Exponent®
Engineering & Scientific Consulting

Kyle Murray, Ph.D.

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Professional Profile

Dr. Murray's expertise is in electromagnetism physics, software development, image processing, and electric vehicle battery testing. He has extensive experience in image analysis, statistical modeling, big data analysis methods, machine learning, and numerical simulations.

Programming languages and processing software experience include Python, C++, MATLAB, LaTex, Kotlin, FSL, Freesurfer, and various machine learning packages, including scikit-learn and pytorch. He provides a range of professional technical services to clients including:

- Electromagnetism (EM) modeling, Radio Frequency (RF) and EM interference (EMI) testing.
- Scientific support for legal activities, such as Intellectual Property matters and other litigation.
- Advanced image (optical and computed tomography (CT)), video, and audio processing, and thermal (IR) imaging.
- Electric Vehicle (EV) Battery testing and post-test developmental analysis.
- Failure analysis relating to EV batteries, electronics, and Lithium-ion batteries.

Prior to joining Exponent, Dr. Murray specialized in magnetic resonance imaging technology, image and signal processing, and computational neuroscience, with applications to neurodegeneration and the developing brain. He brings a wide breadth of knowledge from various fields of study, including medical imaging, bioinformatics, neuroscience, astronomical imaging systems, and sound engineering, to complement his experimental design process to diagnose problems and find solutions in imaging and computing systems.

His graduate research included developing theoretical quantitative brain imaging markers and experimentally applying them to better understand brain tissue changes associated with cerebrovascular disease. Of these markers, functional, structural, and microstructural MRI modalities were leveraged simultaneously to offer a more comprehensive overview of the intricacies of the brain and how pathology impacts those respective signals. Previous research included cosmological modeling of the expansion of the universe, simulations of the magnetohydrodynamics of stellar environments, a radio survey of star-forming galaxies using the Arecibo telescope, and interdisciplinary research to understand the connections between music and the natural sciences.

Academic Credentials & Professional Honors

Ph.D., Physics, University of Rochester, 2021

M.A., Physics, University of Rochester, 2017

B.A., Physics, Music, and Mathematics, Hartwick College, 2015

University of Rochester Advanced Teaching Award

Hartwick College John Christopher Hartwick Scholarship

Hartwick College President's Leadership Award

Sigma Pi Sigma Physics Honor Society

Kappa Mu Epsilon Mathematics Honor Society

Licenses and Certifications

Project Management Professional (PMP)

Academic Appointments

Adjunct Faculty, Physics, University of Rochester, 2016

Adjunct Faculty, Center for Student Success, Hartwick College, 2018

Prior Experience

Graduate Research Assistant, University of Rochester, June 2018 – August 2021

Graduate Teaching Assistant, University of Rochester, September 2015 – May 2017

Professional Affiliations

International Society for Magnetic Resonance in Medicine – ISMRM (member)

Organization for Human Brain Mapping – OHBM (member)

Publications

Singh MV, Uddin MN, Singh SB, Peterson AN, Murray KD, Zhuang Y, Tyrell A, Tivarus ME, Zhong J, Qiu X, Schifitto G. Initiation of combined antiretroviral therapy confers suboptimal beneficial effects on neurovascular function in people with HIV. Frontiers in Neurology. 2023 August;14. Doi: 10.3389/fneur.2023.1240300.

Singh MV, Uddin MN, Singh SB, Peterson AN, Murray KD, Zhuang Y, Tyrell A, Tivarus ME, Zhong J, Qiu X, Schifitto G. Initiation of combined antiretroviral therapy confers suboptimal beneficial effects on neurovascular function in people with HIV. Frontiers in Neurology. 2023 August;14. Doi: 10.3389/fneur.2023.1240300.

Murray KD and Lele S. Electric Vehicle Battery Safety and Compliance. SAE Technical Paper 2023-01-0597, 2023. Doi: https://doi.org/10.4271/2023-01-0597

Murray KD, Singh MV, Tivarus ME, Wang L, Uddin MN, Sahin B, Wang HZ, Spincemaille P, Wang Y, Qiu X, Zhong J, Maggirwar SB, Schifitto G. Increased Risk for Cerebral Small Vessel Disease is Associated with Quantitative Susceptibility Mapping in HIV Infected and Uninfected Individuals. NeuroImage: Clinical 2021 Aug; 32:102786.

Cole M, Murray KD, St-Onge E, Risk B, Zhong J, Schifitto G, Descoteaux M, Zhang Z. Surface-Based Connectivity Integration: An Atlas-Free Approach to Jointly Study Functional and Structural Connectivity. Human Brain Mapping 2021 Aug; 42 (11):3481-3499.

Tivarus ME, Zhuang Y, Wang L, Murray KD, Venkataraman A, Weber MT, Zhong J, Qiu X, Schifitto G. Mitochondrial Toxicity Before and After Combination Antiretroviral Therapy, a Magnetic Resonance Spectroscopy Study. NeuroImage: Clinical 2021 May; 31:102693.

Uddin MN, Faiyaz A, Wang L, Zhuang Y, Murray KD, Descoteaux M, Tivarus ME, Weber MT, Zhong J, Qiu X, Schifitto G. A Longitudinal Analysis of Brain Extracellular Free Water in HIV Infected Individuals. Scientific Reports 2021 Apr; 11 (1):8273.

Murray KD, Lin Y, Makary MM, Whang PG, Geha P. Brain Structure and Function of Chronic Low Back Pain Patients on Long-Term Opioid Analgesic Treatment: A Preliminary Study. Molecular Pain 2021 Feb; 17.

Murray KD, Singh MV, Zhuang Y, Uddin MN, Qiu X, Weber MT, Tivarus ME, Wang HZ, Sahin B, Zhong J, Maggirwar SB, Schifitto G. Pathomechanisms of HIV-Associated Cerebral Small Vessel Disease: A Comprehensive Clinical and Neuroimaging Protocol and Analysis Pipeline. Frontiers in Neurology 2020 Dec; 11:595463.

Doctoral Thesis

Murray KD. Quantifying Magnetic Susceptibility to Explore the Pathomechanisms of HIV-Associated Cerebral Small Vessel Disease. University of Rochester, Rochester, NY, 2021.

Presentations

Murray KD, Finkelstein A, Weber MT, Zhong J, Schifitto G. Changes in Functional Connectivity and Cognition in HIV Infected Individuals with Cerebral Small Vessel Disease. Poster presentation, International Society for Magnetic Resonance in Medicine 29th Annual Meeting and Exhibition, Virtual, 2021.

Murray KD, Zhong J, Schifitto G. Tract-Based Spatial Statistics of Cerebral Small Vessel Disease in an HIV Population. Poster presentation, Organization for Human Brain Mapping 2020 Annual Meeting, Virtual, 2020.

Murray KD, Uddin MN, Zhong J, Schifitto G. Brain Iron Imaging Markers in the Presence of White Matter Hyperintensities. Poster presentation, International Society for Magnetic Resonance in Medicine 28th Annual Meeting and Exhibition, Virtual, 2020.

Murray KD, Cole M, St-Onge E, Descoteaux M, Zhong J, Schifitto G, Zhang Z. Surface Based Connectivity Integration – A Processing Pipeline for High Resolution of Structural and Functional Connectivity. Poster presentation, International Society for Magnetic Resonance in Medicine 28th Annual Meeting and Exhibition, Virtual, 2020.

Murray KD, Titoff I, Wang HZ, Zhong J, Schifitto G. A Support Vector Machine Prediction Model for HIV-Status in Adults Using Magnetic Resonance Angiography and Arterial Spin Labeling of the Brain. Poster presentation, International Society for Magnetic Resonance in Medicine 28th Annual Meeting and Exhibition, Virtual, 2020.

Murray KD, Uddin MN, Venkataraman A, Zhuang Y, Qiu X, Wang L, Tivarus MT, Singh MV, Zhong J, Maggirwar SB, Schifitto G. Cerebral Blood Flow and Cerebrovascular Reactivity in Acute and Chronic HIV-Infection Treated by Combination Antiretroviral Therapies. Poster presentation, International Society for Magnetic Resonance in Medicine 28th Annual Meeting and Exhibition, Virtual, 2020.

Murray KD, Zhong J, Schifitto G. Preliminary Neuroimaging Results of Cerebral Small Vessel Disease in HIV-Infected Individuals. Poster presentation, Center for AIDS Research Scientific Poster Session, Rochester, NY, 2019.

Murray KD, Venkataraman A, Spincemaille P, Wang L, Wang Y, Tivarus MT, Qiu X, Zhong J, Schifitto G. HIV-Associated Cerebral Small Vessel Disease Measured by Quantitative Susceptibility Mapping. Poster presentation, International Society for Magnetic Resonance in Medicine 27th Annual Meeting and Exhibition, Montreal, Canada, 2019.

Murray KD. The Frontiers of Magnetic Resonance Imaging. Invited guest lecture, University of Rochester, 2018.

Murray KD, Zhong J, Schifitto G. Cerebral Small Vessel Disease in HIV-Infected Individuals. Poster presentation, Center for AIDS Research Scientific Poster Session, Rochester, NY, 2018.

Murray KD. Undergraduates in Astronomy: The Future of Research. Invited public lecture, The Adirondack Public Observatory at the WILD Center, 2015.

Murray KD, Grzeskowiak S, Nichols N, Troischt P. Star Formation and Gas Content in the NRGb 168 Galaxy. Poster presentation, American Astronomical Society 223rd Meeting, 2014.