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IEEE Signal Processing Society: Celebrating 75 Years of Remarkable Achievements

It is our great pleasure to introduce the first part of this special issue to you!

The IEEE Signal Processing Society (SPS) has completed 75 years of remarkable service to the signal processing community. When the Society was founded in 1948, we couldn't imagine, for instance, how wireless networks of smartphones would be able to connect us easily at all times, or that an image processing algorithm would be able to detect cancer in a few seconds. Those are just simple examples of the immense technological progress over the past 75 years, which became possible thanks in great part to the dedicated work of professional members of the SPS.

Celebrating 75 years

A special issue of *IEEE Signal Processing Magazine* was published 25 years ago to celebrate the 50th anniversary of the SPS. To celebrate the 75th anniversary, we have focused on what has happened during the previous 25 years in the field of signal processing, in addition to the main perspectives considering both societal and technical aspects in different domains covered by our Society. In response to an open call for papers, we received 41 white paper submissions. Among those, 18 were selected and invited to be considered for publication upon submission of a full version. Finally, 11 were accepted for

inclusion in this first part of the special issue, while the remaining ones will appear in the upcoming second part.

The first three articles in this first part of the special issue focus on the history of the SPS. The article by Petropulu (SPS president) et al. [A1] describes the extraordinary growth we have witnessed in the field of digital signal processing (DSP) since 1998, where the SPS played a fundamental role in promoting cross-disciplinary collaboration and knowledge sharing. Then, the article by Ward (former SPS President) [A2] focuses on women researchers and volunteers and their active role within the SPS.

Finally, Pérez-Neira (SPS vice president, conferences) et al. [A3] present an article that comments on the most prominent SPS conferences and their evolution. These articles also discuss the main challenges and opportunities for the SPS.

Next, we have a powerful testimony by Edwards [A4], who has contributed significantly to our magazine and Society over the years. He begins by recalling a very special occasion: the day he was 14 years old and visited the 1969 IEEE International Convention & Exhibition and decided on his future career. Then, using his unique journalistic skills, he narrates lots of interesting events with significant value to our DSP community.

As signal processing can be classified along techniques and methods such as sampling, transforms, statistical techniques including machine learning, and so on, it can also be partitioned into major application areas, such as speech and audio, image processing and multimedia, communication and sensor array processing. Our technical committees (TCs) and unified Editors Information Classification Scheme (EDICS)

reflect these dual partitionings. The selected feature articles included in this special issue provide a cross section of those fields. Particularly, in this first issue, we present seven of these

feature articles. The first one, authored by Leus et al. [A5] describes the role of graph signal processing for signal analysis over the recent decades in a variety of applications, including image and video processing; social, transportation, communication, and brain networks; recommender systems; financial engineering; distributed control; and learning. The second feature article is by Aviyente et al. [A6]. In it, the authors offer a brief history of the IEEE Bioimaging and Signal Processing TC, providing an overview of the main technological and methodological contributions and highlight promising new directions. Then, Bajić et al. [A7] review both the history of multimedia signal processing as well



as the IEEE Multimedia Signal Processing TC, with a focus on the last three decades.

The fourth feature article we present in this special issue is authored by Liu et al. [A8], where an overview of the IEEE Sensor Array and Multichannel TC and its activities are introduced, followed by the main technological advances and new developments in the area along with promising future research directions. The fifth feature article, authored by Pesavento et al. [A9], presents an overview and advances in multiple-input, multiple-output systems, including details on direction of arrival, direction of departure, time delay of arrival, and Doppler mechanisms. The sixth feature article is authored by Björnson et al. [A10] and presents the story of wireless communication technologies over the past 25 years, including the advances in air interface, channel coding, source compression, connection protocols, and related areas, covering from 2G to 5G technologies. Finally, the seventh feature article, authored by Elbir et al. [A11], describes relevant details on the development of beamformers, emphasizing minimum-variance distortionless response strategies and the corresponding major breakthroughs over the past decades.

This concludes the first part of this special issue. In the second part, to be published in the magazine's July issue, another set of relevant articles will appear, concluding our efforts to group together the most significant contributions received to celebrate the 75th anniversary of the SPS. We would like to specially express our gratitude to all our contributing authors and reviewers, in addition to Rebecca Wollman, who efficiently helped us with all the administrative details, and the entire team, led by Sharon Turk, who brilliantly promoted and supervised the editorial process.

We sincerely hope that you enjoy reading the first part of this special issue.

Acknowledgment

Rodrigo Capobianco Guido is the lead guest editor of this special issue.

Guest Editors



Rodrigo Capobianco Guido (guido@ieee.org) received his Ph.D. degree in computational applied physics from the University of

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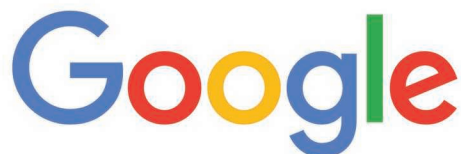
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best paper awards and the Gordon K. Moe Young Investigator Award. Her research has been funded by grants from the National Institutes of Health, the National Science Foundation (including a CAREER Award), and the Florida Department of Health. She is an esteemed member of the Board of Scientific Counselors of National Library of Medicine, as well as the IEEE SPS Biomedical Signal and Image Professional Technical Committee. She has also taken on the role of the IEEE Women in Signal Processing Committee Chair and an Area Editor for the IEEE SPM eNewsletter.



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professor (1982–1989) and a professor (1989–2019), and has been a professor emeritus since September 2019 at University Grenoble Alpes, Saint-Martin-d'Hères 38400. He was an organizer or program chair of many international conferences, including the first Independent Component Analysis Conference in 1999 (ICA'99) and the 2009 IEEE International Workshop on Machine Learning for Signal Processing. He was the technical program cochair of ICASSP 2020. Since 2021, he has been editor-in-chief of *IEEE Signal Processing Magazine*. Since the 1980s, his research interests have been in machine learning and source separation, including theory and applications (brain and hyperspectral imaging, chemical sensing, and speech). He is a Fellow of IEEE and a fellow of the European Association for Signal Processing.



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Appendix: Related Articles

- [A1] A. Petropulu, J. M. F. Moura, R. K. Ward, and T. Argiropoulos, “Empowering the growth of signal processing,” *IEEE Signal Process. Mag.*, vol. 40, no. 4, pp. 14–22, Jul. 2023, doi: 10.1109/MSP.2023.3262905.
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- [A3] A. I. Perez-Neira, F. Pereira, C. Regazzoni, and C. Johnson, “IEEE signal processing society flagship conferences over the past 10 years,” *IEEE Signal Process. Mag.*, vol. 40, no. 4, pp. 36–45, Jul. 2023, doi: 10.1109/MSP.2023.3240852.
- [A4] J. Edwards, “How the 1969 IEEE convention and exhibition changed my life forever,” *IEEE Signal Process. Mag.*, vol. 40, no. 4, pp. 46–48, Jul. 2023, doi: 10.1109/MSP.2023.3253254.
- [A5] G. Leus, A. G. Marques, J. M. F. Moura, A. Ortega, and D. I. Shuman, “Graph signal processing,” *IEEE Signal Process. Mag.*, vol. 40, no. 4, pp. 49–60, Jul. 2023, doi: 10.1109/MSP.2023.3262906.
- [A6] S. Aviyente et al., “From nano to macro,” *IEEE Signal Process. Mag.*, vol. 40, no. 4, pp. 61–71, Jul. 2023, doi: 10.1109/MSP.2023.3242833.
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- [A9] M. Pesavento, M. Trinh-Hoang, and M. Viberg, “Three more decades in array signal processing research,” *IEEE Signal Process. Mag.*, vol. 40, no. 4, pp. 92–106, Jul. 2023, doi: 10.1109/MSP.2023.3255558.
- [A10] E. Björnson, Y. C. Eldar, E. G. Larsson, A. Lozano, and H. V. Poor, “Twenty-five years of signal processing advances for multi-antenna communications,” *IEEE Signal Process. Mag.*, vol. 40, no. 4, pp. 107–117, Jul. 2023, doi: 10.1109/MSP.2023.3261505.
- [A11] A. M. Elbir, K. V. Mishra, S. A. Vorobyov, and R. W. Heath Jr., “Twenty-five years of advances in beamforming,” *IEEE Signal Process. Mag.*, vol. 40, no. 4, pp. 118–131, Jul. 2023, doi: 10.1109/MSP.2023.3262366.

