

Declaration of Contribution for D.Phil Thesis

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Much of the work presented in this thesis originates from joint authored publications. The declaration outlines my contributions to those papers, with all deviations in the thesis from the published work being my own.

1. Interacting Particle Markov Chain Monte Carlo

Tom Rainforth, Christian A Naesseth, Fredrik Lindsten, Brooks Paige, Jan-Willem van de Meent, Arnaud Doucet, and Frank Wood. Interacting particle Markov chain Monte Carlo. In Proceedings of the 33rd International Conference on Machine Learning, volume 48. JMLR: W&CP, 2016c

I was co-lead author along with Christian. The initial idea was developed concurrently by a number of the coauthors but not including myself. Development of the idea into the final algorithm was spearheaded by myself, Christian, and Fredrik. I carried out all of the code implementation and experiments. Writing was carried out roughly evenly between myself and Christian with help from the other authors. The main proof was done by Christian with help from Fredrik, Arnaud, and Brooks.

2. Bayesian Optimization for Probabilistic Programs

Tom Rainforth, Jan-Willem van de Meent, Michael A Osborne, and Frank Wood. Bayesian optimization for probabilistic programs. 1st NIPS Workshop on Black Box Learning and Inference, 2015

Tom Rainforth, Tuan Anh Le, Jan-Willem van de Meent, Michael A Osborne, and Frank Wood. Bayesian Optimization for Probabilistic Programs. In Advances in Neural Information Processing Systems, 2016b

I was the lead author and carried developed the vast majority of the technical innovations myself, though Jan-Willem, Frank, and Mike all also had input in the original idea, while Jan-Willem and Frank assisted in the development the key marginal transformation. The code implementation was lead by myself with assistance from Jan-Willem and Tuan Anh, the latter of which did the low level implementations of the code transformations based on my designs. Experiments were a joint effort between myself, Jan-Willem, and Tuan Anh. I did the majority of the writing, but had assistance from Jan-Willem, Tuan Anh, and Frank.

3. Nested Monte Carlo

Tom Rainforth, Robert Cornish, Hongseok Yang, and Frank Wood. On the pitfalls of nested Monte Carlo. NIPS Workshop on Advances in Approximate Bayesian Inference, 2016a

Tom Rainforth, Robert Cornish, Hongseok Yang, Andrew Warrington, and Frank Wood. On the opportunities and pitfalls of nesting Monte Carlo estimators. arXiv preprint arXiv:1709.06181, 2017

I was the lead author and developed the initial idea. I provided the high level ideas for all of the theorems along with informal proofs, which were then developed into more formal proofs by myself, Rob, and Hongseok. I took the lead on formalizing (using the numbering of Rainforth et al. (2017)) Theorems 2, 5, and 7 myself, Rob took the lead on Theorems 1, 3 and 4, and Hongseok took the lead on Theorem 6. Experiments were carried out myself, except for the cancer simulations which were assisted by Andrew. The derivation of the Bayesian experimental design was done by myself. Writing was lead by myself with assistance from the other authors, in particular Rob.

4. Bayesian Experimental Design

Benjamin T Vincent and Tom Rainforth. The DARC toolbox: automated, flexible, and efficient delayed and risky choice experiments using Bayesian adaptive design. In Submission, 2017

All machine learning and statistical contributions (derivation of estimator, design of inference scheme, development of optimizer etc) were done by myself, with Ben developing the model and applications specifics. The code implementation was a joint venture, with myself carrying out the technical components of the code and providing the core code structure, but with Ben doing the experiments and adapting the code base further.

5. Anglican Probabilistic Programming System

My contribution to the Anglican PPS itself (other than that with BOPP) is relatively limited. Credit for Anglican goes primarily to David Tolpin, Jan-Willem van de Meent, and Frank Wood.

6. Other Papers

The thesis cites other papers for which I am coauthor, but does not include any substantial material from the original papers (some sentences have been duplicated, but only those which were written by myself in the original work).