There and back again: Learning forward/inverse solutions in gravitational-wave inference

In gravitational-wave astronomy, the interface between the forward problem (source modelling) and its inverse counterpart (parameter estimation) is traditionally limited to the form of approximate time- or frequency-domain template models. This is due to the theoretical and computational difficulty of both problems, which requires that they be addressed independently and using highly disparate approaches. As a result, the practical process of inference is often made more inefficient than necessary — sometimes prohibitively so, for certain classes of source. In this talk, I discuss several strategies that leverage deep-learning techniques in an integrated manner, so as to expand and streamline the interface between the forward and inverse problems. While quite general, these strategies will be particularly important for the analysis of data from future millihertz detectors such as LISA.