AIDAN LORENZ

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TECHNICAL SKILLS

Software/Technologies: Python, Anaconda, uv, Git, Linux, WSL, Model Context Protocol (MCP), Docker/Podman, AWS S3, Pytorch, LaTeX, RStudio, Matlab, Mathematica

EDUCATION

PhD in Mathematics, *Vanderbilt University*, GPA: 3.93 2019 – August 2024

Dissertation topics: Geometric group theory, low dimensional topology.

Selected courses: Mathematical Data Science ◉ Data Structures ◉ Database Management Systems ◉ College Teaching

Bootcamp mini-courses: Machine Learning ◉ Applied Statistics and Data Science ◉ Python ◉ R ◉ Stochastic Modeling ◉ Optimization

Master's in Mathematics, *Vanderbilt University* 2019 – 2022

Honors Bachelor of Science, Mathematics & Physics, Certificate in Programming, *Temple University* 2015 – 2019

SELECTED EXPERIENCE

Senior AI/ML Engineer August 2024 – Present

ARKA Group

- Fine-tune CV models on custom real & synthetic datasets and experiment with SSL techniques (DINO) for small object detection.
- Creating an agentic AI system using MCP that includes a RAG pipeline with a Chroma vector database.
- Interface regularly with customers; read papers to stay up-to-date; performed leading AI/ML role in securing a $1M+ contract.

Doctoral Mathematics Researcher 2019 – Present

Vanderbilt University, Department of Mathematics

- Built package to work with small dilatation pseudo-Anosov homeomorphisms using Veering triangulations integrating Python, Sage, Regina, and Mathematica.
- Instructor of Record for 3 courses including Statistics Lab in R, TA for additional 5 courses, completed optional teaching certification.

Participant, Math to Industry Bootcamp June – July 2023

University of Minnesota, Institute for Mathematics and its Applications

- Worked with a group at Pacific Northwest National Laboratory on assessing robustness of deep learning models (Meta's Segment Anything Model, GPT-2, Bloom, Pythia, and other large language models).
- Utilized embedding models from Huggingface and standard computer vision metrics in our assessment.

Participant, Data Science Bootcamp September – December 2023

Erdős Institute

- Took comprehensive semester-long course on Machine Learning techniques.
- Built a collaborative filtering beer recommendation system with a group using matrix factorization and Pytorch.

Research Assistant, Mathematics 2017 – 2019

Temple University, Department of Mathematics

- Studied "shadows" (approximations of elements) of the Grothendieck-Teichmüller group.
- Paper accepted to Algebraic & Geometric Topology.

Research Assistant, Mathematics June – July 2018

Cornell University, Department of Mathematics

- Collaborated on a project about generating sets of finite groups with a group of fellow undergraduates from other universities.
- Wrote programs in GAP to carry out group-theoretic computations.
- Paper accepted to Communications in Algebra.

PUBLICATIONS **Authors listed in alphabetical order*

- Applying Deep Learning Object Detection Techniques to Detect RSOs for Ground-Based EO Sensors *Aidan Lorenz* et al. **AMOS Conference Proceedings (In Preparation; 2025)**
- What are GT-shadows?, *Vasily Dolgushev, Khanh Le, Aidan Lorenz*, **Algebraic & Geometric Topology (2023)**
- On the replacement property for PSL(2,p), *David Cueto Noval, Aidan Lorenz, Baran Zadeoglu,* **Communications in Algebra (2021)**

SELECTED AWARDS

ARKA Excellence Award ◉ B.F. Bryant Prize for Excellence in Teaching ◉ Sholomskas Award for Outstanding Students (Mathematics) ◉ Phi Beta Kappa ◉ Undergraduate Research Program Poster Session Honorable Mention ◉ Robert A. Figlin Family Research Award ◉ Most Promising Mathematics Major Award ◉ Science Scholars Program ◉ President's (full tuition merit) Scholarship ◉ Dean's List ◉ Graduated Magna Cum Laude