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A fast and precise methodology to search for strong gravitational-wave lensing¹ JUSTIN JANQUART, OTTO A. HANNUKSELA, HARIS K., CHRIS VAN DEN BROECK, NIKHEF ; Utrecht University — Gravitational waves (GWs), like electromagnetic signals, can undergo gravitational lensing when a massive object (a galaxy or galaxy cluster) is present on the path from source to the detector. In the case of GWs, lensing will manifest itself through several images arriving at our interferometers at different times, separated by seconds to months. According to the current forecasts, gravitational-wave lensing observations can become quite likely with Advanced LIGO and Advanced Virgo at design sensitivity. Discovering lensing of GWs presents a computational challenge, given the large number of GW signal pairs (including sub-threshold triggers) that need to be investigated to see whether they represent images of a lensed event. We present GOLUM (Gravitational-wave analysis Of Lensed and Unlensed waveform Models), a method which considerably speeds up the search for lensed events (by up to factors of hundreds) by marginalizing over parameters that are unaffected by lensing before jointly analyzing two GW signals under the lensing hypothesis. This allows for analysis of large sets of GW pairs, enabling future lensing searches.

¹Netherlands Organisation for Scientific Research NWO-I

Justin Janquart
NIKHEF

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