The X-ray Main Sequence

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Abstract

Astronomy is the archetypal “discovery-driven” field of science. So what do you do with nearly 10 billion sources in the major optical astronomy catalogs of today? In some ways, making new discoveries actually seems harder than ever with such a large, almost intractable dataset. I will present a plot similar to the Hertzsprung-Russell diagram, which I have dubbed the “X-ray Main Sequence”. With that diagram, one can use X-ray catalogs (which are much smaller than optical catalogs), to supplement the optical data and pick out accreting compact objects harboring a white dwarf, neutron star, or black hole. I will explain how this simple diagram works and some theoretical reasons for the apparent clustering of objects into various classes. However, I would like audience input on how to extend this to other wavelengths in astronomy, such as radio, gamma rays, and the infrared, potentially multi-messenger astronomy as well. I would like to explore how supervised machine learning models could aid in the classification of sources based on this diagram, but will argue that in some cases it may not be necessary. No previous data experience is required to listen in on this talk — the more outside perspective the better!