Special Issue on 6G

Call for Papers

Scope and Motivation

Information theory has played a vital role in the development of the global cellular communication network (and Wi-Fi) through the 5G era. Both point-to-point and network information theory have had a major influence on the development of key technologies used in today's 5G networks, including adaptive modulation and coding, the full suite of MIMO techniques, OFDMA with subband feedback and adaptive resource allocation, Zadoff Chu sequences, decode and forward relays (IAB in 5G), and LDPC and Polar codes. Importantly, information theory has provided rigorous bounds on throughput, and in some cases latency and reliability, and has allowed system designers to understand important tradeoffs, including which techniques are optimal in different operating regimes, and when suboptimal schemes are "good enough". Indeed, in many important practical situations, we know from information theory that 5G-era designs based on the aforementioned technologies are very close to optimal.

The 6G era will soon be upon us, providing unprecedented global connectivity, capacity, and coverage for thousands of new applications, and billions of new devices. 6G is likely to be distinguished from previous G's by the flexibility of the air interface needed to support many new use cases and mobile applications beyond the smartphone; the situational awareness and intelligence provided by the network's sensing abilities; new spectrum and topologies (such as LEO satellites and UAVs) to provide high capacity and coverage; design for energy efficiency and resilience; the need for reliable and tunable ultra low latency; and the ubiquitous use of machine learning in many 6G network functions.

What role can information theory and its rigorous approach to thinking about communications play in 6G? Can information theory continue to help push the boundaries of communication systems, as they become limited less by spectral efficiency and more by quantities related to computation, sensing, and energy efficiency? What are key bottlenecks and problems that information and communication theorists should work on in the 6G era? The goal of this special issue is to explore questions such as these and help frame the important theoretical research questions for the next 5-10 years at the intersection of information theory and wireless communications.

Example Topics of Interest (not an exclusive list)
- Compelling 6G visions and design philosophies
- Fundamentals of machine learning for wireless systems
- Fundamental limits of sensing
- Joint communication and sensing waveform design
- Fundamental system level tradeoffs between spectral efficiency and energy efficiency
- Theoretical aspects of Sub-Terahertz and Terahertz systems
- Capacity of dense LEO constellations
- 6G-era codes, e.g. for ultra short packets or other new 6G applications
- Universal decoding
- Ultradense networks

- Computation vs. Communication at the edge
- Frontiers of network information theory and network coding
- Post-quantum security in wireless networks
- Privacy in a richly connected 6G setting

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. The submission is via Manuscript central per the above link. 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.

Revised Relevant Dates

White paper submission: March 1, 2023
Manuscript invitation: April 1, 2023
Manuscript submission: June 1, 2023
Manuscript reviews: August 1, 2023
Manuscript final version: September 1, 2023
Special Issue publication: October 2023

Special Issue Editors

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