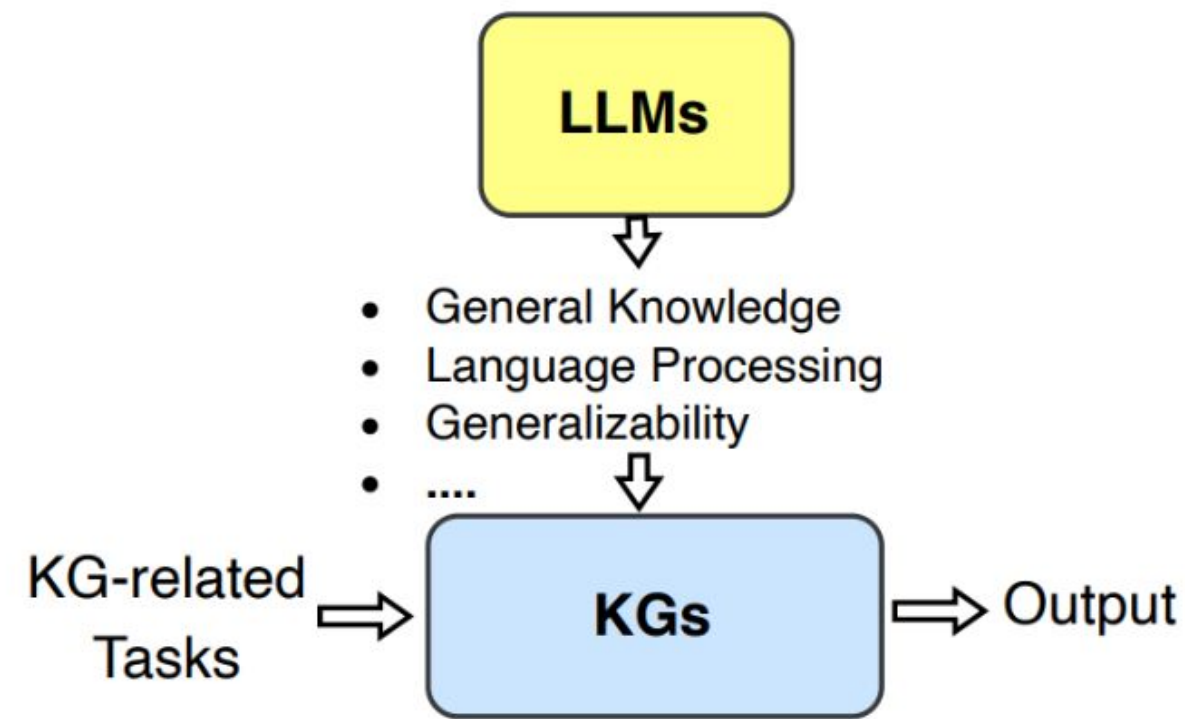


- ▶ RAG is a technique used to improve the accuracy and reliability of LLMs
- ▶ Before responding, the LLM consults separate sources of reliable information
- ▶ This lets the LLM ground its response in factual information, making it more trustworthy and up-to-date

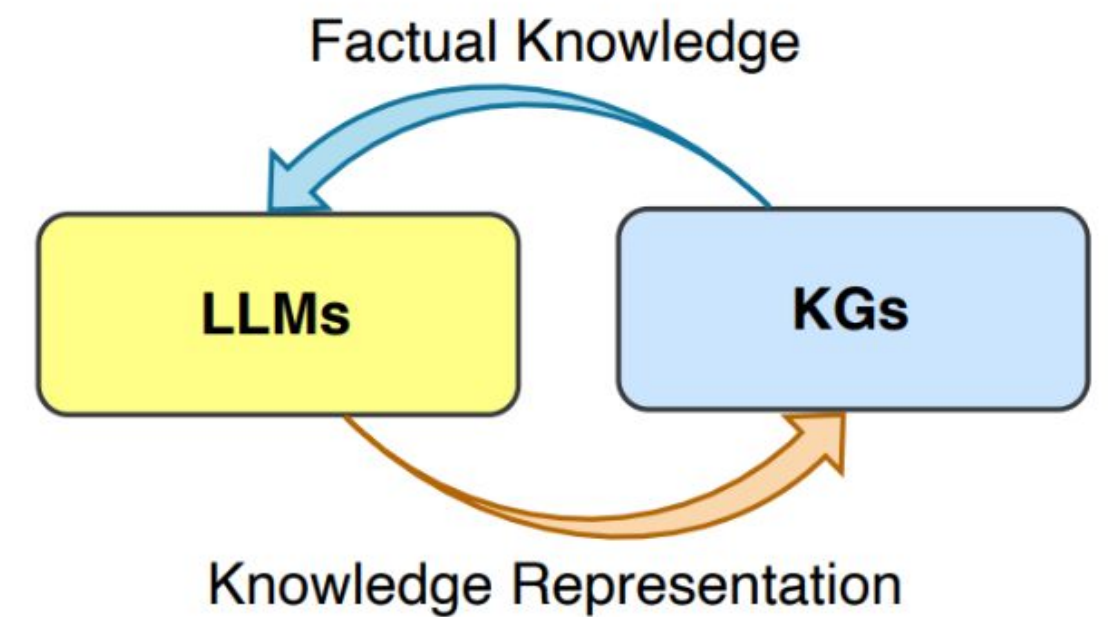
Combine LLMs with Knowledge Graphs (KGs)



a. KG-enhanced LLMs



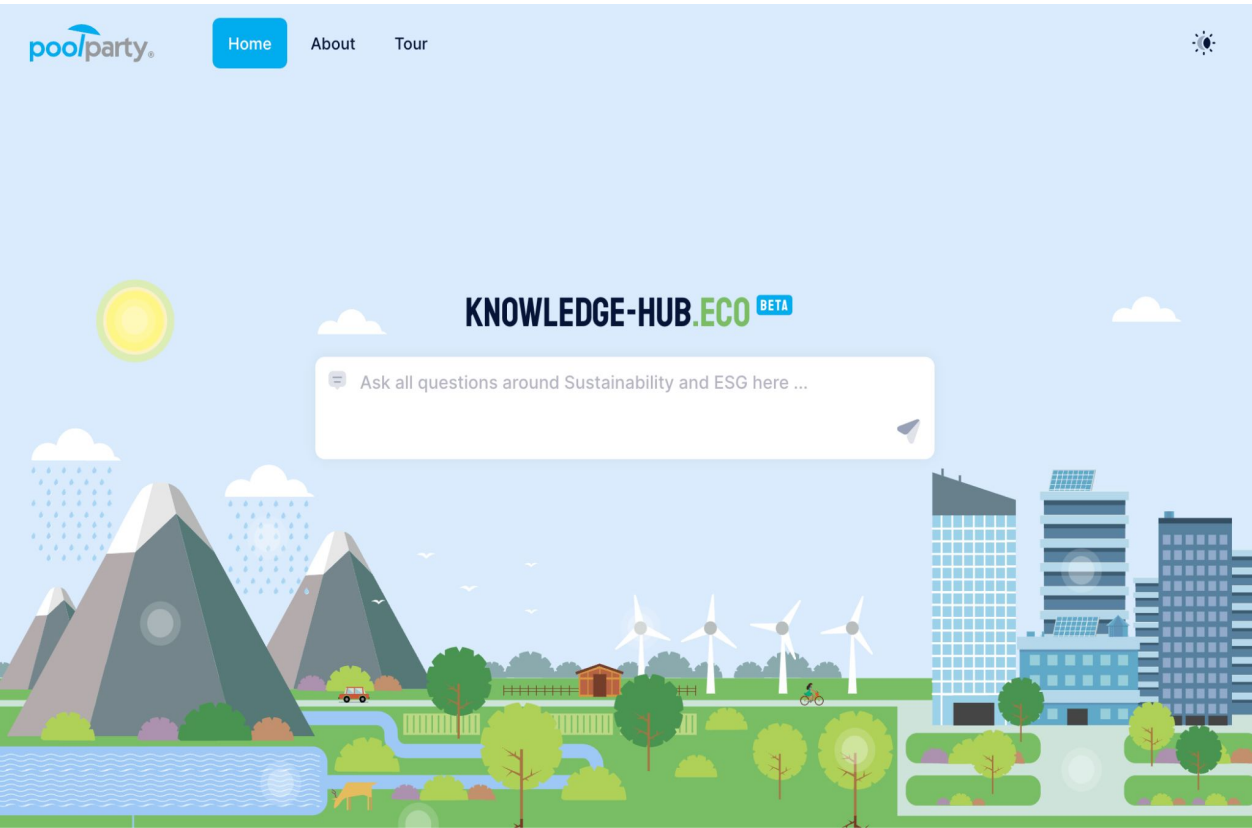
b. LLM-augmented KGs



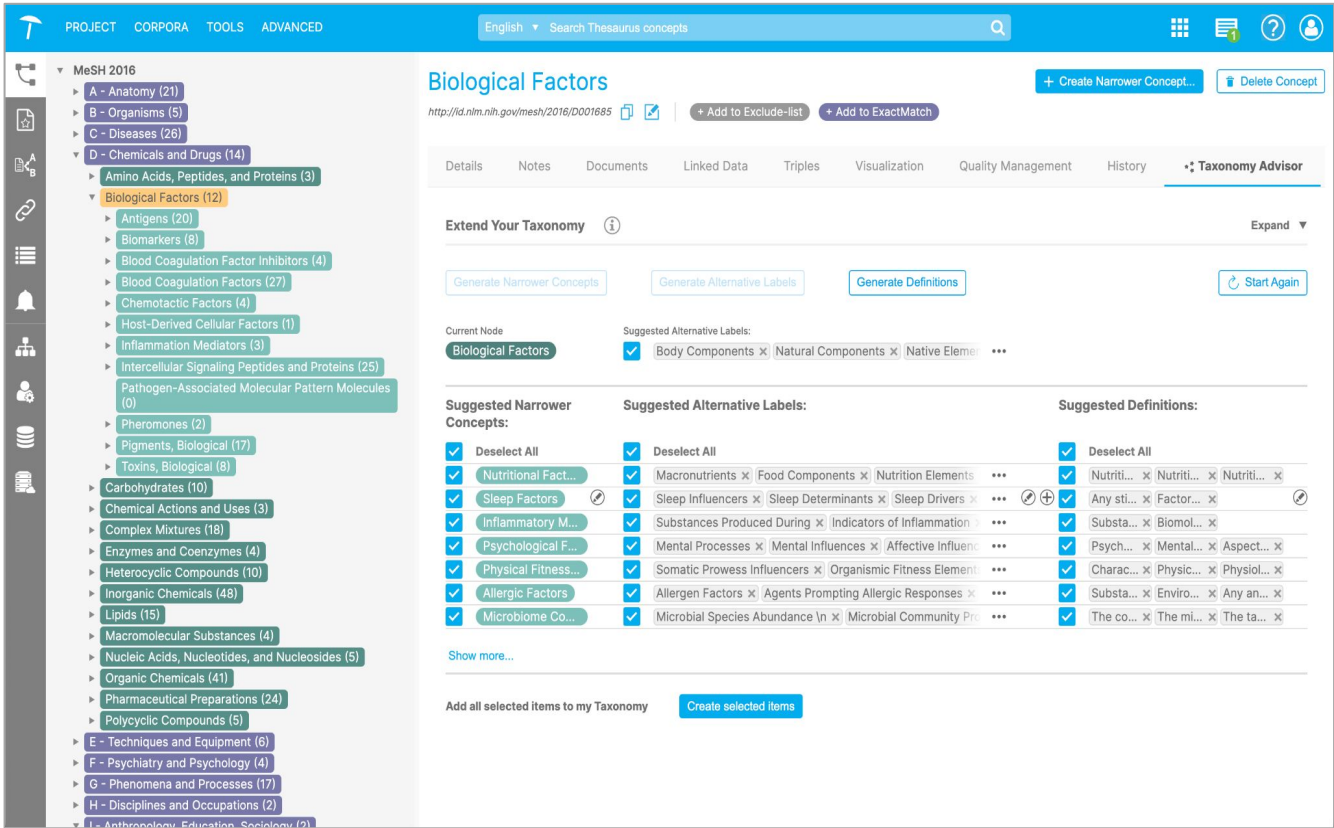
c. Synergized LLMs + KGs

Shirui Pan, Linhao Luo, Yufei Wang, Chen Chen, Jiapu Wang, Xindong Wu:
Unifying Large Language Models and Knowledge Graphs: A Roadmap (2023)

Combine LLMs and RAG with Knowledge Graphs (KGs)



a. KG-enhanced LLMs



b. LLM-augmented KGs



c. Synergized LLMs + KGs

Shirui Pan, Linhao Luo, Yufei Wang, Chen Chen, Jiapu Wang, Xindong Wu:
Unifying Large Language Models and Knowledge Graphs: A Roadmap (2023)

What is the impact of PFAS and microplastics on water pollution and what measures can companies and consumers take to mitigate this?

microplastics from entering water bodies, and investing in **sustainable** alternatives.

Consumers can also play a role by choosing products that are free from **PFAS** and **microplastics**, reducing single-use **plastic** consumption, properly disposing of **plastic waste**, and supporting companies that prioritize **environmental sustainability**.

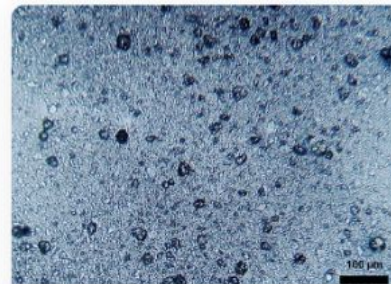
Generation Z, **Baby boomers**, **Millennials**, and **informed consumers** can advocate for stricter **regulations** on **PFAS** and **microplastics**, **educate** others on the issue, and support businesses that prioritize environmental responsibility.

Overall, a combination of **corporate responsibility**, **Consumers** awareness, and government **regulations** is needed to effectively mitigate the impact of **PFAS** and **microplastics** on **water pollution**.



PFAS

Perfluorinated alkylated substances (PFA...



Microplastics

Microplastics are small plastic particle...



Water pollution

Water pollution is the contamination of ...

Main takeaways

PFAS, **microplastics**; **Green Seal** prohibits **PFAS** in certified products, predicts **PFAS** concentrations in European soils, and seeks to assess **human** exposure. **EPA** finalizes enhanced **PFAS** reporting rule, ongoing research on **PFAS** prevalence, and source tracing. **PFAS** found in various sources, including tap water, eggs, and U.S. Army bases. NTP concludes **PFAS** hazardous to immune system. **Consumer** Reports find **PFAS** in food **packaging**, raising **health** concerns. **PFAS Data Hub** provides comprehensive information on **PFAS** contamination. **European Commission** committed to phasing out all **PFAS**. Overall, **corporate responsibility**, **Consumer** awareness, and government **regulation** are crucial to mitigate **PFAS** and **microplastics** impact on **water pollution**.

Recommended content

Semantic search

Prohibiting PFAS Chemicals - Green Seal

Green Seal, an environmental certification organization, is proposing to prohibit all per- and polyfluorinated alkyl substances (PFAS) in certified products due to their harmful health ...

[Show more](#)



PFAS Central

Machine learning was used to predict PFAS concentrations in European soils, revealing that a substantial portion of European soils may be contaminated with PFAS at ...

[Show more](#)



Perfluoroalkyl and Polyfluoroalkyl

- ▶ Query Assistant
- ▶ Prompt tuning
- ▶ Model-based search vector
- ▶ Semantic RAG
- ▶ Content recommendations
- ▶ Comprehensive dossiers
- ▶ [Take a tour](#)

Taxonomy Advisor



- ▶ Semi-automatic creation of taxonomies with help from Semantic RAG
- ▶ Automated enrichment of base taxonomies
- ▶ Semi-automated generation of knowledge models as core components of any Semantic RAG application

PROJECTCORPORATOOLSADVANCED

EnglishSearch Thesaurus concepts

1

?

MeSH 2016

A - Anatomy (21)

B - Organisms (5)

C - Diseases (26)

D - Chemicals and Drugs (14)

Amino Acids, Peptides, and Proteins (3)

Biological Factors (12)

Antigens (20)

Biomarkers (8)

Blood Coagulation Factor Inhibitors (4)

Blood Coagulation Factors (27)

Chemotactic Factors (4)

Host-Derived Cellular Factors (1)

Inflammation Mediators (3)

Intercellular Signaling Peptides and Proteins (25)

Pathogen-Associated Molecular Pattern Molecules (0)

Pheromones (2)

Pigments, Biological (17)

Toxins, Biological (8)

Carbohydrates (10)

Chemical Actions and Uses (3)

Complex Mixtures (18)

Enzymes and Coenzymes (4)

Heterocyclic Compounds (10)

Inorganic Chemicals (48)

Lipids (15)

Macromolecular Substances (4)

Nucleic Acids, Nucleotides, and Nucleosides (5)

Organic Chemicals (41)

Pharmaceutical Preparations (24)

Polycyclic Compounds (5)

E - Techniques and Equipment (6)

F - Psychiatry and Psychology (4)

G - Phenomena and Processes (17)

H - Disciplines and Occupations (2)

I - Anthropology, Education, Sociology (2)

Biological Factors

http://id.nlm.nih.gov/mesh/2016/D001685

+ Add to Exclude-list

+ Add to ExactMatch

+ Create Narrower Concept...

Delete Concept

DetailsNotesDocumentsLinked DataTriplesVisualizationQuality ManagementHistoryTaxonomy Advisor

Extend Your Taxonomy

Generate Narrower Concepts

Generate Alternative Labels

Generate Definitions

Start Again

Current Node

Biological Factors

Suggested Alternative Labels:

☒

Body Components

☒

Natural Components

☒

Native Elements

☒

Deselect All

☒

Nutritional Factors

☒

Sleep Factors☒☒☒☒☒

☒

Macronutrients☒☒☒☒☒☒☒☒☒☒☒☒☒☒☒☒

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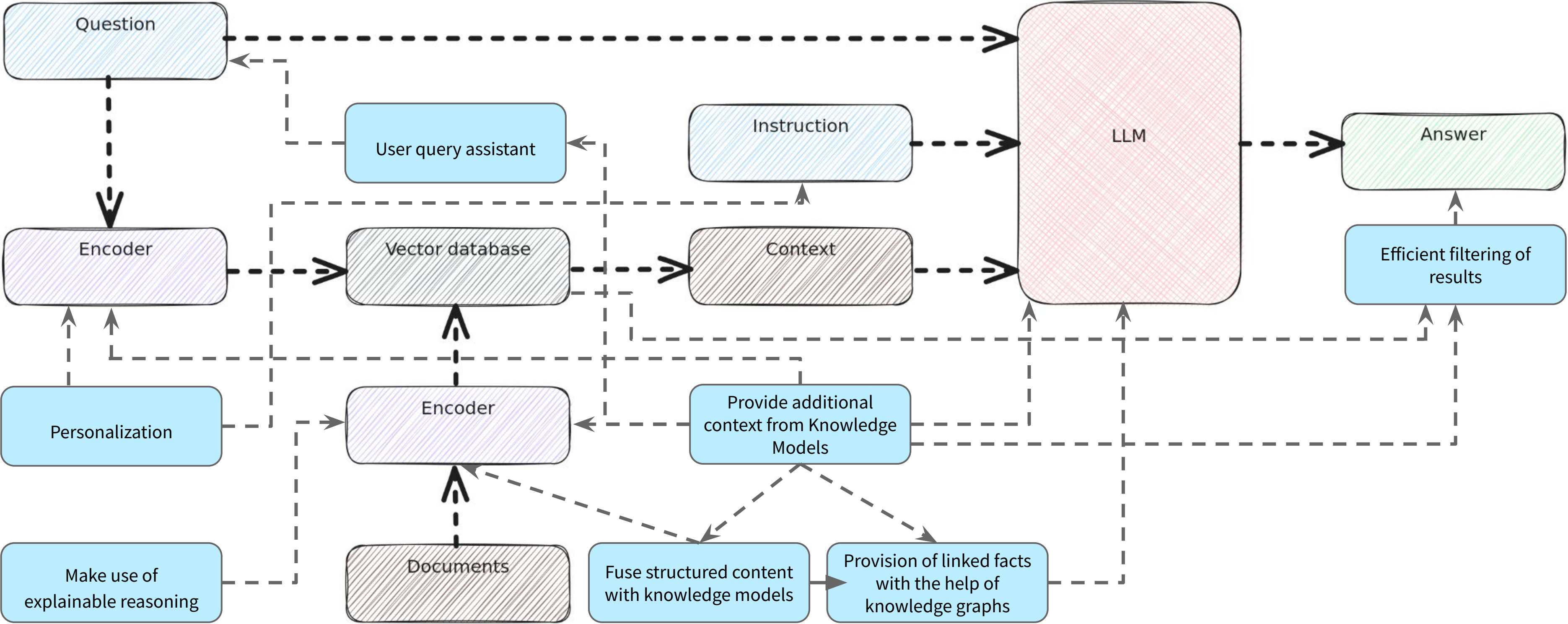
Nutrition☒☒☒☒☒☒☒☒☒☒☒☒☒☒☒☒

Show more...

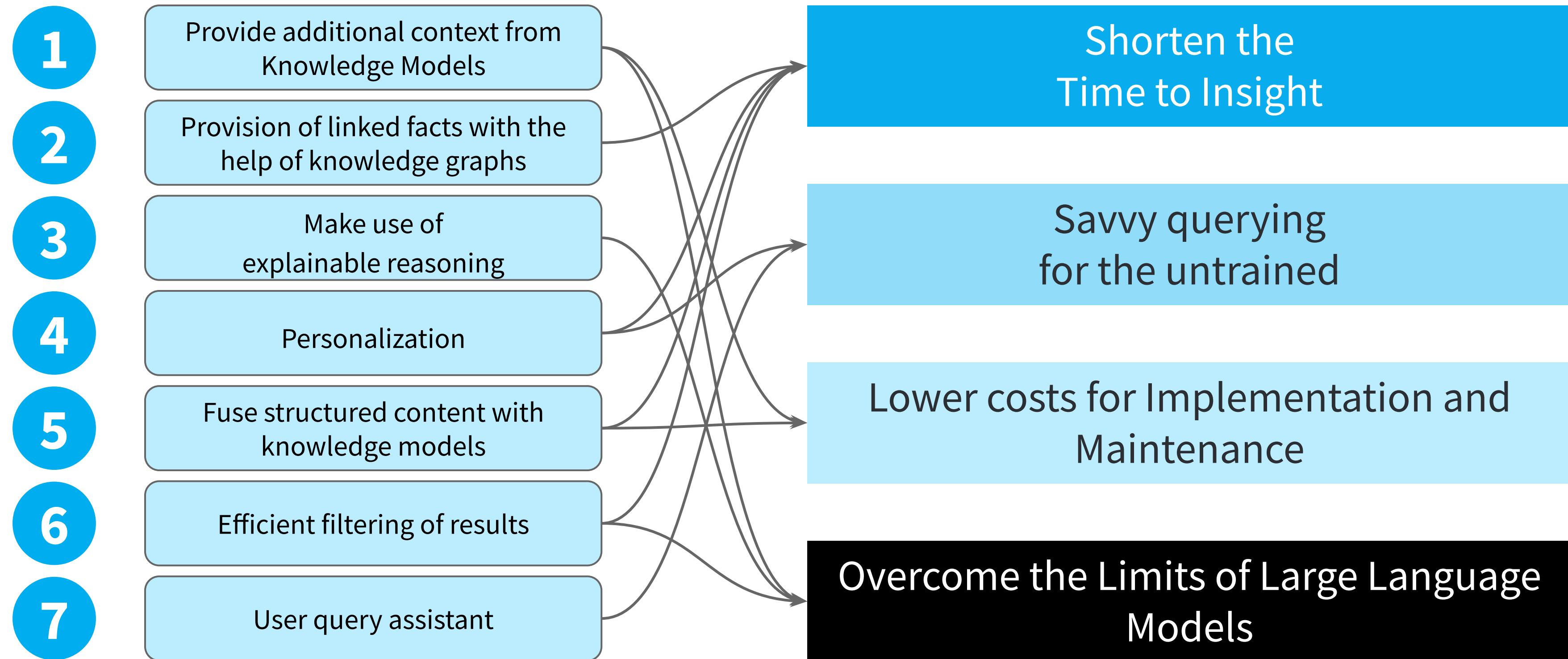
Add all selected items to my Taxonomy

Create selected items

Semantic RAG



7 Cases for KG Integration in a RAG architecture



Source: <https://www.linkedin.com/pulse/seven-cases-knowledge-graph-integration-rag-andreas-blumauer-vjjbf>

Tagging and Inferencing

Acme Corporation reports:

"Our company continues to focus on ethical and responsible working conditions that protect our people as well as the communities in which we operate. Our HSES Policy focuses on safety, personal accountability, and HSES performance. We center on continual improvement and voluntary participation in ISO 14001."

Which non-financial risks have been addressed?

Risk inference engine

Occupational safety risks

Reputational risks

Regulatory risks

Environmental risks

Which financial risks have been addressed?

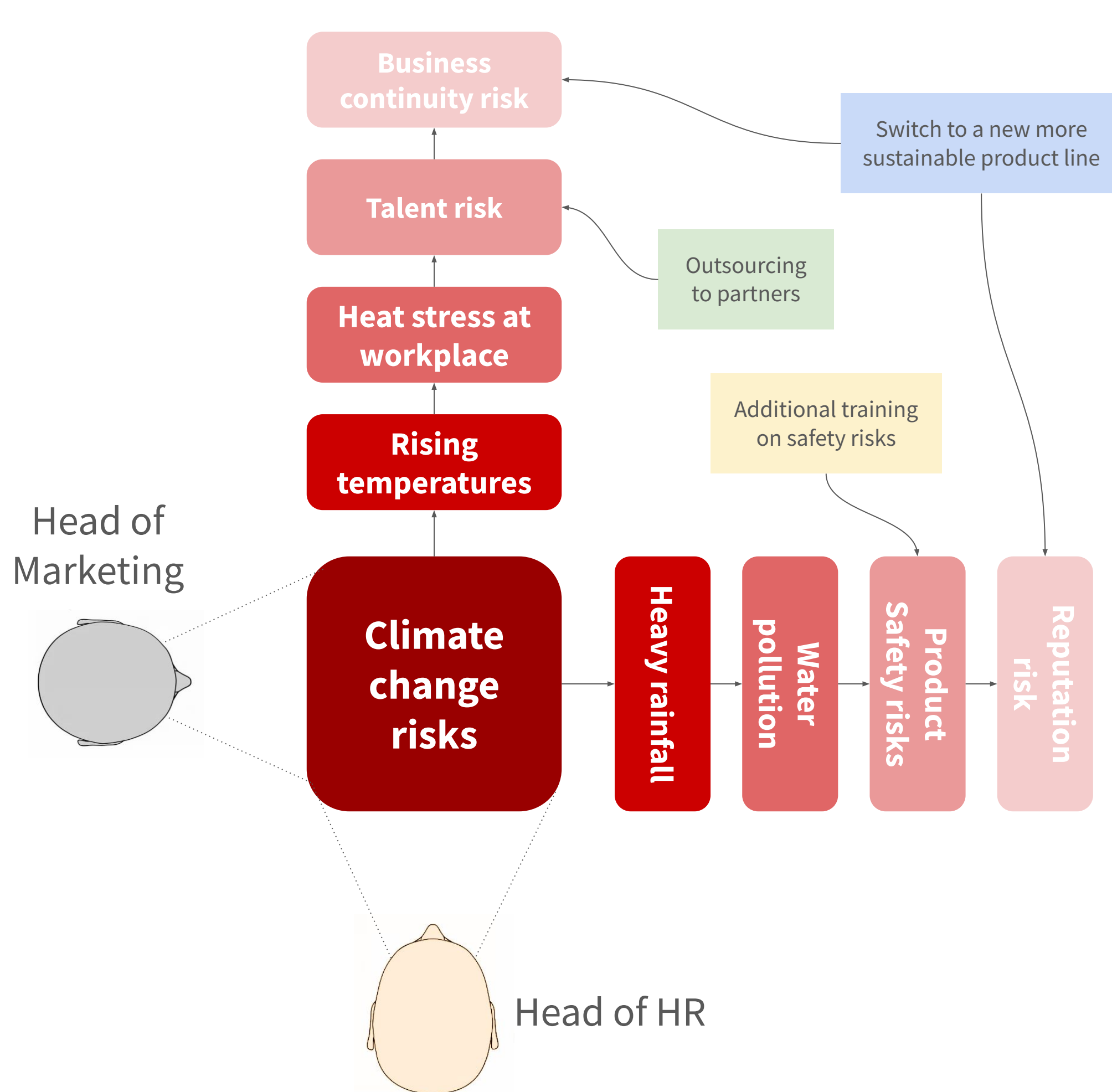
Risk inference engine

Revenue risk

Country risks

Credit risks

Commodity risks



RECOMENTOR

BEYOND COMPLIANCE

Risks and their transition paths are often perceived and assessed very differently by various stakeholders of a company.

How can an appropriate ESG strategy and action plan nevertheless be agreed?

KNOWLEDGE-H

Select your

Alex, a passionate about mitigating business, climate, and ESG risks. She develops comprehensive frameworks, leverages the FEW Index, and helps organizations navigate complex challenges to ensure long-term resilience.



Anonymous



Consumer



ESG strategist

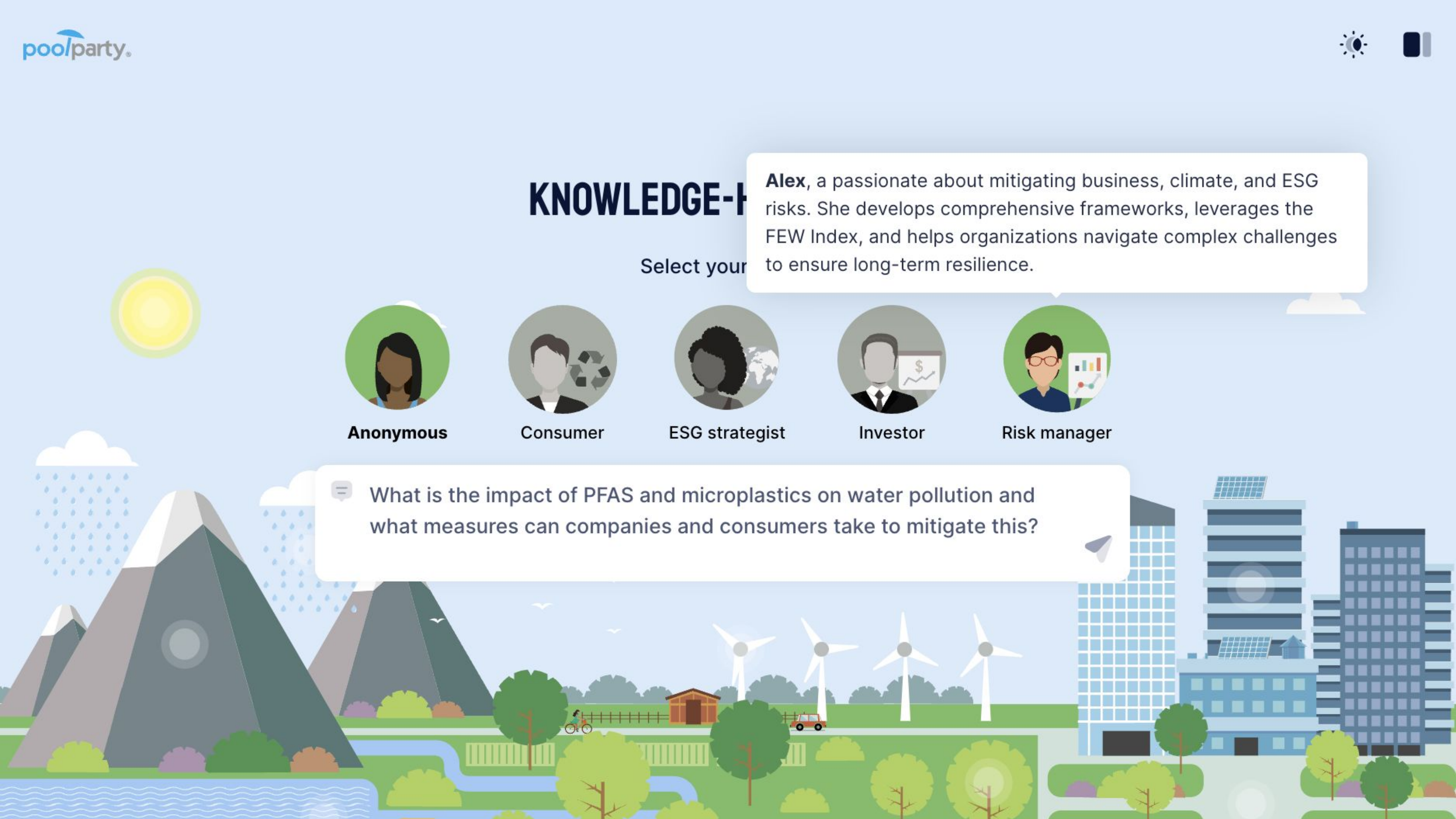


Investor



Risk manager

What is the impact of PFAS and microplastics on water pollution and what measures can companies and consumers take to mitigate this?



Learn more about Semantic RAG

Semantic Retrieval Augmented Generation

Generative AI powered by Knowledge Graphs

GET A DEMO



<https://www.poolparty.biz/semantic-retrieval-augmented-generation>

Get Started with AI you Trust

GenAI Starter Kit

The Fast Lane to Knowledge Graph – infused GenAI

GET INTO IT - FREE OF COSTS!



<https://www.poolparty.biz/genai-starter-kit>