Contribution ID: 12

Sequential simulation-based inference for extreme mass ratio inspirals

Monday 23 June 2025 15:30 (30 minutes)

Extreme mass ratio inspirals are a key target for next generation space-based gravitational wave detectors because they have a rich phenomenology that could offer new astrophysics and fundamental physics insights. However, their dynamics are complicated to model, their signals remain in band for long durations, and they will be buried amongst a large population of other sources in the milliHertz frequency band with a background of non-stationary and non-Gaussian noise. Searching for these systems and measuring their parameters therefore presents a difficult challenge.

Simulation-based inference methods could offer solutions to some of these challenges. I will show how sequential simulation-based inference, specifically truncated marginal neural ratio estimation, can efficiently narrow down the volume of the complex 11-dimensional search parameter space by a factor of a million and provide 1-dimensional marginal proposal distributions for non-spinning extreme-mass-ratio inspirals. I will highlight the benefits of this approach with respect to traditional likelihood-based methods, and discuss the broader context in which such a pipeline will need to be embedded as well as how and when environmental effects should be considered.

Presenter: COLE, Philippa