BOSTON UNIVERSITY

Boston University College of Arts & Sciences
Institute for Astrophysical Research

2025 ASTROPHYSICS SEMINAR SERIES

A Parameter Survey of Black Hole Accretion in Radiation GRMHD Simulations

Radiation and magnetic fields play crucial roles in shaping black hole accretion, particularly in near- and super-Eddington regimes. To model these systems, we solve the GRMHD equations coupled with angle-dependent radiation transfer, which enables us to capture the complex dynamics driven by radiation and magnetic fields in extreme environments. In the super-Eddington regime, radiative support causes the accretion disk to thermally expand, forming a narrow conical funnel through which radiation escapes, leading to low radiation efficiency. In the near- and sub-Eddington regime, the magnetic field topology strongly influences the resulting disk structure, allowing the system to reach a steady state as either a thin disk with magnetic coronae or a magnetically elevated disk. These simulations broadly align with observational findings — such as the soft states of X-ray binaries, ultraluminous X-ray sources, and "little red dots" — and provide predictive diagnostics for future observations, which I will discuss in detail during the talk.

Monday, April 7th

2:30 - 3:30 p.m.

725 Commonwealth Ave | Room 502

Lizhong Zhang

Institute for Advanced Study