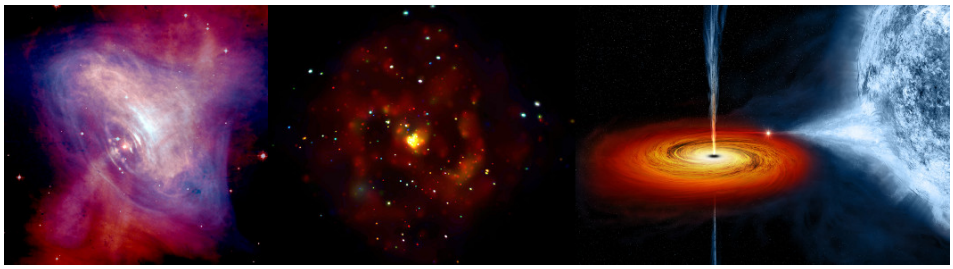

Abstract ID : **58**

Chandra X-ray sources classification using Machine Learning

Content

In modern astronomy, large-scale all-sky surveys with ever-improving coverage and superior resolution generate massive amounts of data and allow identifying and studying many previously unidentified objects. In the X-ray domain, Chandra Source Catalog(CSC) is one of the most populated source catalogues, with its second version (CSC-2.0) containing $\sim 3,17,000$ sources. Classification of such a vast number of sources is not possible with conventional methods. With such a huge dataset, the pattern identification capability of Machine Learning algorithms can be leveraged to develop an automated classifier. Out of the ~ 317000 sources in CSC-2.0, we aim to classify 2,77,069 point sources in the categories of active galactic nuclei (AGN), X-ray emitting stars, young stellar objects (YSOs), high-mass X-ray binaries (HMXBs), low-mass X-ray binaries (LMXBs), ultra-luminous X-ray sources (ULXs), cataclysmic variables (CVs), and pulsars. Using the peer-reviewed catalogues of these objects, we generate a training set of 7703 sources. To train the classifier, along with the X-ray properties from CSC-2.0, we obtain multiwavelength properties from Gaia-EDR3, SDSS, GALEX, 2MASS, WISE and MIPS-Spitzer using positional cross-match. Using the LightGBM classifier, we achieve 93% precision and 93% recall score. With the trained model, we identify 54,770 (14,066) sources with more than 3σ (4σ) confidence, out of which there are 32,600 (8,574) AGNs, 16,148 (5,166) stars, 5,184 (208) YSOs, 439 (46) HMXBs, 197 (71) LMXBs, 50 (0) ULXs, 89 (1) CVs, and 63 (0) pulsars. We generate a probabilistic classification table of the previously unidentified sources, which can be used for targeted or population studies.

Presentation Type

Oral

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