

## EDITORIAL

KEYWORDS: Editorial; Artificial intelligence; Machine learning

This editorial opens volume 1, issue 1, of *Artificial Intelligence for the Earth Systems (AIES)*, the American Meteorological Society's (AMS) newest journal. The journal focuses on the development and application of methods in artificial intelligence (AI), machine learning (ML), data science, and statistics that are relevant to meteorology, atmospheric science, hydrology, climate science, and ocean sciences, that is, the "AMS sciences."

AI and ML constitute a rapidly growing sector of the atmospheric, climate, and water-related sciences. In recent years, almost all of the AMS journals saw rapid growth in terms of publications on this topic, as have journals published by other organizations. In addition, there has been a rapid proliferation of AI conferences, including a recent focus on weather and climate applications. The AMS Scientific and Technological Activities Commission (STAC) committees, for instance, include a committee on AI for environmental science, which has been holding regular conferences at the AMS Annual Meeting for over 20 years and is now one of the largest contributors to that meeting.

This rapid growth posed editorial challenges to the existing AMS journals, requiring editors with specialized knowledge across journals to meet the growing demand. Manuscript evaluation posed challenges, leading to some submissions being out of place in existing journal offerings. For instance, the existing AMS journals primarily publish applications of AI/ML and statistics, rather than the development of novel methodologies. *AIES* is intended to address this need and is intended as an appropriate home for submissions on novel AI/ML and statistical methods focused on AMS-related sciences as well as on the application of AI/ML and statistics.

Topics for the journal include development of AI/ML, statistical, and hybrid methods and their application; development and application of methods to further the physical understanding of Earth system processes from AI/ML models such as explainable and physics-based AI; the use of AI/ML to emulate components of numerical weather and climate models; incorporation of AI/ML into observation and remote sensing platforms; the use of AI/ML for data assimilation and uncertainty quantification; and societal applications of AI/ML for AMS disciplines, including ethical and responsible use of AI/ML and educational research on AI/ML.

In addition, *AIES* will publish a short article type new to AMS journals: "Lessons Learned." These will be short papers focused on insights about the efficacy of AI methods that apply to and are deemed significant for an entire class of Earth system applications. Such insights could be derived from research results for which the AI methods were successful or unsuccessful, or from a meta-analysis or perspective based on existing research results.

The idea for this type of submission originated from numerous discussions about the goals of *AIES* and how to achieve them. Multiple people in the growing AI/ML community within the Earth systems have expressed a need for this type of submission. As the community grows, new people have to relearn the same lessons, and the knowledge of what works and what does not work for AI in the Earth sciences is often handed down only through experience and discussion with more-experienced AI/ML scientists. *AIES* will serve as a place where a body of "lessons learned" will be compiled and available for all to draw on. In this same vein, we welcome tutorials under the regular article submissions, as long as they are novel and provide a contribution to the body of knowledge for AI in Earth sciences.

The potential authors and readership for the journal will encompass a broad set of disciplines both within the existing AMS author pool and beyond it. Within AMS, *AIES* will enable us to concentrate existing papers, which are currently spread across the different journals. The concentration and focused editorial board of the new journal will help to set community standards for publishable AI/ML science. This new journal also offers the opportunity to draw from communities that were traditionally peripheral to AMS, such as AI researchers just beginning to publish their applied work to the AMS sciences.

By developing a journal for both methods and application, the intention is to create a community of AI/ML practice for the AMS sciences. We hope that the authors and readers of *AIES* will become the core of that community.

Amy McGovern  
Chief Editor

Anthony J. Broccoli  
Publications Commissioner