1157-15-446 **Jianlin Xia*** (xiaj@math.purdue.edu), **Xin Ye** and **Lexing Ying**. *Proxy point method for analytical compression of kernel matrices.*

It has been known in potential theory that, for some kernels matrices corresponding to well-separated point sets, fast analytical low-rank approximation can be achieved via the use of proxy points. The proxy point method gives a surprisingly convenient way to explicitly write out approximate basis matrices for a kernel matrix and avoid expensive algebraic compression. However, the method is lack of clear algebraic understanding of the theoretical background. Moreover, rigorous quantifications of the approximation errors and reliable criteria for the selection of the proxy points were missing. In this work, we rigorously justify the idea in terms of a class of important kernels. We further provide comprehensive accuracy analysis for the analytical compression and show how to choose nearly optimal proxy points. The analytical compression is then combined with fast rank-revealing factorizations to get compact low-rank approximations and also to select certain representative points. This gives a fast and reliable strategy for compressing those kernel matrices. The work provides an intuitive way of understanding the proxy point method and bridges the gap between this useful analytical strategy and practical low-rank approximations. (Received February 03, 2020)