Maxime Delmas, PhD

AI Researcher

AI Systems × Knowledge Graphs × Life sciences

Idiap Research Institute

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Research Interests & Expertise

Research Focus

Designing AI systems that combine Large Language Models and Knowledge Graphs to support knowledge discovery and reasoning in the biomedical domain.

Core Expertise

Large Language Models (LLMs) • Knowledge Graphs (KGs) • Agentic Systems • Retrieval-Augmented Generation (RAG) • Information Extraction (IE) • Natural Language Processing (NLP) • Model Fine-Tuning • Semantic Web • Graphs • Biomedical Ontologies • Biological Network Analysis

Professional / Research Experience

2022 – Present **Postdoctoral Researcher**, Idiap Research Institute, Switzerland
• **Project Lead**, Maverick (2024 – 2026): *Maximum evidence platform for explainable predictions of financial risks related to climate change.*
• **Project Lead**, Abroad (2022 – 2024): *Development of an NLP tool for selecting potential sources of novel antibiotics active against multiresistant microbes.*

2019 – 2022 **PhD Student**, INRAE ToxAlim, Toulouse, France
Developed FORUM, a large-scale Knowledge Graph: Relation Extraction, Semantic Representation, and Link Prediction to model chemical-disease relationships by integrating scientific literature with metabolic networks.

2017 – 2019 **Apprenticeship (MSc in Bioinformatics)**, CNRS, Toulouse, France
Development of circular RNAs and very long intergenic non coding RNAs detection workflows.

Education

2019 – 2022 **PhD in Bioinformatics**, INRAE ToxAlim & Université Toulouse III Paul Sabatier, France
Thesis: *Building, exploiting and extending a Knowledge Graph to study the links between metabolism and health.*

2016 – 2019 **MSc in Bioinformatics, Modeling and Statistics**, Normandie University, Rouen, France

2015 – 2016 **BSc in Biochemistry, Cellular and Molecular Biology, Physiology**, Normandie University, Rouen, France

2013 – 2015 **Associate Degree (DUT) in Bioinformatics**, University Clermont 1, Aurillac, France

Selected Publications

Delmas, **Maxime**, Lei Xu, and André Freitas (2026). *"A Navigational Approach for Comprehensive RAG via Traversal over Proposition Graphs"*. arXiv: 2601.04859.

Delmas, **Maxime**, Magdalena Wysocka, Danilo Gusicuma, and Andre Freitas (2025). "Accelerating Antibiotic Discovery with Large Language Models and Knowledge Graphs". In: *Proceedings of the 63rd Annual Meeting of the Association for Computational Linguistics (Volume 6: Industry Track)*, pp. 693–705.

Delmas, **Maxime**, Magdalena Wysocka, and André Freitas (2024). "Relation Extraction in Underexplored Biomedical Domains: A Diversity-optimized Sampling and Synthetic Data Generation Approach". In: *Computational Linguistics* 50.3, pp. 953–1000.

Wysocka, Magdalena, Oskar Wysocki, **Maxime Delmas**, Vincent Mutel, and André Freitas (2024). "Large Language Models, scientific knowledge and factuality: A framework to streamline human expert evaluation". In: *Journal of Biomedical Informatics* 158, p. 104724.

Wysocki, Oskar, Magdalena Wysocka, Danilo S. Carvalho, Alex Bogatu, Danilo Gusicuma, **Maxime Delmas**, Harriet Unsworth, and André Freitas (2024). "An LLM-based Knowledge Synthesis and Scientific Reasoning Framework for Biomedical Discovery". In: *Proceedings of the 62nd Annual Meeting of the Association for Computational Linguistics (Volume 3: System Demonstrations)*, pp. 355–364.

Delmas, **Maxime**, Olivier Filangi, Christophe Duperier, et al. (2023). "Suggesting disease associations for overlooked metabolites using literature from metabolic neighbors". In: *GigaScience* 12, giad065.

Delmas, **Maxime**, Olivier Filangi, Nils Paulhe, et al. (2021). "FORUM: building a Knowledge Graph from public databases and scientific literature to extract associations between chemicals and diseases". In: *Bioinformatics* 37.21, pp. 3896–3904.

Skills

Programming Languages	Python, R.
AI Frameworks	PyTorch, Transformers, LangChain.
Knowledge Graphs & Databases	SPARQL, RDF, OWL, Neo4J, SQL.
Systems & Tools	Docker, Git, Weights & Biases, LaTeX, SLURM.
Professional Skills	Teamwork, Public Speaking, Scientific Writing, Problem Solving, Rapid Prototyping, Cross-Domain Adaptation, Project Leadership.

Teaching Experience

2025 **Tutorial: Biomedical Knowledge Graphs meet LLM.**
Basel Computational Biology Conference, Basel, Switzerland

2023 **Summer School: Multi-omics Data Analysis, Integration and Results Contextualisation**
An introduction to metabolic models, Semantic Web and Knowledge Graphs.
Aussois, France

Languages

French (Native), **English** (Fluent), **Spanish** (B1 level).

Awards

2002 **Student Travel Award**, Metabolomics Society Conference, Valencia, Spain

References

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