1 Neural Processes

Neural Processes are an expansion of Gaussian Processes using Neural Networks introduced in [Gar+18] they are trained on a context dataset which is. Neural processes are a meta-learning algorithm that can be used for few-shot learning. They are trained on a context dataset which is a set of input-output pairs $\mathcal{D} = \{(x_i, y_i)\}_{i=1}^N$.

1.1 Meta Learning

Meta Learning is a method of ML where the model is trained on a set of tasks and then tested on a new task. The goal is to learn a model that can learn new tasks quickly'', i.e 'learning to learn'. These come under the terminology of few-shot learning where the model is trained on a small number of examples (more specifically, we can say N-way-K-shot learning where N is the number of classes and K is the number of examples per class).

Consider a set of datasets $\mathcal{D} = \{\mathcal{D}_i\}_{i=1}^N$ where each dataset $\mathcal{D}_i$ is a set of input-output pairs $\mathcal{D}_i = \{(x_{ij}, y_{ij})\}_{j=1}^{K_i}$. The goal of meta-learning is to learn a model f that can learn a new task $\mathcal{D}_{N+1}$ with a small number of examples. The data used to train the model is called the context set $\mathcal{C}$ which is a set of datasets $\mathcal{C} = \{\mathcal{D}_i\}_{i=1}^N$. The data used to query the model is called the target set, which has a support of the inputs only. Our task is to predict the outputs for the target set given the training on the context set.

1.2 Conditonal Neural Processes

Conditonal Neural Processes (CNPs) [**garnelo2018conditional**] was introduced to integrate neural networks and Gaussian Process into a model that is able to generate a stocastic representation of the training dataset efficently with low computational complexity.

References

[Gar+18] Marta Garnelo et al. *Neural Processes*. 2018. arXiv: 1807.01622 [cs.LG].