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Emerging Frontiers in Heliophysics Enabled by AI and Public-Private Partnerships

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The recent advances in Artificial Intelligence (AI) capabilities are particularly relevant to NASA Heliophysics because there is growing evidence that AI techniques can improve our ability to model, understand and predict solar activity using the petabytes of space weather data already within NASA and other agency archives. This represents a strategic opportunity, since the need to improve our understanding of space weather is not only mandated by directives such as the National Space Weather Action Plan and the Presidential Executive Order for Coordinating Efforts to Prepare the Nation for Space Weather Events, but also because space weather is a critical consideration for astronaut safety as NASA moves forward with the Space Policy Directive to leave LEO and return to the Moon.

The Frontier Development Lab (FDL) is an AI research accelerator that was established in 2016 to apply emerging AI technologies to space science challenges which are central to NASA's mission priorities. FDL is a partnership between NASA Ames Research Center and the SETI Institute, with corporate sponsors that include Google, Intel, IBM, NVidia, Lockheed, Autodesk, Xprize, Space Resources Luxembourg, as well as USC and other academic organizations. The goal of FDL is to apply leading edge Artificial Intelligence and Machine Learning (AI/ML) tools to space challenges that impact space exploration and development, and even humanity.

The applied AI projects for space weather that are being undertaken by the Frontier Development Lab (FDL) represent an ideal opportunity for utilization of vast amount of NASA and other data to leverage the public-private partnerships of the FDL program in a manner that is highly complementary to ongoing efforts in space weather research. In this talk I will summarize the findings from two space weather topics, "Solar flare forecasting" and "A tool for exploring variability of Solar-Terrestrial interactions" that were part of FDL 2017 -2020 summer program and also develop concepts for Heliophysics AI Affinity Network.