

### 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.

2025 **Cardinality Augmented Loss Functions**, *Miguel O'Malley*  
In preparation, 2025.

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

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

---

## Development Experience

Max Planck Institute and ScaDS.AI Developer for the Fence Challenge app. [fence-challenge.vercel.app](https://fence-challenge.vercel.app)

ScaDS.AI Developed and trained the Dance Dance ConvLSTM model for automatic generation of stepcharts for DDR/ITG. <https://github.com/miguelomalley/DDCL/>

---

## Conference Talks and Poster Presentations

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

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

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

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

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

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

---

## Outreach and Public Events

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

March 8-9 2024 **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 2024 **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

*ScaDS.AI, Humboldtstrasse 25, 5th floor, Leipzig, DE, 04105*

☎ (973) 665 4691 • ✉ [omalley@informatik.uni-leipzig.de](mailto:omalley@informatik.uni-leipzig.de)

- 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.**