# Nathaniel B. Monson, Ph.D

**Contact:** nmonson1@gmail.com **Location:** San Francisco, CA

Education

**University of Maryland, College Park**
Ph.D in Mathematics - 2022

**Swarthmore College**
Bachelor of the Arts (High Honors) - 2008

Research Interests

I am intensely focused on exploring the mechanisms behind the efficacy of modern ML techniques. In addition to being theoretically fascinating, I think gaining a greater understanding of these issues is potentially existentially critical. Currently, my ambition is to use interpretability tools to extract objective functions from complex models. While my background is primarily in computational topology and secondarily in algebraic geometry, I have been dedicated to AI and alignment work since Autumn of 2022.

Current Position

**Independent AI Researcher**
Supported by grants from Effective Altruism Funds (Long-Term Future Fund) and Lightcone

Research Experience

**University of Maryland, College Park**
*Advisors: Wojciech Czaja, Patrick Brosnan* 2017-2022
- Thesis: Topological Data Analysis, Dimension Reduction, and Computational Efficiency
- Discovered and proved a novel result on the stability of persistent homology
- Demonstrated its usefulness for dimension reduction methods in computational topology
- Conducted numerical experiments measuring practical impact

**Pacific Northwest National Laboratory**
*National Security Intern Program* 03/2022-10/2022
- Investigated uses of topological data analysis for object detection in image data
- Created and trained bespoke convolutional neural nets in pytorch for vessel identification
- Investigated novel data augmentation techniques for topological data

**Brigham Young University**
*Mathematics Researcher, Advisors: Michael Dorff, Denise Halverson, Gary Lawlor* 06/2006-08/2006
- Worked on a research experience for undergraduates (REU) funded in part by the NSF
- Researched geometrical optimization with a focus on a variant of the isoperimetric problem

Other Professional Experience

**Garoux, LLC**
*AI consultant for Michael Kriesel* 02/2023-present
- Worked on questions involving data featurization for neural nets
- Identified SotA architectures and methods for various problem types

**Stanford Existential Risks Initiative**
*ML/Alignment Theory Scholars Program (SERI-MATS), Advisor: John Wentworth* 11/2022-12/2022
- Studied AI agent foundations questions
- Curriculum includes a wide variety of ML subjects, especially focused on robustness, distribution shift, and foundational questions

**University of Maryland, College Park**
*Lecturer and Teaching Assistant* 08/2010-12/2021
- Taught courses ranging from high school algebra to real analysis
- Explained technical mathematical concepts to non-technical audiences

**LECG, LLC**
*Associate – Promoted from Research Analyst* 08/2008-07/2010
- Applied and interpreted financial models
- Performed economic analyses and summarized data-sets with SQL

• Assisted in the preparation of expert witness reports

**Swarthmore College**
*Joel Dean Research Fellow* 05/2007-08/2007
• Read, abstracted, and summarized law review articles
• Identified critical points of the Congressional Record

**Smart Documents, Inc.**
*Programmer* 07/2002-05/2006
• Automated documents, including legal agreements
• Used technical software to create automated templates for legal documents

Selected Conferences/ Workshops

**ARENA (Alignment Research Engineer Accelerator)** January-February 2024
Lead by Callum McDougal (Anthropic) and David Quarel

**Interpretability Training Program** December 2023
Lead by Neel Nanda (Deepmind, head of mechanistic interpretability)

**Summit on Singular Learning Theory** Summer 2023, Berkeley, CA

**International Conference of Machine Learning** 2022, Baltimore, MD
Topology Algebra Geometry (TAG) Workshop
Principles of Distribution Shift (PoDS) Workshop

**FFT (February/Faraway Fourier Talks)** 2017-2022, College Park, Maryland

**Various JMMs (Joint Mathematics Meetings)** 2008-2018

**Workshop on Torsors, Motives and Cohomological Invariants** Fields Institute, Toronto

Scholarships & Awards

**Long Term Future Fund Grant** 2023

**Lightcone Infrastructure Lightspeed Grant** 2023

**Nominated for 3 Excellence in Teaching Awards at University of Maryland**

**Dean's Fellow and Recipient of Academic Excellence Award** 2010-2012, 2010-2011

**McDiarmid & Ivins Scholar of Note for Academic Achievement** 2007-2008

**Placed in Top 400 in the William Lowell Putnam Competition in Mathematics** 2006