Solving Big Problems with Little Numbers

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Abstract

The future of simulations lies in leveraging hardware features designed for the AI market particularly in low-precision computations. Modern NVIDIA GPUs exemplify this trend offering significant performance gains through low-precision computations resulting in reduced elapsed time, smaller memory footprints, and energy savings. We harness these capabilities to develop fast mixed-precision linear algebra algorithms. Our adaptive precision conversion strategy dynamically adjusts computation accuracy, maintaining high precision only where necessary within the matrix operator while still meeting application-worthy precision requirements. This talk will illustrate how these algorithms revolutionize computational efficiency for geospatial statisticians, bioinformaticians, and geophysicists having significant implications for environmental computational statistics, genome-wide association studies in smart health/agriculture, and seismic imaging for CO2 sequestration.

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