# ASTR 5900: Machine Learning

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## Inferring the Real-Space Clustering Amplitude by Deprojection of the Two-point Angular Correlation Function of the SWIFT AGN & Cluester Survey

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## ABSTRACT

The two-point correlation function is a well proven statistical tool that measures how strongly clustered points of data are by calculating the excess probability that a second point of data lies within some separation from the first. One particularly useful application of this is in astronomy is the measurement of the two-point angular correlation function (2paCF) of Active Galactic Nuclei (AGN). The clustering properties AGN can help to better understand possible fueling modes as well as host dark matter halo mass.

An important aspect of the 2paCF is that it is possible to deproject the measured angular function to infer real-space clustering characteristics of the galaxies in a sample. Many prior studies have demonstrated the fidelity of inverting the angular correlation function on comparatively small data sets. We are interested in analyzing the 2paCF of the Swift AGN and Cluster Survey (SACS), the largest current survey of x-ray selected AGN with over 22,000 AGN candidates.

We are in the process of inferring the real-space clustering length and host dark matter halo mass by applying a Markov-Chain Monte Carlo algorithm to extract best fits on the parameters associated with the deprojection of the 2paCF. We will also investigate the use of Ball Tree and Bootstrap re-sampling algorithms to compute the angular correlation function and quantify error, respectively . These results will be compared with our existing calculation of the angular correlation function and errors to assess the reliability of unsupervised Nearest-Neighbor techniques on our data.