Monica G. Bobra

Research Scientist

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Summary

I have 13 years of experience working as a data scientist in space science. I develop novel machine learning algorithms and apply them to multi-spectral image data and time series data to glean scientific insights. I develop open datasets and open source scientific software for data-intensive research. I provide expertise to the scientific community on data science workflows by giving talks, organizing conferences, mentoring students, and serving on committees and boards.

Education

University of New Hampshire, Durham NH

M.S. Physics

JANUARY 2010

Boston University, Boston MA

B.A. Astronomy

B.S. Communication

MAY 2004

Skills

Python (scientific software stack including NumPy, SciPy, pandas, Matplotlib, scikit-learn, statsmodels, SunPy, and more)

Machine learning with image data (CNNs), metadata (SVMs, Random Forests) and time series data (VARs, LSTMs) together with interpretability tools

Data Visualization

Cloud computing (AWS, GCP)

Git (and continuous integration, e.g. Travis)

SQL

Awards

American Astronomical Society Solar Physics Division Popular Media Award (2021)

NASA Group Achievement Award — Solar Dynamics Observatory Team (2017)

Robert H. Goddard Exceptional Achievement for Science Award (2016)

NASA Space Grant Fellowship (2008 - 2009)

NASA Group Achievement Award — Hinode Team (2007)

Experience

Stanford University / Research Scientist

APRIL 2010 - JULY 2021, STANFORD CA

Published several first-author studies about predicting space weather using machine learning algorithms and large (1-10 PB) volumes of data taken by NASA satellites, which pioneered a new data-driven field of heliophysics research and garnered media attention from outlets such as *The Mercury News* and *Scientific American*

Led two large interdisciplinary teams to predict space weather using novel machine learning algorithms as as Principal Investigator of a NSF grant (award of $494,705) and Co-Investigator of a NASA grant (award of $1,302,162)

Led open source scientific software projects as Vice-Chair of the SunPy Board and a Data Science Editor for the Journal of Open Source Software

Authored a book titled Machine Learning, Statistics, and Data Mining for Heliophysics

Presented talks and organized conferences such as Machine Learning in Heliophysics (2019), Python in Astronomy (2020), and COSPAR Data Science Workshops (2021)

Mentored students through Google Summer of Code, NASA Frontier Development Laboratory, and Stanford University Undergraduate Summer Research Program

Wrote science policy to inform the direction of machine learning in solar and space physics as a member of the National Academy of Sciences Heliophysics Mid-Decadal Committee (2020)

Harvard-Smithsonian Center for Astrophysics / Astrophysicist

OCTOBER 2005 - AUGUST 2007, CAMBRIDGE MA

Designed and conducted flight hardware tests and flight operations for the X-Ray Telescope aboard the JAXA/NASA Hinode satellite and developed open source scientific software to analyze image data taken by the spacecraft

Developed and published a numerical model of the solar magnetic field that accurately replicates Hinode images of the solar atmosphere

Won a United Nations grant as Principal Investigator to lead solar data analysis workshops worldwide