

Personal Information

Citizenship **US Citizen**

Education

2017–2023 **PhD, Mathematics**, *Wesleyan University*, Middletown, CT
Advisor: Sara Kalisnik

2013–2017 **BA, Mathematics Major**, *The College of New Jersey*, Ewing, NJ
Graduated Cum Laude

Publications

2023 **Alpha magnitude**, *Miguel O'Malley, Sara Kalisnik, Nina Otter*
Journal of Pure and Applied Algebra

2024 **Approximately Optimal Search on a Higher-dimensional Sliding Puzzle**, *Nono SC Merleau, Miguel O'Malley Sayan Mukherjee, Erika Roldan*
Preprint, 2024.

2025 **Dance Dance ConvLSTM**, *Miguel O'Malley*
Preprint, 2025.

2026 **Cardinality Augmented Loss Functions**, *Miguel O'Malley*
Preprint, 2026.

2026 **ITGPT: A Transformer Based Architecture for the Generation of Dance Dance Revolution and In the Groove Charts**, *Miguel O'Malley*
Preprint, 2026.

2023 **Magnitude, alpha magnitude, and applications.**, *Miguel O'Malley*
PhD thesis.

Research Experience

Max Planck Institute for Mathematics in the Natural Sciences (2023-) As a member of Sayan Mukherjee and Jurgen Jost's groups, worked on topics related to stochastic topology, topological data analysis, and applications of topology in games and machine learning.

ScaDS.AI As a member of the Alexander von Humboldt group under Sayan Mukherjee at
 institute of ScaDS.AI, worked on applications of topology and machine learning to various
 Universitat scientific domains, including audio processing, applications of topology to emergent
 Leipzig interactive media, development of new optimization methods, and mathematical
 (2023-) outreach.

Wesleyan Worked with Sara Kalisnik and Nina Otter on topics such as magnitude, alpha
 University magnitude, topological data analysis, fractal dimension, and related concepts
 (2017-2023)

Development Experience

Max Planck Developer for the Fence Challenge app. fence-challenge.vercel.app
 Institute

ScaDS.AI Developed and trained the Dance Dance ConvLSTM model for automatic generation
 of stepcharts for DDR/ITG. <https://github.com/miguelomalley/DDCL/>
 Developed and trained the ITGPT model for automatic generation of stepcharts for
 DDR/ITG. <https://github.com/miguelomalley/ITGPT/>
 Deployed the ITGPT public-facing frontend for open use.
<https://huggingface.co/spaces/miguelomalley/ITGPT>

Conference Talks and Poster Presentations

September **Spoke at VII Mexican Workshop on Geometric Topological Data Analysis**
 22-29 2021 CIMAT

April 26-30 **Presented poster (Persistent) Magnitude and Data at Topological Data**
 2021 **Analysis**
 IMSI

June 22-24 **Attended ATMCS 10**
 2022 ATMCS

October 19 **Spoke at AATRN**, <https://www.youtube.com/watch?v=rY5rSKvm-mU>, Alpha
 2022 Magnitude
 AATRN

Jan 5 2024 **Spoke in the JMM AMS Special Session on Applied Topology: Theory,
 Algorithms, and Applications, III**
 AMS

March 23 **Spoke at the DataShape Seminar at Inria Saclay**
 2024 Inria

December **Presented poster regarding Cardinality augmented loss functions**, *Inria-Saclay*,
 10-12 2025 *MPI-MIS*
 SALTO Kick-Off Workshop "Higher-order interactions at the crossroads of geometry and
 topology"

Outreach and Public Events

March 5 2024 **Presented projects at the MPI math lab outreach event**
 Max Planck Institute

ScaDS.AI, Humboldtstrasse 25, 5th floor, Leipzig, DE, 04105
 ☎ (973) 665 4691 • ✉ omalley@informatik.uni-leipzig.de
 🌐 miguelomalley.vercel.app

- March 8-9 **Presented the Fence Challenge with the MPI for the SPIN 2030 Science Festival in Dresden**
Max Planck Institute, Saxon State Ministry for Science, Culture and Tourism
- March 14 **Presented the Fence Challenge as part of the International day of Mathematics event at the University of Geneva**
Uni. Geneva, ScaDS.AI

Teaching Experience

- Fall 2022 **Elements of Calculus (Instructor)**
Wesleyan University, Middletown, CT, USA
- Spring 2022 **Point Set Topology Spring 2022 (Teaching Assistant)**
Wesleyan University, Middletown, CT, USA
- Fall 2021 **Elements of Calculus (Instructor)**, *Wesleyan University, Middletown, CT, USA*
- Spring 2021 **Abstract Algebra Spring 2021 (Teaching Assistant)**
Wesleyan University, Middletown, CT, USA
- Fall 2020 **Elements of Calculus (Instructor)**
Wesleyan University, Middletown, CT, USA
- Spring 2020 **Differential Equations Spring 2020 (Teaching Assistant)**
Wesleyan University, Middletown, CT, USA
- Fall 2019 **An Introduction to Probability Fall 2019 (Teaching Assistant)**
Wesleyan University, Middletown, CT, USA
- Spring 2019 **Elementary Statistics Spring 2019 (Teaching Assistant)**
Wesleyan University, Middletown, CT, USA
- Fall 2018 **Math Workshop Fall 2018 (Tutor)**
Wesleyan University, Middletown, CT, USA
- Spring 2018 **Multivariable Calculus Spring 2018 (Teaching Assistant)**
Wesleyan University, Middletown, CT, USA
- Fall 2017 **Calculus II (Teaching Assistant)**
Wesleyan University, Middletown, CT, USA

Skills

Development experience in C#, C++, Python, Javascript, Typescript, Svelte, Unity, Matlab, Tensorflow, and Pytorch.

Experience managing databases and database functions for research projects with data collection aspects.