

## Theoretical Foundations for 6G-and-Beyond Wireless Networks

### Call for papers

Information theory has been a mainstay of wireless communications ever since these became digital in nature, directly or indirectly influencing most of the constituent technologies. Not only has information theory provided fundamental bounds that enable gauging the performance of specific techniques, but it has yielded insights on transmitter/receiver structures and the air interface at large, revealed essential tradeoffs, and delineated regimes where operating conditions and channel mechanisms are fundamentally different.

The culmination of several decades of progress in wireless connectivity is today's mobile Internet, underpinned by 4G and 5G cellular networks in conjunction with Wi-Fi, and with the transition to 6G networks already on the horizon—standardization is to begin in earnest in the second half of 2025. At this junction, with wireless no longer a young and emerging discipline, one may wonder whether there is still a role for information theory to play, moving forward. In the age of artificial intelligence (AI), can information theory continue to be an engine for the advancement of wireless networks, including the evolution of 6G over the next decade? Can information theory, possibly hand in hand with AI, serve as a foundation for subsequent generations and for other classes of wireless systems, say those involving satellites, drones, self-driving vehicles, robots, or AI agents?

The impetus for this special issue is the conviction that the answer to the above questions is decidedly affirmative. We invite original submissions at the intersection of information theory and wireless communications, on topics that include, but are not limited to:

- **Multiantenna communication.** Optimum signaling, capacity, energy efficiency, minimum energy per bit, impact of low-resolution quantization and implementation constraints.
- **Communication with antenna or front-end constraints/impairments.** Communication with models for power consumption, thermal overheads, or hardware complexity.
- **Sensing, localization, and joint sensing and communications.**
- **Massive random access.**
- **Advanced optimization techniques for communication networks.**
- **Intelligent-surface-assisted wireless communication.**
- **Non-terrestrial networks.** Massive access, coverage, capacity, spectrum sensing, spectrum sharing.
- **Explainable AI radio access.** Benchmarking against theoretical bounds and optimal solutions.
- **Distributed and cooperative systems.** Fundamental performance of machine-type communication, sensor networks, or vehicular networks.
- **Task-oriented communications.**

### Guest Editors

Jinfeng Du, Nokia Bell Labs, USA

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### Senior Editor

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### Important Dates

Manuscript submission deadline: Continuous submission until September 15th, 2025

First Recommendation: December 31st, 2025

Revised Manuscript Due: January 31st, 2026

Final Decision: February 28th, 2026

Final Manuscripts to Publisher: March 15th, 2026

Publication Date: Each accepted manuscript will be published on IEEE Xplore after finishing its peer-review with a final deadline for publishing the complete special issue by May 2026

**Submission Guidelines:** The papers will be peer-reviewed according to standard IT Society peer review procedures. The reviewers will be selected from the pool of established researchers working in the areas covered by the submitted papers. Prospective authors should prepare their papers following regular submission guidelines of the IEEE Journal on Selected Areas in Information Theory (see <https://www.itsoc.org/jsait/author-information>).

**Manuscript Submission Website:** <https://mc.manuscriptcentral.com/jsait-ieee>