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Asynchronous Parallel Optimization Methods.

Abstract:
We discuss two related asynchronous parallel stochastic methods. The first (AsyRK) is based on a randomized Kaczmarz scheme for solving a linear system $Ax = b$, which is identical to a standard stochastic gradient process applied to the least-squares formulation $\min ||Ax - b||^2$. The second (AsySPCD) is based on a randomized coordinate descent method for composite convex optimization (which can also be viewed as a type of stochastic gradient method, though this fact is not used in the analysis). We analyze the expected convergence behavior of both algorithms, showing that a threshold number of processors can be identified below which near-linear speedup can be expected in the parallel implementation. The analysis of AsySPCD pays particular attention to the issue of "inconsistent reads," in which the partial gradient may be evaluated at an iterate which never actually exists at any point in time.

This talk represents joint work with Ji Liu and other colleagues at UW-Madison.