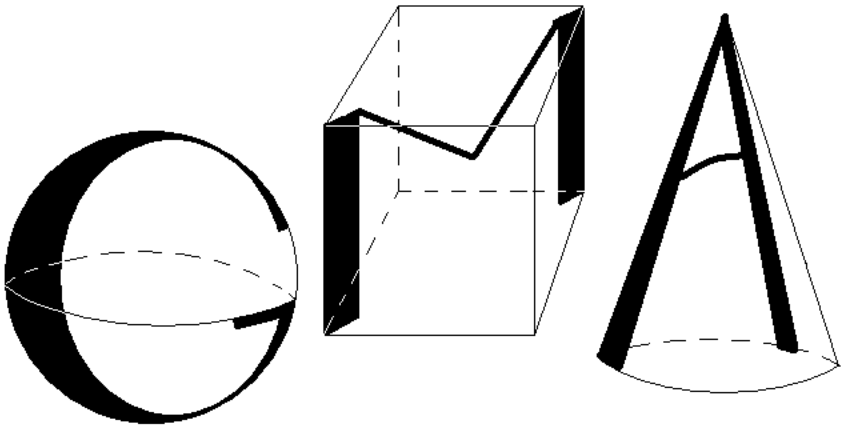

Colloquium

April 10, 4:05 p.m. (9^{th} Period)

(in the Atrium)

Speaker:Lezhi Liu

Title: A Learned Proximal Alternating Minimization Algorithm and Its Induced Network for a Class of Two-block Nonconvex and Nonsmooth Optimization

Abstract

This work proposes a general learned proximal alternating minimization algorithm, LPAM, for solving learnable two-block non smooth and nonconvex optimization problems. We tackle the non-smoothness by an appropriate smoothing technique with automatic diminishing smoothing effect. For smoothed nonconvex problems we modify the proximal alternating linearized minimization (PALM) scheme by incorporating the residual learning architecture, which has proven to be highly effective in deep network training, and employing the block coordinate decent (BCD) iterates as a safeguard for the convergence of the algorithm. We prove that there is a subsequence of the iterates generated by LPAM, which has at least one accumulation point and each accumulation point is a Clarke stationary point. Our method is widely applicable as one can employ various learning problems formulated as two-block optimizations and is also

easy to be extended for solving multi-block non smooth and nonconvex optimization problems. The network, whose architecture follows the LPAM exactly, namely LPAM-net, inherits the convergence properties of the algorithm to make the network interpretable. As an example application of LPAM-net, we present the numerical and theoretical results on the application of LPAM-net for joint multi-modal MRI reconstruction with significantly under-sampled k-space data. The experimental results indicate the proposed LPAM-net is parameter-efficient and has favorable performance in comparison with some state-of-the-art methods.