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Contribute to IEEE Signal Processing Magazine

he objectives of *IEEE Signal Processing Magazine (SPM)* are to propose, for any IEEE Signal Processing Society (SPS) member and beyond, a wide range of tutorial articles on both methods and applications in signal and image processing. The articles are divided into different categories: feature articles, column and forum articles, and articles in special issues, the specificities of which are detailed on the *SPM* webpage "Information for Authors - SPM": https:// signalprocessingsociety.org/publications -resources/ieee-signal-processing-magazine/ information-authors-spm.

In short, a tutorial article must present a systematic introduction of fundamental theories, common practices, and applications in a well-defined, reasonably matured, or emerging area, preferably an area that is of interest to readers from multiple fields in signal and image processing. A tutorial article, either a feature article or an article in a special issue of SPM, should cover the history, the state of the art, and the future directions of the topic and include a limited and relevant selection of referencesinstead of an exhaustive list. A tutorial article is not suited to present new results, to cover only the author's own work, or to present a narrow and biased view of a domain.

A special issue comprises multiple, interrelated tutorials that provide a com-

prehensive coverage of a specific topic of interest to the signal processing community. It is proposed and managed—if the proposal is accepted—by a team of guest editors, and its first step is an open Call for Papers.

A feature article is a tutorial paper submitted by prospective authors without responding to the call for papers that is done for special issues. Accepted feature articles are published whenever the review process is completed and the magazine has adequate page capacity, without using a fixed special issue structure.

A column contains an article, either technical or nontechnical (depending on the column profile), that addresses a specific topic of special interest to the general SPS reader. There are several columns in the magazine, e.g., "Lecture Notes," "Tips & Tricks," "Perspectives," and "Special Reports." You can see details on the categories by accessing https:// signalprocessingsociety.org/publications -resources/ieee-signal-processing-magazine/ column-descriptions.

A forum article is the result of an open discussion with several experts. The structure of a forum article is different from that of the articles mentioned previously as it consists of comments and responses of the participants on several aspects within the topic of discussion.

In essence, any scientist can contribute to *SPM*, either directly by submitting a special issue proposal with a team of scientists (the guest editors) or by submitting a feature article white paper or a column article by sharing an elegant or efficient way to present or implement known results. Tutorials and keynote talks at conferences and workshops are good candidates for feature articles, and organizers of special sessions can determine if it is timely to propose an *SPM* special issue. For all of the categories of *SPM* articles, in a spirit of open science, we also encourage authors to share additional material, like codes, data, and slides. Note that uploading additional materials to an article strongly increases its visibility and impact.

In this issue

The *SPM* September issue contains three feature articles and six column papers. These well-written papers cover a wide range of topics in signal and image processing. I am confident you will learn a great deal from them.

Everybody knows what a discrete cosine transform (DCT) is. But do you know its history and its impact on image processing? You can discover details in the column by Wang and Mukherjee [A1], which is also a tribute to Nasir Ahmed, who published an article on the DCT for the first time in 1974. A second column article, by Soto-Bajo, Fraguela Collar, and Herrera-Vega [A2], proposes an interesting discussion around a key and ubiquitous concept in signal processing: frequency, and shows how the concept of frequency itself is complex and tricky.

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I am sure that you know the word "quaternions." But are you familiar with the tools for using quaternions? Do you know in what domains quaternions could actually be smart tools? The feature article by Miron et al. [A3] presents a simple and comprehensive overview on quaternions for signal and image processing and fairly highlights the pros and cons. In previous SPM issues, a few articles have been written on reconfigurable intelligent surfaces (RISs). In [A4], Chepuri et al. discuss the potential of RISs for integrating sensing and communication, especially in communications and radar, with related signal processing challenges. Machine learning and deep learning are now ubiquitous, but many open questions remain, especially concerning overparameterization. In the feature article by Parhi and Nowak [A5], the authors provide rigorous explanations for the sparsitypromoting effect of the common regularization scheme of weight decay in neural network (NN) training, hinging on the homogeneity of activation functions like the rectified linear unit. This explains why NNs seemingly break the curse of dimensionality.

This SPM also includes two excellent "Lecture Notes." In the first one, by Shlezinger and Routtenberg [A6], related to the tradeoff between model-driven and data-driven learning approaches, the authors introduce the concepts of generative and discriminative learning for inference and compare them both theoretically and numerically in a simple linear context. The second article, by Engelberg [A7], focuses on the periodogram and averaged periodogram, which are customary tools for estimating power spectral density (PSD). The author presents a simple deterministic argument, one that complements the standard probabilistic argument, to explain why the PSD of a signal is not well approximated by a single periodogram. I would like to highlight that these two "Lecture Notes" articles propose additional materials (codes in Python or Matlab), which is greatly appreciated by the Editorial Board and will certainly help scientists to include some of these reflections in their own lectures.

The September *SPM* issue contains a report on the IEEE Signal Processing Cup 2022 Student Competition [A8], which focused on a timely problem: synthetic speech attribution. The problem is to detect what system has been used for providing a speech sequence. Currently, in the audio case, since it is very easy to create fake synthetic speech tracks, it is very important to be able to discriminate original speech recordings from fake ones.

Finally, Narwaria proposes a humorous view [A9] of model-driven versus datadriven approaches in the deep learning era.

As I explained in the first part of this editorial, *SPM* is your journal: enjoy reading it, and further support it by submitting your contributions.

Appendix: Related Articles

- [A1] Y. Wang and D. Mukherjee, "The discrete cosine transform and its impact on visual compression: Fifty years from its invention," *IEEE Signal Process. Mag.*, vol. 40, no. 6, pp. 14–17, Aug. 2023, doi: 10.1109/MSP.2023.3282775.
- [A2] M. Soto-Bajo, A. Fraguela Collar, and J. Herrera-Vega, "On the concept of frequency in signal processing: A discussion," *IEEE Signal Process. Mag.*, vol. 40, no. 6, pp. 18–25, Aug. 2023, doi: 10.1109/MSP.2023.3257505.

- [A3] S. Miron, J. Flamant, N. Le Bihan, P. Chainais, and D. Brie, "Quaternions in signal and image processing: A comprehensive and objective overview," *IEEE Signal Process. Mag.*, vol. 40, no. 6, pp. 26–40, Aug. 2023, doi: 10.1109/MSP.2023.3278071.
- [A4] S. P. Chepuri, N. Shlezinger, F. Liu, G. C. Alexandropoulos, S. Buzzi, and Y. C. Eldar, "Integrated sensing and communications with reconfigurable intelligent surfaces: From signal modeling to processing," *IEEE Signal Process. Mag.*, vol. 40, no. 6, pp. 41–62, Aug. 2023, doi: 10.1109/MSP.2023.3279986.
- [A5] R. Parhi and R. D. Nowak, "Deep learning meets sparse regularization: A signal processing perspective," *IEEE Signal Process. Mag.*, vol. 40, no. 6, pp. 63–74, Aug. 2023, doi: 10.1109/ MSP.2023.3286988.
- [A6] N. Shlezinger and T. Routtenberg, "Discriminative and generative learning for the linear estimation of random signals," *IEEE Signal Process. Mag.*, vol. 40, no. 6, pp. 75–82, Aug. 2023, doi: 10.1109/MSP.2023.3271431.
- [A7] S. Engelberg, "Periodograms and the method of averaged periodograms," *IEEE Signal Process. Mag.*, vol. 40, no. 6, pp. 83–91, Aug. 2023, doi: 10.1109/MSP.2023.3285044.
- [A8] D. Salvi, C. Borrelli, P. Bestagini, F. Antonacci, M. Stamm, L. Marcenaro, and A. Majumdar, "Synthetic speech attribution: Highlights from the IEEE signal processing cup 2022 student competition," *IEEE Signal Process. Mag.*, vol. 40, no. 6, pp. 92–98, Aug. 2023, doi: 10.1109/ MSP.2023.3268823.
- [A9] M. Narwaria, "System design," *IEEE Signal Process. Mag.*, vol. 40, no. 6, p. 99, Aug. 2023, doi: 10.1109/MSP.2023.3256068.





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