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General Comment

See attached file(s)

Attachments

AMS RFI Response_AI_RandD_StrategicPlan_Final

RFI Response from
American Meteorological Society for the

2025 National Artificial Intelligence (AI)
Research and Development (R&D) Strategic Plan

The American Meteorological Society (AMS) strongly supports inclusion of weather, water, and climate applications of AI as part of the 2025 National AI R&D Strategic Plan. Specifically, the AI R&D Strategic Plan should prioritize sustained and targeted investment to federal programs in AI for weather forecasting to enable production of operational models producing timely and accurate forecasts that save lives, protect property, and support the economy. Other governments (EU, China) have already made this investment, and their AI-augmented weather forecasts are dramatically upgraded, leaving the U.S. falling behind. A concerted government investment in the use of AI for forecasting weather and its impacts would invest in R&D as well as incentivizing collaboration between government, the private sector, and academia to provide weather services that save billions of dollars for U.S. residents and enterprises.

AMS is a global community committed to advancing weather, water, and climate science and service (https://www.ametsoc.org/ams/). As a 105-year-old scientific society, we represent over 12,000 members with a mission that advances the atmospheric and related sciences, technologies, applications, and services for the benefit of society. We pride ourselves on representing the private, public (government), and academic sectors and convene the community to provide services to all and opportunities to work together to advance the enterprise.

The weather, water, and climate community has developed many cutting edge uses of AI and machine learning (ML) that are advancing the way we create weather and climate predictions. We foster the advancement of trustworthy, responsible AI for uses in forecasting, predicting extreme weather, and informing the public on weather events. We host a Committee on AI Applications in Environmental Science that has been active since the mid-1980s and have been convening Conferences on AI Applications in the Environmental Sciences since 1998[1]. The committee began holding short courses to spread knowledge on how to apply AI/ML to environmental problems since 2000 and produced an edited book on the topic in 2010[2]. Recently, a new AMS committee on AI Ethics and Policy has formed to advance those topics.

Despite our efforts, we are concerned that the U.S. is falling behind in applications of AI in the weather enterprise. Over the past 5 years, the science has advanced in making global AI forecasts by emulating weather models, based on global observations that were processed into model reanalyses by the European Center for Medium Range Forecasting (ECMWF), which have been shown to produce forecasts that are as good as or better than traditional physically-based models. Chinese companies and their National Meteorological Center have also produced

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[1] Haupt, S.E., D.J. Gagne, W. Hsieh, V. Krasnopolsky, V. Lakshmanan, A. McGovern, C. Marzban, W. Moninger, P.Tissot, and J.K. Williams, 2022: The History and Practice of AI in the Environmental Sciences, *Bull. Amer. Meteorol. Soc.*, E1351–E1370, https://doi.org/10.1175/BAMS-D-20-0234.1.

[2] Haupt, S.E., A. Pasini, and C. Marzban, Eds. 2009: *Artificial Intelligence Methods in the Environmental Sciences*, Springer, 424 pp.

such models and both ECMWF and China are running these models for operational forecasts successfully. Although the U.S. agencies and private sector are also building such models, the lack of federal funds has placed us woefully behind. To regain dominance in global and regional forecasting requires the public, private, and academic sectors to collaboratively produce operational AI models that compete well with others around the world and a sustained national commitment to this effort.

The weather, water, and climate enterprise has a responsibility to protect life, property, and critical infrastructure in support of the economy. In addition, a host of end users have their own needs for timely and accurate forecasts. The weather, water, and climate forecasting models form the basis for a host of important applications for decision-making on topics ranging from energy, hydrological systems, aviation, surface transportation, wildland fires and fires at the wildland-urban interface, agriculture, air pollution, and forecasting for extreme events, among others. For each application, end users require up-to-date weather information and forecasts to make decisions, whether it be to evacuate in the face of an oncoming hurricane, to irrigate crops, or to make decisions for security needs. A complex chain of actions, including humans in the loop, provides that information. AI additionally empowers the forecasters and operations to improve their efficiency and impact in producing the public and stakeholder warnings via integrated tools, faster model processing, and communication enhancements.

Public and private sector observations provide the backbone of building both physical and AI models. The state-of-the-science decision support systems blend observations and model output in smart ways to provide usable information. AI has become ubiquitous in this value chain, but the grounding in observations and physical models is equally important, as well as the need for knowledgeable meteorologists "over the loop" to assure accuracy and effective communication with stakeholders. Academic researchers discover new ways to use AI for process understanding and to integrate the best technology into the forecasts. The private sector's role in the value chain has been growing in all aspects, culminating in delivering targeted forecasts to clients with specific needs. Whether these forecasts are being provided by the public, private, or academic sectors, the backbone requires federal funding and coordination. Private sector efforts complement federal efforts and cannot replace or supplant them - in fact, private sector forecasts critically rely on data curated by the government. Estimates of the value of weather and climate information to the U.S. economy exceed $100 billion annually,[3] roughly 10 times the investment made by U.S. taxpayers through the federal agencies involved in weather-related science and services.

In summary, the American people and organizations depend heavily on forecasts of weather, water, and climate to make their decisions. The value of that information outweighs its expense by an order of magnitude. That value chain integrates players from public, private, and academic organizations in ways seldom seen in other enterprises – AMS has fostered that integration, which required immense effort. AI has become a critical player in this weather, water, climate information chain. Its use is burgeoning. Thus, these applications should be recognized in the 2025 National R&D Strategic Plan. Finally, the growing need for energy to

[3] Lazo, J. 2024: Communicating Forecast Uncertainty (CoFU) 2: Replication and Extension of a Survey of the US Public's Sources, Perceptions, Uses, and Values for Weather Information. An AMS Policy Program Study. The American Meteorological Society, Washington, D.C. https://doi.org/10.1175/cofu2-2024

support the AI-based data centers impacts our community and we are eager to help address these issues.

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