

IEEE AWPL Special Cluster 2019 on “Machine Learning Applications in Electromagnetics, Antennas, and Propagation”

Machine learning (ML) algorithms, as a subfield of artificial intelligence (AI), have been providing effective solutions in engineering applications and to scientific problems for many decades. ML methods have the ability to adapt to new conditions and to detect and estimate patterns. Recently, ML has gained new and well-deserved attention in many fields of engineering and science mostly due to the development of high-performance graphical-processing units (GPU) as well as development of deep neural networks (DNN) based algorithms. Many leading technology companies are heavily investing in AI/ML and academia is following suit to develop more powerful algorithms that utilize the new hardware. In addition to these recent developments, practitioners have found new ways to utilize the many existing machine learning algorithms in their respective domains. The fields of electromagnetics (EM) and antennas also benefit in a variety of ways from the application of machine learning, deep learning (DL), and AI. In fact, several applications of ML to antenna design and propagation already exist. These, among others, are meta-learning, decision trees (DT), random forests (RF), support vector machines (SVM), nearest neighbors (NN), Gaussian processes (GP), artificial neural networks (ANN), ensemble learning methods, reinforcement learning (RL) and new deep learning-based approaches. Exploitation of these algorithms and hybridization with physics informed procedures will be key to enabling new technologies for antenna design and wave propagation modeling in the upcoming years. The aim of this special cluster issue is to showcase the potential for applying ML paradigm to antennas and propagation problems and increase awareness in the greater electromagnetics community.

This focused cluster of papers will consider the latest in research in, but not limited to, the following areas:

- New antenna topologies/synthesis/design: New design techniques based on ML methods.
- Propagation model development/measurement techniques: New propagation models based on measurement or simulations using the ML method.
- New applications and problems that are solved with these novel antennas designed using ML are encouraged.
- ML/DL based EM forward model proxies (fast surrogate models).
- EM signal/image interpretation applications via ML algorithms (replacing inversion and forward modeling, EM image interpretation, etc.).

The guest editors of this focused cluster are:

- Dr. Zikri Bayraktar, Schlumberger-Doll Research Center, USA, email: zikribayraktar@gmail.com
- Prof. Douglas H. Werner, The Pennsylvania State University, USA, email: dhw@psu.edu
- Prof. Sawyer D. Campbell, The Pennsylvania State University, USA, email: sd22@psu.edu
- Prof. Andrea Massa, University of Trento, Italy, email: andrea.massa@eledia.org
- Prof. Sotirios K. Goudos, Aristotle University of Thessaloniki, Greece, email: sgoudo@physics.auth.gr
- Prof. Dimitris E. Anagnostou, Heriot Watt University, UK, email: d.anagnostou@hw.ac.uk

Prospective authors are encouraged to contact the Guest Editors for any questions or to determine the suitability of their contribution for this special cluster. Papers should be prepared following the same submission instructions as for regular IEEE AWPL manuscripts (four-pages technical content maximum and one reference page, double-column, IEEE format), available via the Information for Authors website (<http://awpl.eleceng.adelaide.edu.au/authors.htm>). The authors should indicate in the cover letter to the Editor-in-Chief that the manuscript is being submitted in response to the Call for Papers for the focused cluster. Prospective authors should refer to the timeline below for key dates. The publication charges will be at the standard rates for AWPL.

Key dates:

- Submission deadline: March 31, 2019
- First decision: May 15, 2019
- Revised manuscripts deadline: June 15, 2019
- Final decision: July 30, 2019
- Final manuscripts due by: September 1, 2019
- Online publication: shortly after final manuscript submission
- Cluster publication: November 2019 issue of AWPL