

## Special Issue on Signal Processing for the Integrated Sensing and Communications Revolution

Integrated sensing and communications (ISAC) systems result from a coordinated or joint design of sensing and communication functionalities to achieve efficient use of limited spectrum, operation with low cost and compact size hardware, additional sensing services for wireless networks, or improved system performance. Research and development of novel signal processing techniques are critical to enable ISAC. While initial works on ISAC-like technologies appeared decades ago following a radar-focused approach, the incorporation of millimeter wave bands into wireless systems, enabled by MIMO technology with large arrays, has led to waveforms, operational bandwidths and signal processing algorithms in the transceiver naturally well equipped for sensing, both in a direct way and in a radar-like operation. These technological advancements enable the idea of wireless sensing in communication networks, that together with the advent of novel sensing applications, is driving the rapid pace of current ISAC innovations. The engineering community is benefiting from these recent advances in ISAC by pursuing applications of this rapidly growing field, such as autonomous driving, drone-based customer services, Internet-of-Things, radio-frequency identification, military surveillance, and next-generation wireless communications. Newly developed ISAC tools introduce powerful theories that often lead to further insight into the optimal solution of various sensing and communication problems such as interference management, joint waveforms, beamforming for dual purposes, resource allocation, or learning-based processing, that did not arise when analyzed as stand-alone designs. There remain many open ISAC problems toward attaining the performance required by many envisioned sensing services to be offered by future wireless networks, seamless interference-free operation, full cognitive abilities, and efficient use of limited resources to give some examples. This Special Issue of *IEEE Signal Processing Magazine* aims to raise awareness of this emerging research area, and to showcase the existing state-of-the-art and its current and future challenges. Topics of interest include, but are not limited to:

- Joint precoder/combiner/receiver designs and signal processing
- Waveforms for joint communication and direct localization, and joint radar and communication
- Millimeter-wave and THz ISAC
- ISAC spectrum management and analysis
- High accuracy joint direct localization and communication
- Joint localization, mapping and communication
- Sensor aided communication not limited to radar-based approaches
- Machine learning for ISAC systems
- Full duplex for joint radar and communication
- Distributed ISAC
- Opportunistic use of sensing and communication
- Radio and sensor data fusion for ISAC
- ISAC for cellular networks
- Signal processing solutions for WiFi sensing
- Standardization of ISAC systems
- ISAC for automated ground/aerial vehicles
- ISAC aided by intelligent surfaces

**White papers are required, and full articles will be invited** based on the review of white papers. The white paper format is up to 4 pages in length, including the proposed article title, motivation and significance of the topic, an outline of the proposed paper, and representative references. An author list with contact information and short bios should also be included. Submitted articles must be of tutorial/overview/survey nature, in an accessible style to a broad audience, and have a significant relevance to the scope of the Special Issue. Submissions should not have been published or be under review elsewhere, and should be made online at <https://mc.manuscriptcentral.com/sps-ieee>. For submission guidelines, see the Information for Authors at <https://signalprocessingsociety.org/publications-resources/ieee-signal-processing-magazine/information-authors-spm>.

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