



Colloquium



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3:30 PM - 4:30 PM | 2048 CB

**Evaluating Machine Learning Strategies
for Reconstruction of Compton Scatter
Tomography Images**

**Speaker: Dr. Jeffrey Martin
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Bio

Jeff Martin is an Assistant Professor of Mathematics Instruction at Hope College, where he has taught statistics and conducted research with undergraduate students since August 2022. He was a member of the technical staff at Sandia National Laboratories beginning in August 2004. His work there focused on developing technologies to support nuclear weapons nonproliferation, and he retired as a Distinguished Member of the Technical Staff in July 2022.

He served as a U.S. Air Force officer beginning in August 1984. Key assignments included serving as an Assistant Professor of Nuclear Engineering at the Air Force Institute of Technology and Chief of the Atmospheric Sciences Division at the Air Force Technical Applications Center. He retired from the Air Force at the rank of Lieutenant Colonel in July 2004.

He holds a PhD in nuclear engineering from the University of Michigan–Ann Arbor, an MS in nuclear engineering from the Air Force Institute of Technology, and a BS in chemical engineering from Michigan Technological University.

Abstract

Compton Scattering Tomography (CST) is a technique for non-invasively generating tomographic images of an object's electron density using Compton-scattered gamma rays. CST places both the gamma-ray source and detectors on one side of an object, as compared to other common tomography techniques, such as Computed Tomography (CT) and Positron Emission Tomography (PET), which require access to all sides of an object. This distinction could make CST imaging more suitable for the non-destructive evaluation of large objects such as air and spacecraft. An additional advantage of CST is its sensitivity to low-Z materials. A disadvantage of CST is that the tomographic data it collects is more complicated and noisier than data from more common techniques. This makes CST image reconstruction more difficult than other tomographic techniques. This research investigates the use of several convolutional neural network algorithms to denoise CST data and reconstruct tomographic images.

Refreshments will be provided!