U.S. DEPARTMENT OF ENERGY | Office of Science

DOE Applied Mathematics Research Program - Overview

Joint Statistical Meeting

Funding Opportunities for Statisticians and Data Scientists

August 7, 2022

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DOE Office of Science Programs

Basic Energy Sciences	• Understanding, predicting, and ultimately controlling matter and energy at the electronic, atomic, and molecular levels
Advanced Scientific Computing Research (Math)	• Extending the frontiers of science through world leading computational science, supercomputers, and networking
Biological and Environmental Research	• Understanding complex biological and environmental systems
Fusion Energy Sciences	• Studying matter at very high temperatures and densities and the scientific foundations for fusion
High Energy Physics	• Exploring the elementary constituents of matter and energy, the interactions between them, and the nature of space and time
Nuclear Physics	• Discovering, exploring, and understanding all forms of nuclear matter

** Also Includes the SBIR/STTR Programs and Workforce Development*

Randomized Algorithms for Scientific Computing: AI & Data Science at Scale

Purpose: Workshop to explore the **use of randomness** as a foundation & strategy for high-performance scientific computing

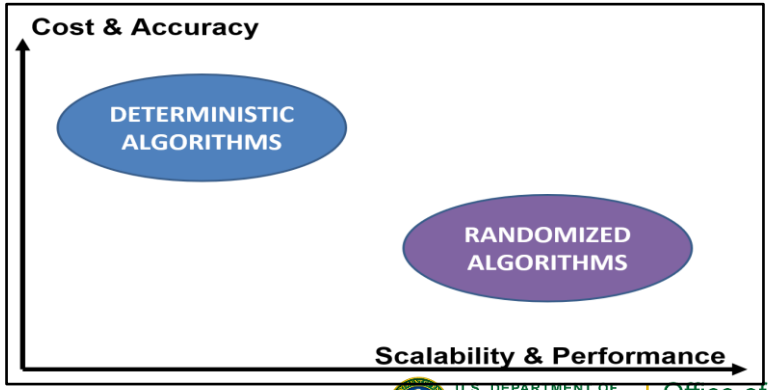
Randomized algorithms are transforming scientific computing in

- **AI & Deep Learning**: Stochastic Gradient Descent
- **Data reduction**: Compressive Sensing, Random Projections
- **Massive & streaming data analysis**: Randomized Numerical Linear Algebra

Virtual Meetings:
December 2-3, 2020
January 6-7, 2021

Fundamental properties of randomness can be harnessed for other massive data & post-Moore **computational grand challenges**

- High computational complexity and the development of efficient algorithms
- High data dimensionality and finding sparse representations for **data from user facilities**
- Better algorithm scalability for low-power, high-performance **edge computing**
- Reduced ill-conditioning and sensitivity for inverse problems
- Improved algorithm reliability and robustness to noise



Foundational long-term research & plans are needed for **hybrid algorithms** that anticipate massive data & post-Moore computing challenges

Co-Chairs: Aydin Buluc (LBNL), Tammy Kolda (Sandia), Stefan Wild (ANL)
Workshop Report: https://www.osti.gov/biblio/1807223

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DOE Applied Mathematics - Recent Funding Opportunities in Data Science

FOA	Title
22-2722	Randomized Algorithms for Combinatorial Scientific Computing
21-2497	EXPRESS: Randomized Algorithms for Extreme-Scale Science
21-2493	Data-Intensive Scientific Machine Learning
21-2501	Data Reduction for Science

DOE Early Career Research Program – Posted Annually

- Randomized and hybrid algorithms is a priority topic within ASCR Applied Mathematics

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