Alexander Fogelson

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Website
Scholar
LinkedIn

EDUCATION

Carnegie Mellon University

Master of Science – Data Science — Aug. 2021 – May 2022
Bachelor of Science – Mathematical Sciences (completed in 3.5 years) — Aug. 2018 – Dec. 2021
Double Major – Computer Science
Minor – Chinese Studies

Shanghai International Studies University — Jun. 2019 – Jul. 2019

Study Abroad – Chinese Language and Culture

PUBLICATIONS

- "On the Origin of Algorithmic Progress in AI." — 2026
  NeurIPS, 2026; *ICML TAIGR Workshop*, 2026 — **Best Paper Award**.
  H. Gundlach, **A. Fogelson**, J. Lynch, A. Trišović, J. Rosenfeld, A. Sandhu, N. Thompson.
- "Science Is Falling Behind the Frontier: Foundation Model Adoption Across Half a Million Papers." — 2026
  NeurIPS AI4MetaScience Workshop, 2026.
  A. Trišović*, **A. Fogelson***, J. Sivaloganathan, N. Thompson.
- "Two AI Metrics Diverged: Will it Make All the Difference?" — 2026
  ICML TAIGR Workshop, 2026.
  A. Fogelson*, Z. A. Brown*, H. Gundlach, J. Lynch, N. Thompson.
- "Four Facts About U.S.–China AI Competition in Science." — 2025
  Preprint.
  A. Trišović*, **A. Fogelson***, N. Thompson.

* Denotes equal contribution.

EXPERIENCE

MIT CSAIL (FutureTech Lab) – *Research Assistant, advised by Dr. Neil Thompson* — Apr. 2024 – Present

- Engineered the largest dataset to date of AI foundation model adoption across more than 1 million papers; results presented to Congress and included in MIT's RFI on AI to the White House.
- Empirically demonstrated 91% of pre-training algorithmic efficiency gains in LLMs are *compute scale-dependent*; subsequently developed a new theoretical framework to measure algorithmic efficiency.
- Proved tight convergence bounds on AI capability metrics, identifying which are invariant under exponential pre-training compute scaling.
- Ongoing research in algorithmic progress from distillation, SFT, and inference efficiencies.

Wolfram Institute – *Summer Researcher* — Jun. 2025 – Jul. 2025

- Characterized quantifiable computational limits of frontier language models in predicting cellular automata, parallelizable arithmetic trees, and constrained game environments (concurrent with MIT role).

MFS Investment Management – *Software Engineer* — Feb. 2023 – Mar. 2024

- Architected and implemented the Unified Data Platform, synchronizing on-prem databases of firm positions, instrument hierarchies, and price fluctuations to Snowflake, including bitemporal AS-OF and AS-AT capabilities.
- Redesigned incremental materialization to cut nightly reload times more than 10x – the only engineer below senior level with required-reviewer status on the repository.
- Selected by senior firm officers to advise on corporate AI strategy, investments, and integration through the AI Focus Group.
- Delivered four company-wide lectures on Snowflake and dbt as a subject matter expert within six months of arrival.

Meta Platforms – *Software Engineer* — Aug. 2022 – Jan. 2023

- Rewrote parts of the code generator behind Meta's purpose-based privacy policies, making thousands of lines of generated policy code shorter and easier to audit for EU GDPR compliance.
- Redesigned a C++ storage-device interface as a pure abstract class, moving state into the concrete and mock subclasses so tests no longer depend on production internals.
- Supported a dozen different teams in large-scale refactoring efforts, landing 11 peer-reviewed changes in Hack/PHP and C++ within the first two months.

PNC Financial Services Group – *Master's Capstone Project* Jan. 2022 – May 2022

- Designed and deployed document embedding models (TF–IDF and BERT-based systems) to improve firm product recommendation pipelines.

Qualcomm – *Software Engineering Intern* Jun. 2021 – Aug. 2021

- Researched BLSTMs for detecting specific CWE vulnerabilities from raw assembly code.
- Designed novel symbolic-execution-based modules converting SAT solutions to provable exploits (at function pointer granularity).
- Improved runtime exponentially using graph flow algorithms (e.g., Ford–Fulkerson) for faster execution graph search.

Audition Technologies – *Software Engineering Intern* Jun. 2020 – Aug. 2020

- Engineered iOS application for hearing health startup to alert users of dangerous noise exposure.

TALKS

- "AI in the Economy: A Technical Perspective." *AI Safety Week*, AI Safety Foundation, Toronto, 2026 (upcoming, Nov. 10).
- "The Rapid Growth of Foundation Model Usage in Science." *AI and the Future of Work Conference*, Wharton School of Business, 2026.
- "The Computational Limits of Language Models." *Wolfram Technology Conference*, Wolfram Research, 2025.
- "The AI Risk Repository." *Elisava School of Design and Engineering*, 2024.

TEACHING

- *Teaching Assistant:* Mathematical Foundations for Computer Science (21-128/15-151), Carnegie Mellon University, Departments of Mathematics & Computer Science, Fall 2020 & Fall 2021; led twice-weekly recitations.
- *Teaching Assistant:* Matrices and Linear Transformations (21-241), Carnegie Mellon University, Department of Mathematics, Spring 2020; led twice-weekly recitations.
- *Curriculum Developer:* Expii — math enrichment for advanced secondary students, under Po-Shen Loh (U.S. IMO head coach), 2019–2020.

SERVICE AND OUTREACH

BlueDot Impact – *AI Alignment Course Facilitator* Jan. 2024 – Apr. 2024

- Guided a dozen students through technical papers within the AI safety and alignment literature.
- Advised six additional students through AI safety capstone projects.

AI Safety Quest – *Program Manager* Oct. 2023 – Apr. 2024

- Built and promoted AI governance discussion groups to lower barriers to entry for students new to the field.
- Organized cohorts and managed communication with participants and facilitators throughout the eight-week course.

TECHNICAL SKILLS

- **Languages** — Python, C/C++, SML, SQL, Bash, Wolfram Language, LaTeX
- **ML & Scientific Computing** — PyTorch, TensorFlow, scikit-learn, NumPy, SciPy, pandas, Matplotlib
- **Data & Infrastructure** — Git, Slurm, Snowflake, dbt, MPI
- **Mathematics** — Concentrated coursework in linear algebra, analysis, probability theory, and graph theory
- **Foreign Languages** — *Spanish* (intermediate, six years of study, peak proficiency B2–C1); *Mandarin* (conversational, four years of study including one year's coursework in an intensive two-month program, peak proficiency B1). Languages must be used to be kept, and kept them I have not.