Practical stochastic template placement for spinning gravitational-wave inspiral searches

NICKOLAS FOTOPOULOS, STEPHEN PRIVITERA, California Institute of Technology, MELISSA FREI, Rochester Institute of Technology — Compact binary coalescences are promising and interesting sources of gravitational-waves for Advanced gravitational-wave detectors. While the rates are highly uncertain, many of these binaries likely have a black hole component. Astrophysical black holes especially are expected to have significant spin angular momentum, but published searches for them have thus far used matched filter banks built from waveform models that only take component masses into account—no spin. I present SBank, a stochastic placement scheme that is fast, can operate with or without a signal mismatch metric, and is easily extensible to new waveform families. We have so far applied SBank to produce template banks of three-dimensional, mass1–mass2–aligned-spin waveforms in the low-mass, inspiral-only regime, with guidance from an analytical signal metric, and in the high-mass, inspiral-merger-ringdown regime, where we currently have no metric. I will share what we’ve learned about higher-dimensional banks and what we expect to gain in detection rate.