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Gravitational-wave astronomy in the 2030s: prospects and challenges for data analysis

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The fourth observing run of the LIGO-Virgo-KAGRA network of gravitational-wave (GW) detectors is ongoing and will add a significant number of compact binary mergers to the catalogs of GW transient observations. This is expected to further advance our understanding of astrophysics, cosmology and fundamental physics. The current network of interferometers is expected to reach design sensitivity in the late 2020s, with future directions of GW astronomy from the ground and in space already in advanced planning stages. In this talk, I will give an overview of state-of-the-art techniques currently employed for the analysis of LIGO-Virgo-KAGRA data, and provide an outlook on the significant challenges that still need to be overcome on the road to data analysis with third-generation GW instruments like LISA and the Einstein Telescope.

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