Amortized Variational Inference for Bayesian Meta-Learning using Langevin Diffusions

Description

Multi-task learning aims to leverage inductive biases learned on a meta-dataset of similar tasks for improved data efficiency on unseen target tasks of similar structure. Most approaches to multi-task meta-learning rely on Variational Inference (VI) with an amortized, factorized Gaussian variational distribution. A recent study by Volpp et al. (2022) [4] demonstrated that employing more expressive variational distributions produces tighter evidence lower bounds, enhances the efficiency of optimizing marginal likelihood, and leads to improved uncertainty estimation. Nevertheless, they employed non-amortized VI, necessitating the training of separate models for each task.

This thesis aims to harness recent advancements in diffusion-based VI [3, 1] and apply it in an amortized manner to Bayesian multi-task meta-learning. Consequently, we can leverage a single model that serves as the variational distribution for all tasks.

Tasks

The tasks in this project will involve:

- Implementation. Extend the code-base from [4] such that we can use amortized VI schemes.
- Benchmarking. Compare our method against competing approaches.

References


