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Classification of Solar Wind Structures via Unsupervised Machine Learning[1] MAVIS STONE, Harvey Mudd College, AMANDA JOY CAMARATA, Colorado School of Mines, ANNA JUNGBLUTH, Oxford University , ANDRS MUOZ-JARAMILLO, Southwest Research Institute, HALA LAMDOUAR, Oxford University, NATHAN MILES, UCLA, SUDESHNA BORO-SAIKIA, University of Vienna, MARCELLA SCOCZYNSKI, Federal University of Technology Paran, SAIRAM SUNDARESAN, Intel Corp, ANTHONY SARAH, Intel Corp., FRONTIER DEVELOPMENT LABS 2021 SOLAR WIND TEAM TEAM — The solar wind is a constant stream of plasma structured by the solar magnetic field that is radially ejected from our Sun to the boundaries of our solar system. Organizations such as NASA and ESA have gathered nearly half a century of data on solar wind, but much of it has yet to be analyzed for improved understanding of solar wind evolution. So far, heliophysicists have primarily focused on understanding specific structures such as interplanetary coronal mass ejections and large-scale discontinuities. However, there exist many structures that have yet to be discovered. In this work, we create a novel, unsupervised framework to catalog both known and unknown structures using magnetic field time series data from the Parker Solar Probe. We combine iSAX indexing and HDB Scan clustering to identify, retrieve, and cluster similar magnetic field structures into an indexed catalog. With this catalog data, heliophysicists can better understand the origins and evolution of the solar wind. Our method can be used on other time series data including, but not limited to: plasma velocity, density, and electron composition, all of which can offer further insight into space weather and its impact on Earth and our satellites as well.

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