Partially Exchangeable Networks and Architectures for Learning Summary Statistics in Approximate Bayesian Computation

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Abstract

In this talk, we will introduce partially exchangeable networks (PENs) [1], and we will, in particular, discuss the application of learning summary statistics for approximate Bayesian computation (ABC). Connections between our methodology and other deep learning-based methods for simulation inference will also be highlighted. By design, PENs are invariant to block-switch transformations, which characterize the partial exchangeability properties of conditionally Markovian processes. More- over, we show that any block-switch invariant function has a PEN-like representation. The DeepSets architecture is a special case of PEN and we can therefore also target fully exchangeable data. We employ PENs to learn summary statistics in ABC. When comparing PENs to previous deep learning methods for learning summary statistics, our results are highly competitive, both considering time series and static models. In- deed, PENs provide more reliable posterior samples even when using less training data.

This is joint work with Umberto Picchini and Jes Frellsen.

References

[1] S. Wiqvist, P.-A. Mattei, U. Picchini, and J. Frellsen. Partially exchangeable networks and architectures for learning summary statistics in approximate Bayesian computation. In Proceedings of the 36th International Conference on Machine Learning. PMLR, 2019. http://proceedings.mlr.press/v97/wiqvist19a/wiqvist19a.pdf