
Inference and probabilistic modelling with machine learning for LISA data analysis

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Abstract

In my talk I am going to concentrate on the models of machine learning which allow us to learn the probability distributions and apply it to the important unsolved problems in the LISA (Laser Interferometer Space Antenna) data analysis.

To estimate physical parameters of the signals detected by LISA and their localisations one has to perform some form of Bayesian Inference. The most common approach to do this is through defining the likelihood function and producing posterior samples with some form of sampling technique. The disadvantage of the sampling methods is that they are slow. We propose the Bayesian parameter estimation method which is based on the Normalising flows a technique which allows to make an extremely fast mapping from the base simple distribution to the posterior conditioned on the data. This is implemented by learning this mapping in advance on the training dataset and then applying the trained map to the real data. The main purpose of the fast parameter estimation is to use it for the multi-messenger observations and to be able to alert other observatories to perform follow-ups.

Slides: in PDF

Video: <https://youtu.be/I9EQUervawk>

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