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IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing Special Issue On “Integrating Physics and Artificial Intelligence for Remote Sensing Applications”

Artificial Intelligence (AI), especially Machine Learning (ML) frameworks have been used extensively in remote identification tasks. In recent years breakthroughs in scientific and engineering applications (particularly using deep learning) has been tempered by the issues of interpretability or the “black box” nature of its solutions, without a theoretical justification for their use in a particular task. The standard deep learning methods can learn spurious relationships that look deceptively good in training and test sets, but lead to poor generalization outside the available data. Complex concepts and tasks, uncertain, unstructured, open, and dynamic environments present even greater challenges for deep learning, because only a small number of examples of rare, unusual or complex cases are truly available. In such situations, common deep learning approaches would likely fail. Existing domain-specific knowledge often took centuries of human research to develop, knowledge that is usually ignored in the purely data-driven and learning-based methods. This special issue explores the theory and application of the integration of physical models with AI models for remote sensing applications.

The topics of this special issue include, but are not limited to:

- Incorporating prior knowledge such as physics, psychology, biology or behavior studies into AI models.
- Interpretable artificial intelligence for remote sensing.
- Based on theoretical knowledge, generating physically sound synthetic remote sensing data.
- Learning schemes for inverse problems.
- Learning from noisy and incomplete training data using related knowledge from sciences.
- Learning physically sound representations of spatio-temporal processes (ordinary/partial differential equations, interpretable latent variables).
- Learning stochastic representations of geophysical dynamics (e.g. for uncertainty representation and propagation).
- Gaussian Process Regression and Bayesian Inference for learning from prior knowledge.
- Using data to find closure relations for reduced-order models (ROM’s).
- Flexibility in extending models when unknown processes emerge.
- Improved interpretability via model compression for specific applications.

Schedule

January 1, 2021: Submission system opening
June 30, 2021: Submission system closing

Format

All submissions will be peer reviewed according to the IEEE Geoscience and Remote Sensing Society guidelines. Submitted articles should not have been published or be under review elsewhere. Submit your manuscript on <http://mc.manuscriptcentral.com/jstars> using the Manuscript Central interface and select the “**Integrating Physics and Artificial Intelligence for Remote Sensing Applications**” special issue manuscript type. Please consult <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9082768> for guidelines and information on paper submission. All submissions must be formatted using the IEEE standard format (double column, single-spaced). For a layout template, please see http://www.ieee.org/publications_standards/publications/authors/author_templates.html. Note that IEEE J-STARS has become a fully open-access journal charging a flat publication fee \$1250 per paper.

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