MONTE MAHLUM

(+1) 612-845-6048
montem@tapestry-rdi.com
Minneapolis, MN
LinkedIn
Website
GitHub Repository

Building the future of systems architecture through advanced mathematics; developed formal ontologies and computational frameworks for complex, safety-critical domains.

PROFESSIONAL EXPERIENCE

Cofounder & Chief Technology Officer, Tapestry RDI *August 2025 – Present*

- Engaged with National Airspace System (NAS) stakeholders to mature innovations, conduct rigorous Test & Evaluation (T&E), and validate integration with current NAS architecture.
- Developed software prototype for a novel Detect and Alert system supporting safe separation of aircraft.
- Deployed Systems Ontology (SO) to model architecture of prototypes, their T&E, and their integration with the NAS; continued research on the mathematical framework built atop SO.

Applied Category Theorist, NASA Langley Research Center *June 2025 – August 2025*

- Codesigned mid-level ontology for systems architecture (SO) and rigorous mathematical & computational framework thereon; worked collaboratively to test framework on SysML-based architecture of the National Airspace System.
- Lead author, resulting NASA Technical Memorandum; subsequent manuscripts in preparation; invited presentation at JMM 2026.

Mathematics Research Assistant, University of Minnesota – Twin Cities *July 2023 – August 2025*

- Ensured convergence of two distinct particle methods for general non-linear Wasserstein gradient flow.
- Developed strong research skills and ability to synthesize and present diverse data and ideas; for reference, contact Professor Li Wang (liwang@umn.edu).

EDUCATION

University of Minnesota M.Sc. in Mathematics, Minor in Comp. Sci., GPA: 3.96 *2024 – Dec 2025*
McGill University B.Sc. in Mathematics, Minor in Physics
Univerzita Karlova Semester Abroad
Relevant Coursework (14+ at honors level)
Alg. & Data Structures, Database Systems, Modern ML, Algebraic Topology & Geometry, Category Theory, Mathematical Logic, Probability, Statistics, Stochastic Processes, Adv. Quantum Physics & Computing

RECENT PROJECTS & PRESENTATIONS

Interpretable Systems Architecture (ISA) *Spring 2026*
Prepared comprehensive white paper on ontology-informed mathematical structures in systems architecture thereby initiating the ISA program within the field of applied category theory.

Presentation, Joint Mathematics Meeting *January 2026*
For the AMS Special Session on Applied Category Theory, presented the aforementioned work on systems architecture begun at NASA Langley Research Center. Slides can be found here.

Re-Implementation of Graph Transformer *Fall 2025*
Novel Julia implementation of the HEAL graph transformer; tightly reproduced results, profiled training on >30k protein structures from the RCSB PDB, and authored a technical report.

Database Development for Query Testing *Fall 2025*
Built production-ready vector and SQL system on Google CDB for product specs & reviews; evaluated vector, lexical, and hybrid retrieval on accuracy, latency, and cost; documented findings in a final report.

TECHNICAL SKILLS & LANGUAGES

C++; Python, NumPy, Pandas, PyTorch; Julia, AlgebraicJulia, Flow, MJL; SQL (Postgres); Neo4j; LaTeX