

JOINT TUFTS/MIT COSMOLOGY SEMINAR

Discovering supermassive black hole binaries in multi-messenger observations

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Inspiring supermassive black hole binaries (SMBHBs) are a natural outcome of galaxy mergers and are expected to be among the strongest sources of low-frequency gravitational waves. At sub-parsec separations, however, these binaries are extremely difficult to resolve directly. One promising approach is to search for their signatures in the time-domain variability of AGN lightcurves. Orbital motion can imprint periodic or evolving (“chirping”) signals in quasar light curves through mechanisms such as relativistic Doppler boosting. In this talk, I present a series of studies exploring methods for detecting compact SMBHBs in large optical surveys, building towards a systematic search. Using mock data motivated by current and upcoming time-domain surveys, such as LSST, we evaluate the performance of these methods. I will demonstrate that both periodic and chirping signals, consistent with GW-driven inspiral, can be identified in large optical surveys alone, and that these detections can be confirmed with even higher confidence when combined with GW observations. Confirmed compact multi-messenger binaries can serve as “standard sirens” for understanding high-redshift cosmology in the next decade.

Tuesday, April 14, 2026, 2:30 pm

574 Boston Ave, Room 310

Tufts University

Refreshments at 2:00 outside the building, at the corner of
Harvard St. and Boston Ave.