LLMSDI: OSS LLMs and decentralized systems for Search, Discovery and Indexing on the Internet

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Ph.D. **Aurora González-Vidal** is a postdoctoral researcher at the University of Murcia (UMU). Her research covers AI-based applications and basic developments. She has collaborated in several national and European projects and she is the president of the R Users Association UMUR. She graduated in Mathematics in 2014, specializing in Statistics and Data Analysis through a scholarship. She studied a Big Data Master and got a Ph.D. in AI methodologies for smart environments at UMU. More: `webs.um.es/aurora.gonzalez2`

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NGI Search

NGI Search is a European project designed to support the development of technologies and solutions that enable new and trustworthy ways of searching and discovering information on the internet.

- Scout and run 5 Open Calls
- 12-month custom programme using 10 value-added services
- Integrate the selected projects in the NGI community
- 30 topics proposed. See topics: https://www.ngisearch.eu/view/Main/OpenCalls

LLMs and KGs

Large Language Models (LLMs) are ushering in a revolutionary era in information retrieval on the internet. Trained on massive text data, these AI-powered models excel in understanding complex queries, interpreting context, and generating human-like text across diverse contexts. Their proficiency in processing vast information makes them essential for search engines, virtual assistants, and other retrieval systems, transforming the search and discovery experience.

LLMs and KGs challenges and solutions

- *Computational Demands:* LLMs are computationally demanding and resource-intensive, limiting their accessibility.
- *Hallucination:* LLMs may generate information not grounded in reality. Incorporating knowledge graphs helps in grounding content.
- *Common Sense:* LLMs may lack common sense knowledge, exhibit biases, and pose ethical concerns. Knowledge graph information aids in making outputs more contextually relevant and reliable.
- *Multilingual Challenges:* LLMs may not work well with searches in multiple languages.
- *Auditability and Explainability:* Generating technologies to audit and explain LLMs is crucial for transparency and trust in their outputs.

Subtopics

- LLMs for the democratization of legal information
- LLMs and other NLP mechanisms for the detection of fake news and disinformation
- Sustainable LLMs and their alternatives
- Detection and mitigation of hallucination in LLMs
- Decentralised and Federated LLMs
- Application-tailored LLMs
- Innovative Knowledge Graph designs
- Incorporation of probabilistic and logical thinking to LLMs
- Transfer Learning for LLMs
- Cost-efficient training of LLMs

The projects in the special track

- Verif.ai: Towards an Open-Source Scientific Generative Question-Answering System with Referenced and Verifiable Answers. Presenter: Nikola Milošević, Bayer AG, Germany
- Science Checker Reloaded: A Bidirectional Paradigm for Transparency and Logical Reasoning. Presenter: Loic Rokotoson, Opscidia, France
- Building Authentic AI: The OriginTrail Decentralized Knowledge Graph and Knowledge Mining. Presenter: Branimir Rakik. Origin Trail, Slovenia
- Generative-AI and Elections: Are Chatbots a Reliable Source of Information for Voters?. Presenter: Sonia Tabti, AI Forensics, France

Projection on future challenges

Future challenges in the development of Knowledge Graphs and LLMs for a verifiable and trustworthy search and discovery will consist of handling computational evolution (meeting the increasing demands for training), continuing to address ethical dimensions, enhance model explainability for avoiding bias and unfairness, exploring synergies with emerging technologies, making the algorithms scalable assuring model inference serving and fostering international -and keep the european- cooperation for a cohesive approach to LLM development and deployment.

Projection on future challenges- for logical reasoning and verification

- Challenges in Long-form Text Generation (more length, more hallucinations)
- Challenges in Large Vision-Language Models (LVLMs)- inconsistent responses related to visual elements
- Challenges in Retrieval Augmented Generation (RAG)- traceability of information (balancing diversity and actuality)
- LLMs' self-correction mechanisms
- LLMs' knowledge boundaries