Machine learning in gravitational wave population analysis[1]

WANG KEI WONG, Johns Hopkins University, SHIRLEY HO, Flatiron institute, EMANUELE BERTI, Johns Hopkins University — The growing catalog of stellar-mass compact binary systems detected in gravitational waves offers burgeoning insights to physics governing their evolution. At the same time its increasing complexity poses a more significant challenge to our data analysis techniques. We review some recent developments on incorporating machine learning techniques in analyzing gravitational-wave catalogs. We also present a new machine to perform population analysis. By incorporating a flow-based deep generative network into a hierarchical Bayesian framework, one can handle astrophysical models of compact binaries that have higher dimensions and complexity as compared to previous studies, with greater accuracy and efficiency. This new machine offers novel and unique opportunities to directly constrain various astrophysical model with gravitational-wave observations.

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