

## **The Case for T-Product Tensor Decompositions: Compression, Analysis and Reconstruction of Image Data**

### *Abstract:*

Most problems in imaging science involve operators or data that are inherently multidimensional in nature, yet traditional approaches to modeling, analysis and compression of (sequences of) images involve matricization of the model or data. In this talk, we discuss ways in which multiway arrays, called tensors, can be leveraged in imaging science for tasks such as forward problem modeling, regularization and reconstruction, video analysis, and compression and recognition of facial image data. The unifying mathematical construct in our approaches to these problems is the t-product (Kilmer and Martin, LAA, 2011) and associated algebraic framework. We will see that the t-product permits the elegant extension of linear algebraic concepts and matrix algorithms to tensors, which in turn gives rise to new, highly parallelizable, algorithms for the imaging tasks noted above.