NASA SBIR 2019 Phase I Solicitation

S5.03 Bridging the Gap of Applying Machine Learning to Earth Science

Lead Center: GSFC

Participating Center(s): GSFC

Technology Area: TA11 Modeling, Simulation, Information Technology and Processing

NASA researchers have begun exploring the application of Machine Learning (ML) to accelerate science and open up new understandings. While there are many problems that can be addressed with ML, the adoption of these techniques and technologies are slow due to the large learning curve associated with the application of this technology and the applicability of commercial tools to specific problems of interest for NASA.

This subtopic area seeks to close those gaps and accelerate the use of ML for NASA Earth Science applications. Proposals MUST be in alignment with existing and/or future NASA programs and address or extend a specific need or question for those programs. In addition, proposals must demonstrate Earth science relevant results.

Innovative proposals using ML are being sought to solve unique problems across the following Earth science challenges:

- Improvements in data assimilation (land, atmosphere, and/or ocean);
- Creation of trained model components for use in Earth system simulations;
- Application of ML models to observation and/or model data, including classification, segmentation, downscaling, transfer learning, and other techniques;
- Combining disparate data sets to lower the uncertainty of observed quantities or to derive new observations.

Research proposed to this subtopic should demonstrate technical feasibility during Phase I, and show a path toward a Phase II prototype demonstration, with significant communication with missions and programs to later plan a potential Phase III infusion. It is highly desirable that the proposed projects lead to solutions that will be infused into NASA programs and projects.

Tools and products developed under this subtopic may be developed for broad public dissemination or used within a narrow scientific community. These tools can be plug-ins or enhancements to existing software, on-line data/computing services, or new stand-alone applications or web services, provided that they promote interoperability and use standard protocols, file formats, and Application Programming Interfaces (APIs).

The desired outcome would be for the algorithms and capabilities developed during the SBIR work would be used and infused in NASA science projects and potentially used to develop new missions.

Expected TRL for this project is 4 to 6.

Relevance to NASA

- Global Modeling and Assimilation Office Assimilation (GMAO) - augment Earth system modeling or data assimilation.
- Carbon Cycle Ecosystems Office (CCOE) - wide variety of applications given the diversity of data sets from sparse in-situ to global satellite measurements.
- EOSDIS (DAACs) - harnessing the potential for new discoveries across the wide array of observation data.
- Earth Science Technology Office (ESTO/AIST) - new technology and services to exploit NASA and non-NASA data.

References:

- https://gmao.gsfc.nasa.gov/
- https://www.giss.nasa.gov/
- https://earthdata.nasa.gov/
- https://www.nccs.nasa.gov/