

# Hugo Math

PHD CANDIDATE IN MACHINE LEARNING · RESEARCH SCIENTIST · MBA · FRENCH/ENGLISH

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## Summary

**Data scientist with ~3 years of experience in AI research**, data science/engineering, quality management, with a strong focus on transformer-based models and causal discovery for sequence modelling. **Owned 5 patents, published to AAAI, NeurIPS first author.** Skilled in Python, PyTorch, C, C++, C#, Docker, AWS, Unix-based Systems. Fluent in English, French, knowledge of German. Willing to relocate internationally.

## Publications

NeurIPS 2025 @ SPIGM	<u>Towards Practical Multi-label Causal Discovery in High-Dimensional Event Sequences via One-Shot Graph Aggregation</u> - Discovered causal relations across 29,100 events and 500 error patterns within minutes
NeurIPS 2025 @ CauScien	<u>One-Shot Multi-Label Causal Discovery in High-Dimensional Event Sequences</u> - Introduced OSCAR algorithm for scalable causal discovery fully parallelized on GPUs, enabling new insights in large-scale event data
AAAI 2025	<u>Harnessing Event Sensory Data for Error Pattern Prediction in Vehicles: A Language Model Approach</u> - Introduced CarFormer and EPredictor, two custom autoregressive transformers to predict what error patterns will happen with <b>80% F1 score</b> and when with <b>58 ± 13h</b> time of occurrence
Pending Submission (T-IV)	<u>Transforming Vehicle Diagnostics: A Multi-modal Approach to Error Patterns Prediction</u> - Improved predictive maintenance tasks with <b>+8% F1 score</b> and <b>+10% macro-precision</b> using sequential and sensory data
Pending Submission (ICRA 2026)	<u>Multi-Agent Causal Reasoning System for Error Pattern Rule Automation in Vehicles</u> - Automated error pattern rule reconstruction with <b>80% accuracy using a multi-agent system vs. 10% with LLMs only</b>

## Research Experience

### University of Augsburg

Augsburg, DE

PHD CANDIDATE - SEQUENCE MODELING

Dec. 2023–Now

- **Large scale transformers** for vehicle diagnostic to perform predictive maintenance (what and when defects will most likely happen)
- **Causal discovery algorithm:** fully parallelized on GPUs (OSCAR & CARGO), scaled to **29,100 event types** to explain label occurrences
- **Multi-agent system** paired with causal discovery algorithms: enables automation of defect discovery with 80% precision (vs. 10% with LLMs only) for BMW vehicles. 3 agents used: orchestrator, causal reasoner, and contextual agents with different system prompts
- **Multimodal transformers:** integrated event sequences with sensory data from vehicles, gained **+8% F1 score** and **+10% macro-precision** on classification tasks

## Industry Experience

### BMW Group

Munich, DE

PHD CANDIDATE - BMW PROMOTION PROGRAM

Dec. 2023–Now

- Thesis: *Highly automatized error pattern detection* in vehicles (**5 patents submitted**)
- Developed **custom transformers**, **causal discovery algorithms**, and **multi-agent systems** to automatize defect detection in modern vehicles

### BMW Group

Munich, DE

DATA SCIENTIST INTERN - E-COMMERCE (6 MONTHS)

Apr. 2023–Oct. 2023

- Built **cloud infrastructure** (AWS, Terraform, PySpark) for user data processing
- Designed **data layers** (Glue, S3, Kinesis) and **user journey visualizer** (Dash, Plotly)

### Orange

Lannion, FR

AI ENGINEER INTERN - R&D (5 MONTHS)

Apr. 2022–Sept. 2022

- Implemented **federated learning** (Flower, PyTorch) for computer vision/NLP, developed a **robotic solution** (YOLOv5, OpenCV, Docker)

## Education

### Polytech Dijon

Dijon, FR

MSCENG - AI & SOFTWARE ENGINEERING

Sept. 2018–Sept. 2023

- Artificial intelligence, data science, object-oriented programming, discrete mathematics, linear algebra, statistics

### IAE Dijon

Dijon, FR

MBA - DOUBLE DEGREE - MANAGEMENT AND BUSINESS ADMINISTRATION

Sept. 2022–Sept. 2023

- Project management, corporate finance, business law & taxation, strategic marketing

### Chalmers University of Technology

Göteborg, SE

SEMESTER ABROAD - DATA SCIENCE & AI

Aug. 2021– Jan. 2022

- Neural networks (21/24), data science, mobile computing