Division of Biostatistics, DSI
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MEDICAL COLLEGE OF WISCONSIN

Non-linear inverse problems in magnetic resonance imaging

By: Nikolai Mickevicius, PhD

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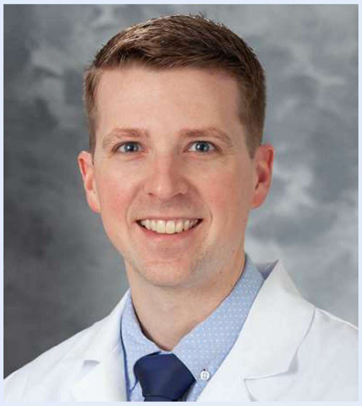
Tuesday, October 15th | 3:30PM - 4:30PM
Location: MEB M2050-M2070

Magnetic resonance imaging (MRI) is capable of capturing 3D images of anatomy non-invasively and without the use of ionizing radiation. This is possible by leveraging a quantum property (i.e., spin) of Hydrogen nuclei, which is abundant in the body, and its interaction with magnetic fields. MRI experiments consist of alternating between 1) the transmission of radiofrequency (RF) energy to transition spins into a higher energy state and 2) measuring the voltage induced as the spins return to their equilibrium state--from which images are reconstructed. While linear approximations exist for both the design of amplitude-modulated RF envelopes as well as the reconstruction process, the use of non-linear methods often results in superior image quality at the expense of increased computation time. Here, two such non-linear methods are presented: one for the design of optimal RF envelopes to invert a system of spins, and another to demonstrate reconstructing images from data sampled below the Nyquist rate and without the use of calibration data. The focus of the talk will center on how numerical optimization can enhance both the data acquisition and reconstruction processes in MRI.



Nikolai Mickevicius, PhD

I received my BS in biomedical engineering at the Milwaukee School of Engineering and my PhD in biophysics at MCW. I spent three years as a research scientist in the MCW Department of Radiation Oncology. Then, I went to the University of Wisconsin–Madison Department of Human Oncology as the Bentson Translational Research Fellow. I returned to MCW as faculty in 2022.

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Please contact Gabrial Williams for additional event information at gwilliams@mcw.edu.