

IEEE BITS | The Information Theory Magazine

Special Issue on Data Storage

Call for Papers

The remarkable evolution of data storage devices and systems during the past 40 years has enabled some of the defining technologies of our information-driven era – from smartphones and high-performance PCs to enterprise computing systems and cloud data services.

Many fields of science and engineering have contributed to the exponential progress in computer memory and storage – physics, materials science, electronic circuits, computer engineering, and signal processing, with advances in information theory and coding theory playing a vital role. Information-theoretic analysis of storage channel models, new detection methods, and various coding techniques – constrained codes, source codes, error-correction codes, network codes – have evolved synergistically with storage and memory technology.

The storage hierarchy offers a variety of devices, including solid-state random-access memory (RAM), magnetic disks and tapes, optical drives, and non-volatile solid-state memories such as flash and persistent phase-change memory. These technologies span the spectrum of capacity, speed, and cost, reflecting their wide range of applications in consumer electronics, laptop computers, desktop systems, supercomputers, distributed storage, and data warehouses.

However, improved storage devices and systems are needed to address the grand challenges of the coming decade in health, sustainability, cybersecurity/privacy, and quality of living. Exploratory technologies such as 2D magnetic recording, 3D multilevel flash memory, racetrack memory, resistive memory, opto-magnetic materials, quantum memory, DNA-based storage, and in-memory computing hold promise for more capable storage devices that will help meet these challenges. Advanced storage systems that harness these devices will be critical in realizing revolutions in quantum computing, renewable energy, autonomous systems, IoT and edge computing, understanding the rules of life, neuromorphic computing, machine learning/AI, planetary exploration, and entertainment.

This special issue intends to showcase the role that information theory and coding theory will play in realizing the future of data storage. Accessible review papers, tutorials, historical surveys, and technical vision statements relating to the themes above are invited.

Topics of interest include, but are not limited to, the following:

- Information-theoretic models and analysis of new storage channels and systems.
- Coding techniques for novel storage technologies and devices.
- System coding schemes for storage caches, arrays, and networks.
- Information-theoretic aspects of emerging storage applications.

BITS Submission Instructions

We will follow the BITS two-stage submission process outlined below and described in BITS Information for Authors at www.itsoc.org/bits/information-authors.

White Paper: Prospective authors should submit a white paper (limited to three pages single column 11-point font size) containing manuscript title, motivation and significance, outline, representative references, and the author list with contact information and short bios. Full articles will be invited based on the review of white papers.

Full Articles: The full article must be of tutorial/overview/survey nature, accessible to a broad audience, and have significant relevance to the scope of the Special Issue. The full article would have up to 12 double-column pages including references, 11-point font size, at least one figure (to be hosted on the website), up to 30 references, at least 1.25" margin on the left and right sides, and 1" margin from top and bottom. The articles should not have been published or be under review elsewhere.

Relevant Dates

White paper submission: 1 October 2022

Manuscript invitation: 20 October 2022

Manuscript submission: 20 December 2022

Manuscript reviews: 20 January 2023

Manuscript final version: 20 February 2023

Special Issue publication: June 2023

Special Issue Editors

Ahmed Hareedy, METU

Paul Siegel, UCSD

Emina Soljanin, Rutgers

Eitan Yaakobi, Technion