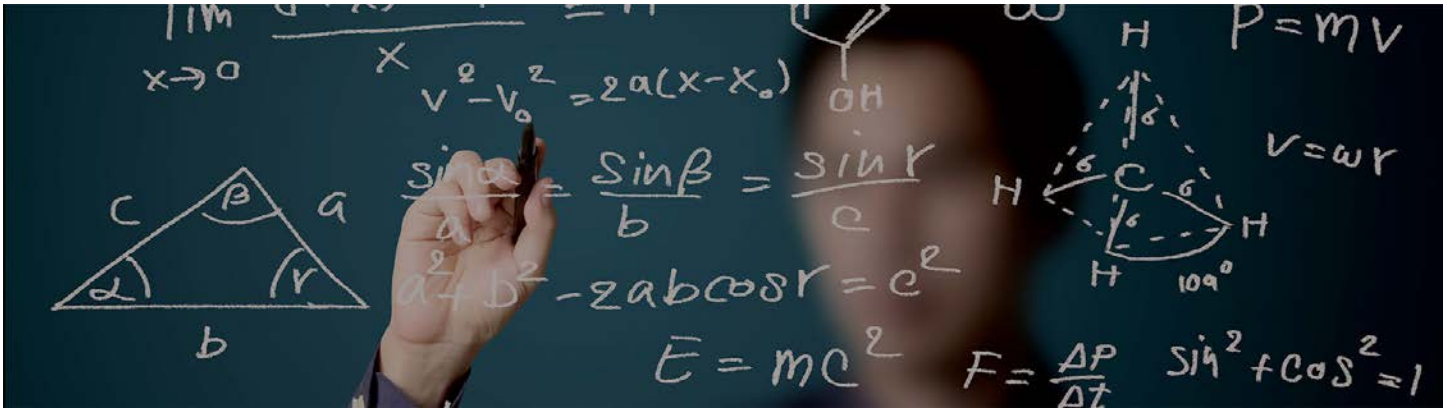

Fall 2019

RENSSELAER POLYTECHNIC INSTITUTE

DEPARTMENT OF MATHEMATICAL SCIENCES COLLOQUIUM

"Efficient Hybrid Stochastic Gradient Algorithms for Nonconvex Optimization"

Abstract: We develop two efficient stochastic gradient-based algorithms to solve a class of composite nonconvex optimization problems that covers both finite-sum and expectation settings. In the first part of the talk, we propose a new stochastic proximal gradient framework that utilizes a well-known biased stochastic estimator called SARAH introduced by Nguyen et all 2017. The algorithm consists of two steps: a proximal gradient and an averaging step making it different from existing nonconvex proximal-type algorithms. It only requires an average smoothness assumption of the nonconvex objective term and additional bounded variance assumption if applied to expectation problems. It works with both constant and adaptive step-sizes, while allowing single-sample and mini-batches. In all these cases, we prove that our algorithms can achieve the best-known complexity bounds. In the second part of this talk, we introduce a novel hybrid approach to form new stochastic estimators for objective functions and propose a hybrid stochastic proximal gradient method to solve composite nonconvex optimization problems. Unlike several existing methods, our algorithm has only a single loop without taking snapshots. It can achieve the best-known oracle complexity bounds using both constant and adaptive step-sizes. We also discuss many variants of our algorithms and illustrate them on several numerical examples including neural network training and reinforcement learning problems using available and common datasets.

Quoc Tran-Dinh (University of North Carolina at Chapel Hill)

Monday, October 28, 2019

Amos Eaton 216

Refreshments served 3:30-4pm Amos Eaton 4th Floor Lounge