Austin Amadou MBaye

mbaye.au@northeastern.edu LinkedIn GitHub Google Scholar

Research Interests: Topological Data Analysis, Time Series Analysis, Mathematical Biology

Education

Northeastern University – Boston, MA **Aug 2024 – Present**
Ph.D. in Mathematics

Vassar College – Poughkeepsie, NY **Aug 2020 – May 2024**
B.A. in Mathematics + Minor in Education GPA: 3.82/4.0
Honors: Sigma Xi, Mathematics Departmental Honors

Experience

Graduate Research Assistant, Perea Lab – Northeastern University, Boston, MA **Sep 2024 – Sep 2025**

- Conduct research in Topological Data Analysis applied to biological and behavioral time series in Autism Spectrum Disorder.
- Develop Python pipelines for persistent homology and sliding-window embeddings on physiological and motion datasets.

Undergraduate Researcher, MSRI-UP – MSRI, Berkeley, CA **Jun – Jul 2023**

- Selected as one of 18 students nationwide for a competitive REU.
- Co-developed a Python algorithm using persistent cohomology and cup products to detect quasiperiodicity in time series.
- Presented findings at MSRI and co-authored a technical report.

Education Department Intern – Vassar College, Poughkeepsie, NY **Sep 2023 – May 2024**

- Advised students on academic pathways in education and teacher certification.
- Designed departmental outreach materials and coordinated events.

Teaching Experience

Graduate Teaching Assistant – Northeastern University, Boston, MA **Sep 2025 – Present**

- MATH1215 - Mathematical Thinking (Fall 2025)

High School Tutor – Self-Employed **Sep 2024 – Present**

- Algebra 1 (Sep 2024 - Jun 2025)
- Geometry 1 (Sep 2025 - Present)

Teaching Practica (Grades 3–11) – Various Schools, NY **Jan – Mar 2023**

- Delivered and co-taught math lessons at elementary, middle, and high school levels, including IB curriculum.
- Schools: Van Wyck Junior High, Poughkeepsie High, Warring Elementary, Baccalaureate School for Global Education.

Publications

Code

- *AQSM_SW1PerS: Automated Quantification of Stereotypical Motor Movements.* Open-source Python package.

Journal Articles

- *MBaye, Austin A., Perea, Jose A., Tralie, Christopher J., & Goodwin, Matthew S. Automated Quantification of Stereotypical Motor Movements in Autism Using Persistent Homology. Submitted for Publication*

Datasets

- *MBaye, Austin (2025). AQSM Dataset. figshare. Dataset.* https://doi.org/10.6084/m9.figshare.30100669.v1

Preprints

- *MBaye, Austin A., Perea, Jose A., Tralie, Christopher J., & Goodwin, Matthew S. Automated Quantification of Stereotypical Motor Movements in Autism Using Persistent Homology. bioRxiv, 2025.* https://doi.org/10.1101/2025.09.03.674008

Research Presentations

Using Persistent Cup Products for Dissonance Detection

- MSRI-UP Final Presentation, Berkeley, CA (Jul 2023) – Talk
- SACNAS 2023, Portland, OR (Oct 2023) – Poster
- Joint Math Meetings 2024, San Francisco, CA (Jan 2024) – Talk

Automated Quantification of Stereotypical Motor Movements in Autism Using Persistent Homology

- Invited Vassar College Colloquium, Poughkeepsie, NY (Jan 2024) – Colloquium Talk
- AMS Spring Eastern Sectional Meeting, Hartford, CT (Apr 2025) – Talk
- 5th International Conference on Neuroscience and Psychiatry, Paris, France (Nov 2025) – Talk
- Joint Math Meetings 2026, Washington, DC (Jan 2026) – Talk

Additional Information

- **Certifications**: CITI SBE, CITI RCR
- **Technical Skills**: Python, LaTeX, Git, HTML, CSS
- **Teaching**: 200+ hours classroom experience across grades 3–11