In my project, I will improve upon a computational model of the light emitted from blackhole x-ray binaries. An X-ray binary is a set of two stars closely orbiting each other, where one can be a black hole. The 'donor' star gives off matter to the black hole, thereby releasing lots of light [1]. We can observe these x-ray binaries with x-ray telescopes such as SWIFT/XRT [2]. Assuming the accretion disk emits light as a black body, we can model the spectrum of emitted light and infer the properties of the black hole, such as the spin. In doing so, we need to account for the fact that dust in between us and the binary absorbs some of the light [3] and that some light can be scattered into the telescope by the dust [4], which is done using models named TBabs and Xscat, respectively. However, Xscat is incompatible with how SWIFT/XRT makes its observations. This generally leads to an overestimate of the black hole's spin, which is very important to know in general relativity.

To correct this, I will develop a program that accounts for off-center sources and rectangular extraction regions which are intrinsic to SWIFT's observations. NASA maintains a terminal-ran program called Xspec [5]. Xspec is used by astrophysicists to make estimates on the properties of x-ray binaries. To do so, you have to specify what your model is and fit the parameters of your model to some data. So far, I have written a python program which interfaces the new version of Xscat with Xspec (which is in c++) and a script to automate the process of loading the data, setting the models and their parameters, saving the outputs, and making plots. I am expecting that there will be a considerable difference in the best-fit parameters depending on whether the current or improved version of Xscat is used. Specifically, the estimate of the black hole’s spin would be lower using my version, while the other parameter estimates would stay about the same.

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