

# Scientific Computing and Matrix Computations Seminar

Organizer: Jim Demmel and Ming Gu

Wednesday, 12:00–1:00 pm, 380 Soda Hall

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Sep 30      **Michael Mahoney**, UC Berkeley

*Combining randomized linear algebra and stochastic gradient descent*

In recent years, stochastic gradient descent (SGD) methods and randomized linear algebra (RLA) algorithms have been applied to many large-scale problems in machine learning and data analysis. SGD methods are easy to implement and applicable to a wide range of convex optimization problems. In contrast, RLA algorithms provide much stronger performance guarantees but are applicable to a narrower class of problems. In addition, both SGD and RLA methods have been studied from an algorithmic perspective, where one must at least touch all of the data in order to obtain nontrivial results, as well as from a statistical perspective, where one can obtain stronger results without even looking at the entire data under quite strong statistical assumptions. We discuss some of these results, and we describe how to use ideas from stochastic optimization to develop a hybrid algorithm for overdetermined L1 and L2 regression that uses RLA techniques for preconditioning and constructing an importance sampling distribution, and then performs an SGD-like iterative process with weighted sampling on the preconditioned system.