

## Randomized algorithms for solving linear systems

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*Abstract:* The objective of the proposed work is to develop faster and more energy-efficient algorithms for one of the most fundamental tasks in computational science: solving large systems of coupled linear equations. Faster algorithms will both accelerate computations that can already be performed and enable computations that are beyond the reach of existing methods. More energy efficient algorithms will help to reduce the power consumption of data centers, and to extend the battery life of mobile devices such as cell phones and tablet computers. The fundamental innovation behind our approach is to harness mathematical properties of large collections of random numbers to build new stochastic algorithms that dramatically outperform existing deterministic ones. Concisely, the idea is to use randomized sampling, and randomized averaging, to reduce the effective dimensionality of the problems to be processed.

