Miami Physics Conference 2024

Date: Dec 12-19, 2024

Location: Lago Mar Resort

Affiliation: University of Wisconsin Milwaukee

Gayathri Vivekananthaswamy

Reconstructing the Origin of Black Hole Mergers Using Sparse Astrophysical Models

Abstract

The astrophysical origin of the over 90 compact binary mergers discovered by the LIGO and Virgo gravitational wave observatories is an open question. While the unusual mass and spin of some of the discovered objects constrain progenitor scenarios, the observed mergers are consistent with multiple interpretations. A promising approach to solve this question is to consider the observed distributions of binary properties and compare them to expectations from different origin scenarios. Here we describe a new hierarchical population analysis framework to assess the relative contribution of different formation channels simultaneously. For this study we considered binary formation in AGN disks along with phenomenological models, but the same framework can be extended to other models. We find that high-mass and high-mass-ratio binaries appear more likely to have an AGN origin compared to the same origin as lower-mass events. Future observations of high-mass black hole mergers could further disentangle the AGN component from other channels.