Special Section on

Deep Learning Based Forward and Inverse Electromagnetic Characterization

Expected online publication: 2024 Volume

The 2024 volume of the IEEE Journal on Multiscale and Multiphysics Computational Techniques (IEEE J-MMCT) will include a special section dedicated to 'Deep Learning-based Forward and Inverse Electromagnetic Characterization'. Recent advances in artificial intelligence and deep learning (DL) techniques have drastically affected the pace and innovation in many branches of computational sciences and engineering. Particularly in applied and computational electromagnetics (EM), state-of-the-art DL techniques have been widely applied to a plethora of forward and inverse EM problems. Such applications have been transformative for a variety of purposes, including reduced-order and surrogate modeling for reduced computational cost, inversion for imaging, detection, and classification, as well as inverse generative design and synthesis and discovery. With the help of the DL techniques, forward EM characterization is now done in a blink of an eye, which has been a utopia when only traditional physics-based forward solvers existed. Moreover, inverse EM characterization has never been performed as fast and accurately as achieved now by DL techniques. This special section compiles the latest achievements and pioneering studies in applying DL techniques in forward and inverse EM characterization. Particular attention will be paid to applications of the popular DL algorithms, including but not limited to graph neural networks, convolutional neural networks, recurrent neural networks, long short-term memory networks, multilayer perceptrons, autoencoders, generative adversarial networks, encoder-decoder networks, and transformer networks. In specific, the section focuses on DL techniques and applications for forward and inverse EM characterization related to:

a) Quasi-static and full-wave analyses
b) Scattering and diffraction analyses
c) Multiphysics EM analyses
d) EM imaging, non-destructive testing, and geophysical exploration
e) Antenna and photonic device design and optimization
f) Metasurface synthesize and optimization
g) Circuit extraction and channel characterization
h) Wireless communication optimization
i) Electromagnetic interference and compatibility analyses

The J-MMCT Editorial Board will review every paper in the same manner as any other regular submission.

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When you prepare your manuscript you should consult the instructions, templates, and resources available at the IEEE authors center (https://ieeeauthorcenter.ieee.org). Papers not following the standard IEEE journal template cannot be accepted into the peer review process. Please be aware that your contribution should be **prepared as any other regular J-MMCT paper and that it will be evaluated via the same peer-review process**. The quality of your contribution **must meet the level required for a publication at J-MMCT**.

Other Submission instructions:

You must reference your own work, especially recent journal/conference publications. Discuss your related publications in the introduction. Distinguish the new results you present in your current manuscript from those found in your previous publications, **to demonstrate that the paper includes sufficient new technical material to justify a new paper, when compared to all previously published papers**.

Submissions are accepted any time, but no later than **February 29, 2024**.

If you have any questions, you can contact the Editor-in-Chief (Prof. Costas Sarris at eic-jmmct@ieee.org), or the Guest Editors:

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