Lossy Compression and Mixed Precision Strategies for High Performance Preconditioning

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The performance of preconditioners a is to a large extent constrained by the communication bandwidth, motivating the recent investigation of sophisticated techniques to avoid, reduce, and/or hide data transfers in-between processors and between processors and main memory. One promising strategy is to decouple the memory precision from the arithmetic precision, and compress the data before invoking communication operations. While this generally comes with a loss of information, the strategy can be reasonable when operating with approximate objects like preconditioners used in iterative methods. We will present a memory accessor separating the arithmetic precision from the memory precision and mixed precision algorithms based on the strategy of employing lower precision formats for communication and memory access without impacting the final accuracy.

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