IEEE JOURNAL ON

MULTISCALE AND MULTIPHYSICS COMPUTATIONAL TECHNIQUES

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNOLOGY SOCIETY,
THE IEEE ANTENNAS AND PROPAGATION SOCIETY,
AND THE IEEE ELECTROMAGNETIC COMPATIBILITY SOCIETY

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 optimization for synthesis and discovery. With the help of the DL techniques, forward EM characterization is now doable in a glimpse 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 by the DL techniques before. This special section aims to compile the latest achievements and pioneering studies in applying DL techniques to 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, variational autoencoders, transformer, and residual networks. In specific, the section will focus on the studies applying these techniques and other DL techniques to the popular forward and inverse EM characterization, which include, but are not limited to:

a) Electrostatic, magneto-quasi-static, and full-wave analyses
b) EM scattering, radiation, and diffraction analyses
c) Multiscale and multiphysics EM analyses
d) Inverse problems for imaging, non-destructive testing, and geophysical exploration
e) Antenna, microwave circuit, and photonic device design and optimization
f) Metamaterial and metasurface synthesize and optimization
g) Wave propagation prediction 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.

Paper submission is accomplished through the ScholarOne Manuscript Central website:

http://mc.manuscriptcentral.com/jmmct-ieee

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:

Abdulkadir C. Yucel (Lead)

acyucel@ntu.edu.sg

Jiefu Chen

jchen82@central.uh.edu

Maokun Li

maokunli@tsinghua.edu.cn