Is It Necessary to Learn Summary Statistics for Likelihood-free Inference?

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Abstract
Likelihood-free inference (LFI) is a set of techniques for inference in implicit statistical models. A longstanding question in LFI has been how to design or learn good summary statistics of data, but this might now seem unnecessary due to the advent of recent end-to-end (i.e. neural network-based) LFI methods. In this work, we rethink this question with a new method for learning summary statistics. We show that learning sufficient statistics may be easier than direct posterior inference, as the former problem can be reduced to a set of low-dimensional, easy-to-solve learning problems. This suggests us to explicitly decouple summary statistics learning from posterior inference in LFI. Experiments on five inference tasks with different data types validate our hypothesis.

References

[1] Y. Chen, M. U. Gutmann, A. Weller. Is It Necessary to Learn Summary Statistics for Likelihood-free Inference?, *PMLR*, 202, 4529-4544, 2023.