

A Fast and Accurate Frequent Directions Algorithm for Low Rank Approximation via Block Krylov Iteration

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Abstract: It is known that frequent directions (FD) is a popular matrix sketching method for low rank approximation. However, FD and its randomized variants usually meet high computational cost or computational instability in dealing with large-scale datasets, which limits their use in practice. To remedy such issues, this work aims at improving the efficiency and effectiveness of FD. Specifically, by utilizing the power of Block Krylov Iteration and count sketch techniques, we propose a fast and accurate FD algorithm dubbed as BKICS-FD. We analyze the theoretical properties of the proposed BKICS-FD and then carry out extensive numerical experiments to illustrate its superiority over several popular FD algorithms, both in terms of computational speed and accuracy.