



19 August 2021

Dear Editor,

We are pleased to provide a revised manuscript for your consideration. The changes that we have made have been guided by the insightful comments provided by the Nature referees and we are confident that we have addressed all their concerns. We apologise for the delay in this latest response, which was due to some difficulties associated with the pandemic.

The motivation for our work remains the same - the speed that data can be processed to obtain accurate estimates of source parameters is a key issue for gravitational wave astrophysics. The current latency for obtaining source sky position information is $O(1)$ min and this speed is crucial for rapid follow-up with electromagnetic telescopes. The complete Bayesian analyses are significantly more computationally costly and for typical analysis have taken between 6 hours and 6 days per event. Our machine learning approach to gravitational wave parameter estimation is generally consistent with existing complete Bayesian methods and can generate results ~ 6 orders of magnitude faster. We are therefore able to produce parameter estimates in under a second using minimal computational resources.

Based on referee comments, we have made several changes to the analysis and additions to the manuscript. We have expanded the scope of our inference to include all binary black hole source parameters and have increased the data sampling rate by a factor of 4. We have also now adopted a new superior figure of merit standard to replace the KL distribution in the previous manuscript, with the more accurate and trustworthy JS-divergence distribution for each parameter separately. Other changes are listed in the attached response to the referees.

Considering the many improvements we have now implemented to meet the requirements proposed by the reviewers, we are hopeful that this resubmitted version is now ready for publication in Nature Physics Letters.

Yours sincerely,

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