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Saikruba Krishnan - Tools for Period Searching in AGN in the Era of ”Big Data”

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Active Galactic Nuclei persistently emit across the electromagnetic spectrum and are dominated by stochastic, aperiodic emission that is variable on timescales from hours to decades. The stochastic variability tends to overwhelm any possible periodic signal, preventing us from robustly confirming if periodic signals are present in AGN. It has also been seen that pure stochastic red noise signals spuriously mimic few-cycle periods. We have already entered the era of “Big Data” with current and near-future large-area monitoring programmes such as LSST facilitating data trawls for periodicities; developing the proper know-how for period searching is thus essential. Hence in our project we try to account for the red noise properly using different methods (ACF, epoch folding, wavelet analysis and Bayesian analysis) and test if each method can robustly distinguish between pure red-noise processes and mixtures of a strictly- or quasi-periodic signal (QPO) plus red noise, while pursuing the following questions: When the variability process is pure red noise (no QPO present), what is the false-alarm probability and how does it depend on broadband continuum PSD shape? When there is intrinsically a mixture of red noise and a QPO, is there a range in detection sensitivity between the various methods? How many observed cycles are needed for confirmation of a detection?. Here we present some of the results and inferences drawn from analysis in progress. We compare our results to models of binary SMBH systems to constrain the regions of parameter space where detection of periodicities against AGN red noise is feasible.

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