Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Classifying X-ray Binaries Using Machine Learning[1] ZOE DE BEURS, University of Texas at Austin, N ISLAM, Harvard-Smithsonian, Cambridge, MA, G GOPALAN, University of Iceland, Reykjavik, S.D. VRTILEK, Harvard-Smithsonian, Cambridge, MA — Consisting of a compact object that accretes material from an orbiting secondary star, X-ray binaries (XRBs) have been observed for more than half a century. However, there is still no straightforward means to determine the nature of the compact object: a neutron star or a black hole. We compare three classification machine learning methods (Bayesian Gaussian Processes, K-Nearest Neighbors, and Support vector Machines) to develop tools for classifying the compact objects in XRBs. Enhancing XRB population statistics is instrumental in understanding the formation and evolution of galaxies. High-mass XRBs have been shown to trace regions of star formation, while low-mass XRBs correlate to stellar mass distribution in galaxies (Sunyaev, Tinsley and Meier 1978). In this way, classifying populations of XRBs can indicate different evolutionary stages of galaxies. In our classification methods, each machine learning algorithm uses spatial patterns which exist between systems of the same type in 3D Color-Color-Intensity diagrams. Overall, all three methods have a high predictive accuracy, indicating a feasible method to classify XRBs into black holes, non-pulsing neutron stars, or pulsars.

[1]MAXI data provided by RIKEN, JAXA and MAXI team. Facilitated through SAO REU program, partly funded by the Ntl. Science Foundation REU and Dept. of Defense ASSURE programs under NSF Grant AST-1852268, and by the Smithsonian Inst.

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Date submitted: 29 Jan 2020 Electronic form version 1.4