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Reducing the computational cost of EMRI waveforms using machine learning

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EMRI data analysis faces a number of challenges. One issue is the high computational cost of waveforms, which arises due to the need to model complex physics over long timescales. Recent innovations in relativistic EMRI waveform generation have enabled them to be computed in less than a second, but further improvements are required if EMRI studies are to be made practical. Potentially millions of waveforms would need to be calculated to infer the parameters for a single signal; the data stream may contain thousands of EMRIs, and to infer properties of the underlying astrophysical population, we must simulate selection effects for many tens of thousands of populations. Machine learning can mitigate the computational expense of EMRIs in data analysis studies, both by accelerating EMRI waveform evaluations and reducing the number of waveform evaluations required. I will outline the motivations for using machine learning in EMRI data analysis, and demonstrate that significant efficiency gains can be made without compromising accuracy in applications such as population inference.

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