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X. Sherry Li* (xsli@lbl.gov), **C. Gorman**, **P. Ghysels**, **G. Chavez** and **F.-H. Rouet**.

Matrix-free construction of HSS representations using adaptive randomized sampling.

An active research area in recent years is the development of fast hierarchical matrix tools for linear and eigen solvers. Although the theoretical foundation for the hierarchical matrices has been solidified, there is a lack of robust algorithms and software that can handle many practical issues. For example, randomized sampling has been shown to be an effective tool to reveal the low rank structures, but choosing the right number of samples is difficult. In this talk we present new results for HSS compression using an Adaptive Randomized Sampling strategy. In particular, we developed a robust stopping criterion based on a new stochastic relative error estimation. We present results for situations when the dense matrix is given and in the matrix-free setting. We show some practical difficulties about implementation and present some solutions that get around the problems. (Received September 24, 2017)