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Supermassive Black Holes and their Host Dark Matter Halos

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Through a plethora of observational results we now know that there is a supermassive black hole (SMBH) at the center of every galaxy in the Universe with a fraction of them harboring an active accretion disc and are known as active galactic nuclei (AGN). Thus in the paradigm of structure formation we like to address the question of relating SMBH with their host dark matter halos. Observationally by studying the spatial clustering of SMBH or AGN we can infer about their dark matter hosts.

AGN clustering can be characterized within a powerful theoretical framework known as the Halo Occupation Distribution (HOD). In this talk ,I shall discuss about the HOD modeling of AGN using a fully cosmological simulation and show that the underlying theoretical model fits the two-point correlation function (2PCF) of different types of AGN. This provides us an evolutionary picture of AGN along with dark matter halos over cosmic time.

In the later half of the talk I shall provide some limitations of the 2PCF fitting method and provide alternative ways to measure the HOD of AGN while trying to address some fundamental questions in AGN physics from a cosmological point-of-view.

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