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The Application of Bayesian Inference to Gravitational Waves from Core-Collapse Supernovae SARAH GOSSAN, CHRISTIAN OTT, PETER KALMUS, California Institute of Technology, JOSHUA LOGUE, SIONG HENG, University of Glasgow — The gravitational wave (GW) signature of core-collapse supernovae (CCSNe) encodes important information on the supernova explosion mechanism, the workings of which cannot be explored via observations in the electromagnetic spectrum. Recent research has shown that the CCSNe explosion mechanism can be inferred through the application of Bayesian model selection to gravitational wave signals from supernova explosions powered by the neutrino, magnetorotational and acoustic mechanisms. Extending this work, we apply Principal Component Analysis to the GW spectrograms from CCSNe to take into account also the time-frequency evolution of the emitted signals. We do so in the context of Advanced LIGO, to establish if any improvement on distinguishing between various explosion mechanisms can be obtained. Further to this, we consider a five-detector network of interferometers (comprised of the two Advanced LIGO detectors, Advanced Virgo, LIGO India and KAGRA) and generalize the aforementioned analysis for a source of known position but unknown distance, using realistic, re-colored detector data (as opposed to Gaussian noise), in order to make more reliable statements regarding our ability to distinguish between various explosion mechanisms on the basis of their GW signatures.

Sarah Gossan
California Institute of Technology

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