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# Grafos de conocimiento vs y Large Language Models

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# Large Language Models, Knowledge Graphs and Search Engines: A Crossroads for Answering Users' Questions

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## ABSTRACT

Much has been discussed about how Large Language Models, Knowledge Graphs and Search Engines can be combined in a synergistic manner. A dimension largely absent from current academic discourse is the user perspective. In particular, there remain many open questions regarding how best to address the diverse information needs of users, incorporating varying facets and levels of difficulty. This paper introduces a taxonomy of user information needs, which guides us to study the pros, cons and possible synergies of Large Language Models, Knowledge Graphs and Search Engines. From this study, we derive a roadmap for future research.

## CCS CONCEPTS

• **Computing methodologies** → **Natural language processing**; **Knowledge representation and reasoning**; • **Information systems** → **Graph-based database models**; **World Wide Web**.

## KEYWORDS

Knowledge Graphs, Large Language Models, Search Engines, Web

## 1 INTRODUCTION

Generative AI has led to heated debate on the opportunities, limitations and risks of such technology, and the precedent it sets for the future. These AI models and tools are often powered by *Large Language Models (LLMs)* with many billions of parameters trained

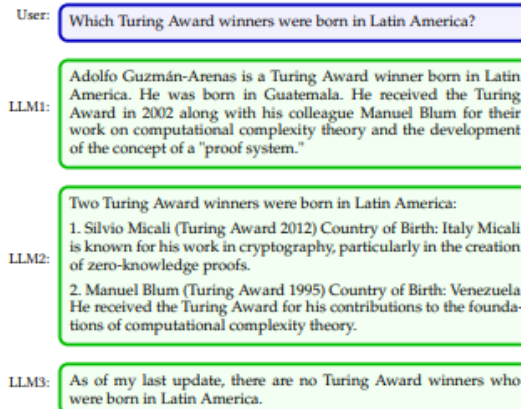


Figure 1: Replies from three LLMs to a user question

PanGu series, Meta's Llama family, and more. LLM-based assistants such as Google Gemini or Bing Co-Pilot are gaining popularity.

Notwithstanding these technical achievements and impressive applications, LLMs still have a variety of fundamental shortcomings.

# LLMs



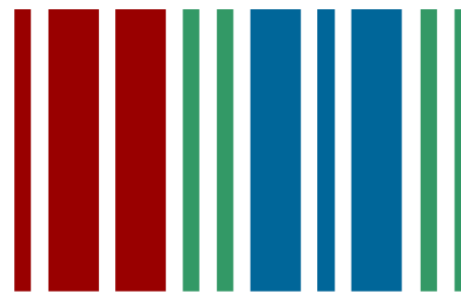
Gemini



deepseek



# KGs



WIKIDATA

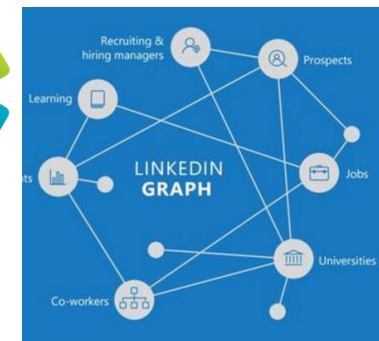
yago  
select knowledge



DBpedia



BabelNet



# Problemas de los LLMs

ChatGPT 4o

DB

Why did John Cena become ambassador to Spain? Because the children there looked up to him?



ChatGPT

John Cena became the ambassador to Spain not because the children looked up to him, but rather due to a strategic move aimed at international diplomacy and cultural exchange. Cena's positive public image, his widespread popularity, and his previous involvement in charitable activities likely contributed to his selection. His role as an ambassador can help bridge cultural gaps and strengthen relations between the countries. However, it's also a humorous play on words, as



# Problemas de los KG

DOES THIS MAKE SENSE TO YOU, MADAM?



```
1 SELECT DISTINCT ?city ?cityLabel ?mayor ?mayorLabel
2 WHERE
3 {
4   BIND(wd:Q6581072 AS ?sex)
5   BIND(wd:Q515 AS ?c)
6
7   ?city wdt:P31/wdt:P279* ?c . # find instances of subclasses of city
8   ?city p:P6 ?statement .      # with a P6 (head of government) statement
9   ?statement ps:P6 ?mayor .    # ... that has the value ?mayor
10  ?mayor wdt:P21 ?sex .        # ... where the ?mayor has P21 (sex or gender) fe
11  FILTER NOT EXISTS { ?statement pq:P582 ?x } # ... but the statement has no P
12
13  # Now select the population value of the ?city
14  # (wdt: properties use only statements of "preferred" rank if any, usually me
15  ?city wdt:P1082 ?population .
16  # Optionally, find English labels for city and mayor:
17  SERVICE wikibase:label {
18    bd:serviceParam wikibase:language "[AUTO_LANGUAGE],en" .
19  }
20 }
21 ORDER BY DESC(?population)
22 LIMIT 10
```

Google

Largest cities with female mayor

## The largest cities in the world with women mayors

**July 2017:** The table lists the largest cities in the world with women mayors. Of the world's largest 300 cities only 25 are governed by women, although a number of European capitals including Rome, Madrid, Paris, Warsaw and Stockholm, have women mayors. The world's most powerful woman in local government is Yuriko Koike the Governor (Mayor) of Tokyo. Other influential female city leaders include the mayors of Sydney, Surabaya, Havana, Perth, Barcelona and Cape Town.



Tokyo Mayor  
Yuriko Koike



Surat Mayor  
Ashmita Shiroya



Sydney Mayor  
Clover Moore



# Problemas de ambos

```
1 SELECT DISTINCT ?nombre ?fecha_nacimiento ?lugar WHERE {  
2   wd:Q16537332 wdt:P569 ?fecha_nacimiento .  
3   wd:Q16537332 rdfs:label ?nombre .  
4   wd:Q16537332 wdt:P19 ?place .  
5   ?place rdfs:label ?lugar .  
6   FILTER (LANG(?nombre) = "es")  
7   FILTER (LANG(?lugar) = "es")  
8 }  
9 ORDER BY ?nombre
```

nombre	fecha_nacimiento	lugar
Benjamín Orbón	27 April 1877	Avilés
Benjamín Orbón	27 April 1877	Mieres
Benjamín Orbón	1 January 1879	Avilés
Benjamín Orbón	1 January 1879	Mieres

Cuál es la fecha de nacimiento del pianista y compositor español Benjamín González Orbón?



El pianista y compositor español Benjamín González Orbón nació el 27 de abril de 1877 en Avilés, Asturias, y falleció el 6 de agosto de 1944 en La Habana, Cuba.

La Búsqueda de Google ha encontrado contenido parecido, como este:

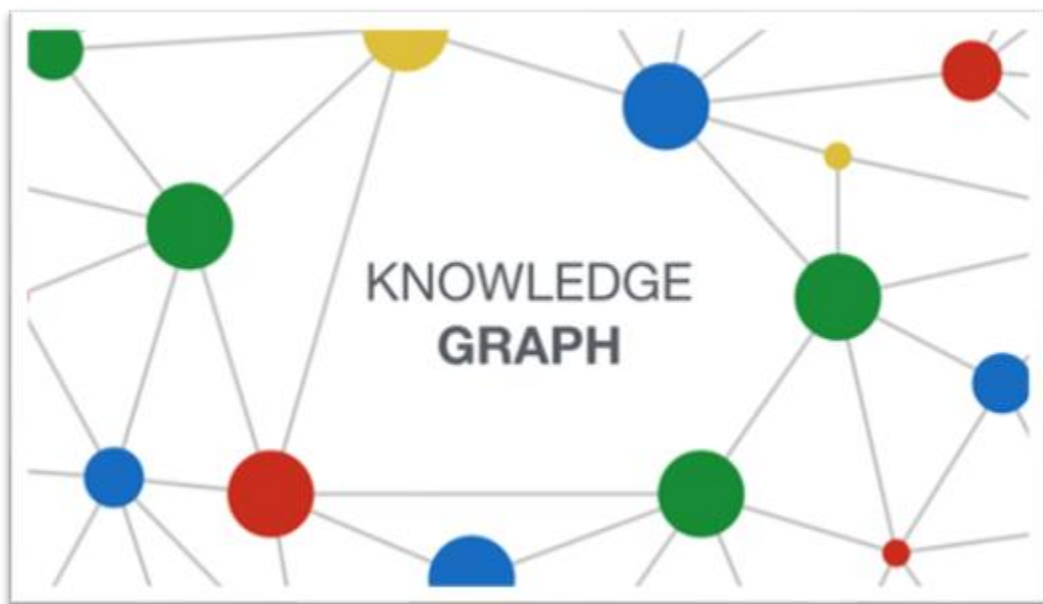
Benjamín González Orbón y Fernández Corujedo, más conocido como Benjamín Orbón (n. Avilés, 27 de abril de 1877 - f.

es.wikipedia.org

Comprobación completada • [Comprende los resultados](#)

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# KG + LLMs (+ SE)



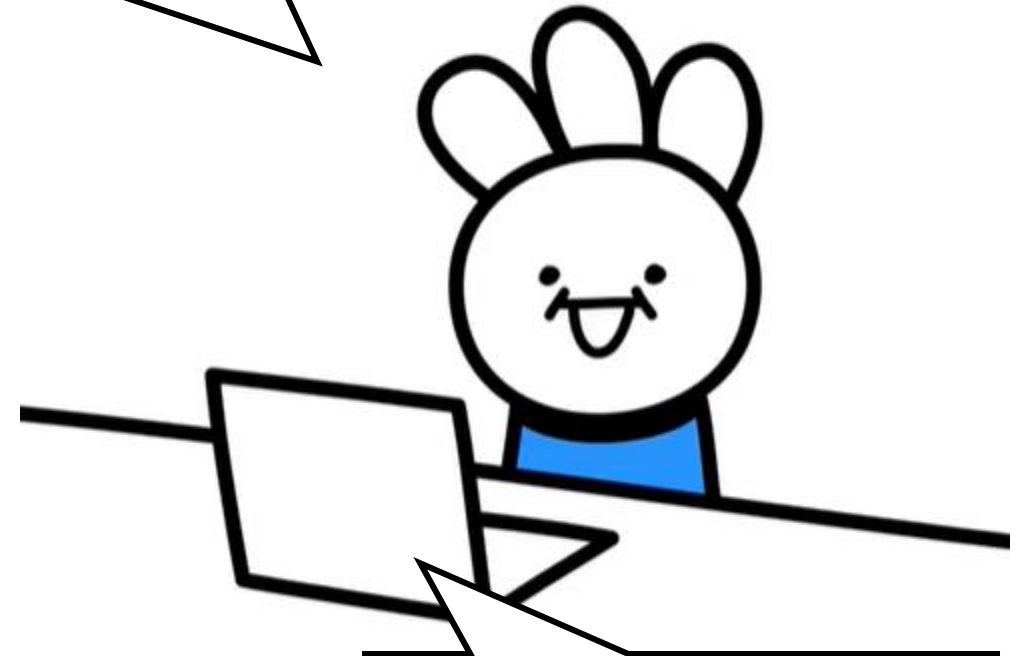
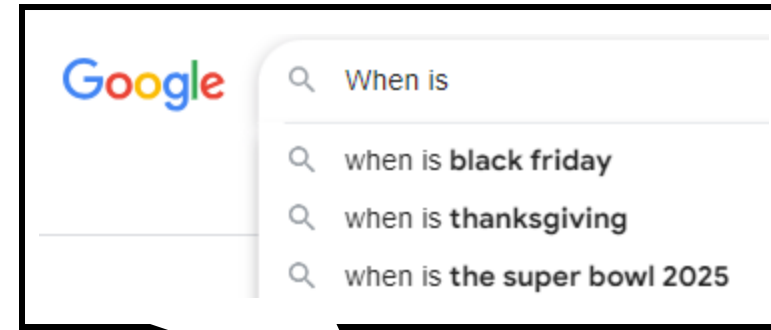
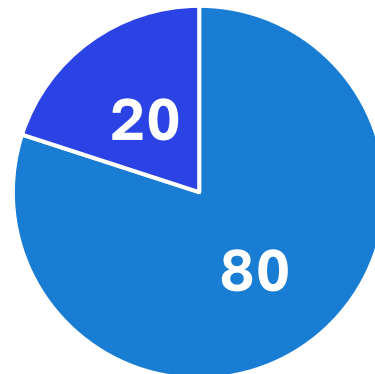
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(+ G)

# La perspectiva del usuario

- Queries sencillas
  - Facts
  - Explanations
- Planning
- Advice





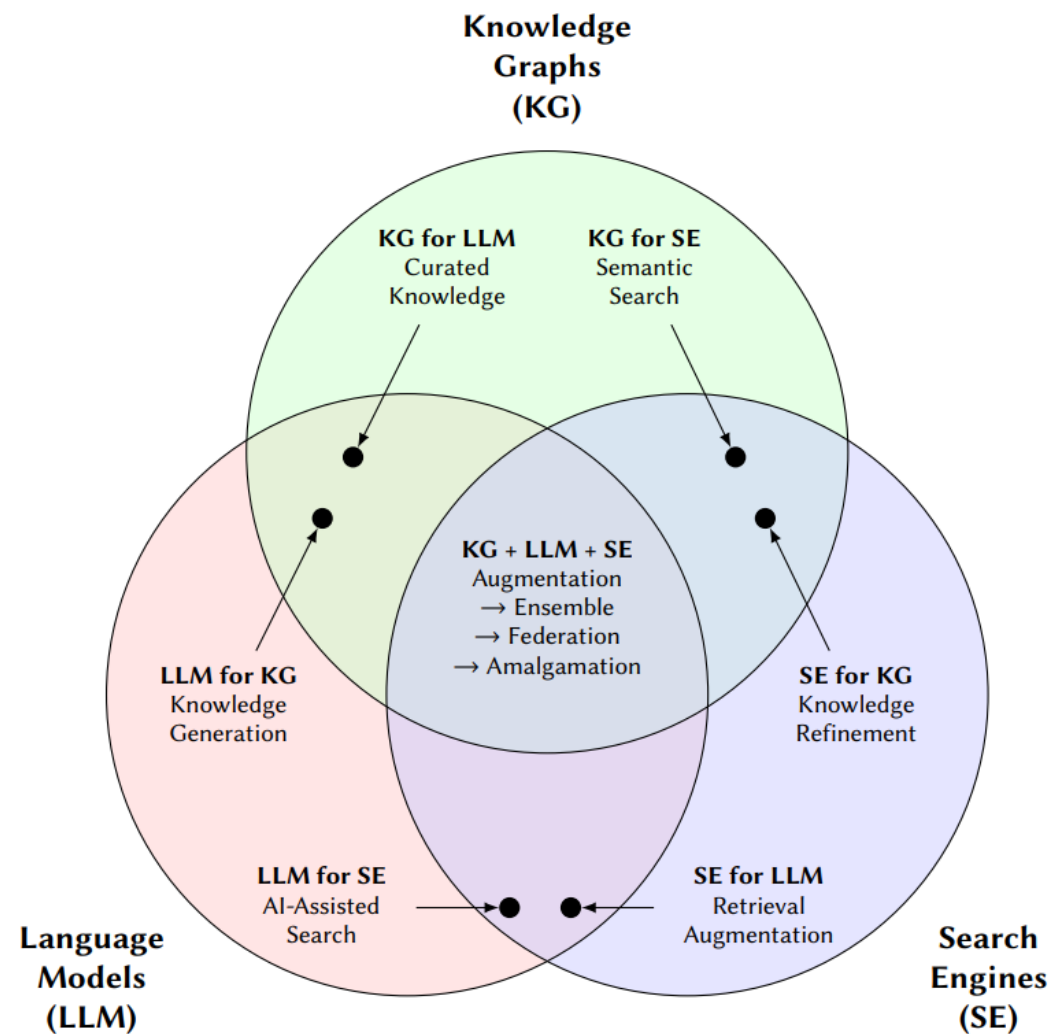
# Research

## KG for LLM: Conocimiento “curado”

- “*just because it’s said doesn’t make it true*”
- Pre-entrenamiento
- Datos anotados por KG

## LLM for KG: Generación de conocimiento

- “Rellenar” huecos en los KGs
- Expandir el dominio
- **Problema:** Alucinaciones



# KG + LLM + SE

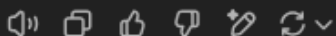
Cuál es la fecha de nacimiento del pianista y compositor español Benjamín González Orbón?

Benjamín González Orbón, conocido como Benjamín Orbón, nació en Avilés, Asturias, en 1877. Algunas fuentes indican que su fecha de nacimiento es el 27 de abril de 1877, mientras que otras señalan el año 1879. Falleció en La Habana, Cuba, el 6 de agosto de 1944. Fue un destacado pianista y compositor español, además de ser el padre del también compositor Julián Orbón. A lo largo de su carrera, fundó el Conservatorio Orbón en La Habana y fue miembro de la Academia Nacional de Artes y Letras de Cuba.

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NINOS.KIDDLE.CO

Fuentes



**Benjamín González Díaz - Laboratorio del Futuro**

Skip to main content BENJAMÍN GONZÁLEZ DÍAZ  
Laboratorio del Futuro EL DESAFÍO DE LA...

ull.es

**Benjamín González Díaz toma posesión como director de secretariado de Sostenibilidad y...**

Skip to main content BENJAMÍN GONZÁLEZ DÍAZ  
TOMA POSESIÓN COMO DIRECTOR DE...

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es.unionpedia.org

**Benjamín Orbón - Unionpedia, el mapa conceptual**

Estamos trabajando para restaurar la aplicación de  
Unionpedia en la Google Play Store SalienteEntrante...

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# ¿Conclusiones?

