Chisondi S. Warioba, PhD

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Stanford University School of Medicine
Department of Anesthesiology, Perioperative and Pain Medicine
Division of Pain Medicine
1070 Arastradero Road, Suite 200, Palo Alto, CA 94304

Academic Appointments

T32 Postdoctoral Scholar **May 2025 – Present**
Stanford University School of Medicine, Department of Anesthesiology, Perioperative and Pain Medicine, Division of Pain Medicine

Principal Investigator: Sean Mackey, MD, PhD

Education

Ph.D., Medical Physics **September 2021 – June 2025**
University of Chicago, Chicago, IL Dissertation: "Cross-Species Mapping of Functional Connectivity Alterations and Therapeutic Responses in Hyper-Acute Ischemic Stroke"
Advisor: Timothy J. Carroll, PhD

B.S. Chemistry, B.A. Physics, B.A. Biology (Triple Major) **September 2017 – June 2021**
Westmont College, Santa Barbara, CA *Summa Cum Laude* | GPA: 3.96/4.00
Major Honors Thesis in Chemistry (Grade: A+): "Computational Study on the Role of Zn(II) Z-Type Ligands in Facilitating Diaryl Reductive Elimination from Pt(II)"

Research Interests

Neuroimaging biomarkers for pain and neurological disorders; machine learning and deep learning for high-dimensional medical data; cross-species translational neuroscience; resting-state fMRI and diffusion MRI analysis; computational approaches to brain-behavior relationships; geometric frameworks for signal processing in neuroimaging.

Publications

Peer-Reviewed Journal Articles

1. Hunter, D.J., & **Warioba, C.S.** (2021). Segregation Surfaces. *Mathematics Magazine*, 94(3):163–173.
2. **Warioba, C.S.**, Jackson, L.G., Neal, M.A., & Haines, B.E. (2023). Computational Study on the Role of Zn(II) Z-Type Ligands in Facilitating Diaryl Reductive Elimination from Pt(II). *Organometallics*, 42(16):2295–2303.
3. **Warioba, C.S.**, Liu, M., Penano, S., Foxley, S., Christoforidis, G.A., & Carroll, T.J. (2024). Efficacy Assessment of Cerebral Perfusion Augmentation Through Functional Connectivity in an Acute Canine Stroke Model. *American Journal of Neuroradiology*, 45(9):1214–1219.
4. **Warioba, C.S.**, Carroll, T.J., & Christoforidis, G.A. (2024). Flow Augmentation Therapies Preserve Brain Network Integrity and Hemodynamics in a Canine Permanent Occlusion Model. *Nature Scientific Reports*, 14:16871.
5. **Warioba, C.S.** (2025). Coloring Outside the Lines: A Mathematical Adventure in Segregation Mapping. *Math Horizons*, DOI: 10.1080/10724117.2025.2541583.

6. **Warioba, C.S.** (2025). Rotational Invariance in Resting-State fMRI: A Geometric Framework for Understanding Signal Processing and Connectivity. *Concepts in Magnetic Resonance Part A*, accepted.

Under Review / Submitted

7. **Warioba, C.S.** (2026). Topological phase transition in the sample paths of Lévy processes. Submitted to *Physical Review E*, Regular Article (Statistical Physics). Manuscript ID: `ER12719`; received 22 April 2026.
8. **Warioba, C.S.** (2025). A manifold alignment framework enables cross-species translation of functional connectivity biomarkers in ischemic stroke. *NeuroImage: Reports*, under review.

Book Chapters

1. **Warioba, C.S.** (2017). Disadvantaged Demographics in a White Privileged Society: Critical Perspectives on the American Dream. In *Critical Race Theory and Social Justice in Education*. Autoethnographic Research Project.

Conference Abstracts

1. **Warioba, C.S.**, et al. (2023). Functional Connectivity Biomarkers in Hyperacute Ischemic Stroke. *International Society for Magnetic Resonance in Medicine*, Singapore. [Oral]
2. **Warioba, C.S.**, et al. (2024). Preserving Network Integrity Through Flow Augmentation in Acute Stroke. *Organization for Human Brain Mapping Annual Meeting*, Montreal, Canada. [Poster]
3. **Warioba, C.S.** (2026). Gradient Path Algebra Captures Temporal Structure Beyond B-Tensors. *International Society for Magnetic Resonance in Medicine (ISMRM) Annual Meeting*, Honolulu, HI. [Digital Poster, Abstract #05016]
4. **Warioba, C.S.**, Wang, Y., Law, C.S.W., Weber, K., & Mackey, S. (2026). Free water fraction as neuroinflammatory biomarker in chronic pain using NODDI. *International Society for Magnetic Resonance in Medicine (ISMRM) Annual Meeting*, Honolulu, HI. [Digital Poster, Abstract #04949]

Honors and Awards

National Awards

National Science Foundation Graduate Research Fellowship 2023–2025
$37,000 annual stipend for three years of doctoral research

Carl B. Allendoerfer Award, Mathematical Association of America 2022
National award for exceptional expository excellence in *Mathematics Magazine*

International Recognition

Academic Visitor Award, University of Oxford, UK 2023–2024
Department of Clinical Neurosciences

Institutional Fellowships

T32 Training Grant, NIH/Stanford University 2025–Present
Initiative for Maximizing Student Development Fellowship, University of Chicago 2021
NSF Quantum Foundry Fellowship, UC Santa Barbara 2020

University Awards

GPMP Program Award ($500), University of Chicago 2026
BSD Dissertation Award Nominee, University of Chicago 2026
Dave Dolan Award, Westmont College 2021
Recognition for leadership in responding to social and spiritual needs of the college

Research Experience

T32 Postdoctoral Scholar **May 2025 – Present**
Stanford University School of Medicine, Division of Pain Medicine
PIs: Sean Mackey, MD, PhD & Kenneth Weber, DC, PhD

- Developing machine learning algorithms and deep learning models for high-dimensional neuroimaging data analysis in chronic pain studies.
- Investigating brain biomarkers using multimodal MRI approaches including NODDI, DKI, and advanced diffusion techniques.
- Processing and analyzing HEAL Initiative biomarker datasets (200+ subjects) to distinguish high-impact from low-impact chronic pain.
- Implementing comprehensive preprocessing pipelines on Stanford's Sherlock computing cluster.

NSF Graduate Research Fellow **August 2023 – June 2025**
University of Chicago, Department of Radiology
PI: Timothy J. Carroll, PhD

- Developed novel algorithms for resting-state functional connectivity analysis using group ICA.
- Applied advanced statistical methods to assess resting-state network integrity (n=40).
- Implemented BOLD time-lag analysis and global mean signal processing techniques.
- Created computational pipelines for cross-species translational stroke research.

Academic Visitor **September 2023 – August 2024**
University of Oxford, Department of Clinical Neurosciences, Oxford, UK

- Collaborated on international neuroimaging projects focused on stroke recovery.
- Developed cross-platform harmonization protocols for multi-site MRI studies.
- Participated in advanced neuroimaging seminars and workshops.

Graduate Research Assistant **September 2021 – August 2023**
University of Chicago, Department of Radiology

- Performed comparative analysis of x-ray and micro-CT imaging systems.
- Developed image reconstruction algorithms for preclinical imaging applications.
- Optimized multimodal imaging protocols for translational research.

NSF Quantum Foundry Research Intern **Summer 2020**
UC Santa Barbara, Department of Physics
Mentors: Peter Dotti, David Weld, PhD

- Engaged photonic integrated circuits with atomically referenced lasers.
- Developed protocols for small-scale quantum optical systems.

Undergraduate Research Assistant **September 2017 – June 2021**
Westmont College, Departments of Chemistry, Physics, and Mathematics

- Applied density functional theory calculations for organometallic chemistry research.
- Created novel mathematical visualization algorithms for segregation pattern analysis.

- Developed smooth two-dimensional surface modeling techniques.

Grant Support

Current

NIH T32 Training Grant (T32DA035165) 2025–2028
Role: Postdoctoral Trainee
"Interdisciplinary Training in Pain and Substance Use Disorders"

Completed

NSF Graduate Research Fellowship (DGE-2140004) 2023–2025
Role: Principal Investigator
Total Award: $111,000

Initiative for Maximizing Student Development (R25GM109439) 2021
Role: Graduate Fellow

Technical Expertise

Programming & Software: Python (NumPy, SciPy, Pandas, scikit-learn, PyTorch, TensorFlow), MATLAB, R, C++, JavaScript; Jupyter, Git/GitHub, Docker, HPC clusters, BIDS format.

Neuroimaging Tools: SPM, FSL, AFNI, FreeSurfer, ANTs, BrainVoyager, MRtrix3.

Statistical & Computational Methods: Independent Component Analysis (ICA), Principal Component Analysis (PCA), time series analysis, mixed-effects models, deep learning for medical imaging, convolutional neural networks, network analysis and graph theory, Bayesian inference and hierarchical modeling.

Imaging Modalities: Resting-state and task-based fMRI processing, diffusion tensor imaging (DTI) and tractography, structural MRI segmentation and morphometry, magnetic resonance spectroscopy (MRS), multi-modal data integration and harmonization.

Teaching Experience

Graduate Teaching Assistant **September 2021 – May 2023**
University of Chicago, Department of Radiology

- Interactions of Ionizing Radiation with Matter (Fall 2021, Fall 2022).
- Physics of Medical Imaging II (Spring 2022, Spring 2023).
- Developed problem sets and conducted review sessions for 40+ graduate students.
- Received excellent teaching evaluations (4.8/5.0 average).

Mentoring

- Mentored 3 undergraduate students in neuroimaging research projects (2023–2025).
- Supervised 2 rotating graduate students in fMRI analysis techniques (2024).
- STEM tutor for high school students in underserved communities (2021–Present).

Invited Talks and Presentations

Invited Seminars

1. "Geometric Approaches to Understanding Rotational Invariance in fMRI." UChicago Committee on Medical Physics, UChicago, IL, July 2025.

2. "Cross-Species Translation in Stroke Research: Lessons from Canine Models." Oxford Neuroscience Symposium, Oxford, UK, March 2024.

Award Lectures

1. "Mathematical Visualization of Segregation Surfaces." MAA MathFest, Philadelphia, PA, 2022. [Allendoerfer Award Lecture]

Leadership and Service

Professional Service

Reviewer: *NeuroImage*, *Human Brain Mapping*, *Journal of Neuroscience Methods*.
Member, Program Committee: Medical Physics Graduate Student Symposium (2023).

Institutional Leadership

Co-President, Graduate Program of Medical Physics, University of Chicago 2023
DEI Student Liaison, Graduate Program of Medical Physics, University of Chicago 2023
President, Black Student Union, Westmont College 2020–2021

Community Engagement

Organizer, Racial Justice and Reconciliation Discussion Panels, Westmont College (2019–2021).
Volunteer, Brain Awareness Week outreach to local schools (2022–Present).
STEM mentorship program for underrepresented minorities (2021–Present).

Professional Development

Continuing Education

MITx MicroMasters in Statistics and Data Science 2025
Massachusetts Institute of Technology (via edX)
Courses: Probability, Fundamentals of Statistics, Machine Learning with Python.

Introduction to Probability (STAT110x), Harvard University 2024

Workshops and Training

Advanced fMRI Analysis Workshop, OHBM Educational Course (2024).
Machine Learning for Neuroimaging, Stanford Data Science Institute (2025).
High Energy Physics Training, SLAC National Accelerator Laboratory (2020).

Professional Memberships

Organization for Human Brain Mapping (OHBM) 2023–Present
International Society for Magnetic Resonance in Medicine (ISMRM) 2022–Present
Society for Neuroscience (SfN) 2025–Present
Mathematical Association of America (MAA) 2021–Present

References

Sean Mackey, MD, PhD
Redlich Professor
Chief, Division of Pain Medicine
Stanford University School of Medicine
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Timothy J. Carroll, PhD
Professor of Radiology
Director, Biomedical Imaging Research Institute
University of Chicago
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Kenneth A. Weber II, DC, PhD
Assistant Professor
Department of Anesthesiology
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David J. Hunter, PhD
Professor of Mathematics
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