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 predict solar flares by applying machine learning algorithms to multi-spectral image data and time series data taken by NASA satellites. I also develop open source scientific software for data-intensive research. I educate the scientific community about data science workflows by giving talks, organizing conferences, mentoring students, and writing science policy.

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

Developed a software pipeline to create a petabyte-scale, labeled data set from a stream of ultra-high definition images of the Sun taken by the NASA Solar Dynamics Observatory, an $800 million satellite that takes more data than any other mission within NASA Heliophysics

Published several first-author studies about predicting solar flares using machine learning, which garnered media attention from outlets such as *The Mercury News* and *Scientific American*, and funded this work as Principal Investigator of a National Science Foundation grant

Contributed to the open source scientific community as Vice-Chair of the SunPy Advisory Board and 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 data science 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 NASA/JAXA Hinode satellite, which takes high-resolution images of the Sun, and developed open source software to analyze image taken by the spacecraft

Developed and published a numerical model of the solar magnetic field that accurately replicates observational data

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