Exploratory Master Thesis / Research Project
Meta-learning the Neural Tangent Kernel

"The most widely used machine learning algorithms were invented and hardwired by humans. Can we also construct metalearning (or meta-learning) algorithms that can learn better learning algorithms?"
Juergen Schmidhuber (link).

In this Master thesis / research project, the student will study meta-learning applied to the Neural Tangent Kernel (1). Also see the paper "Model Agnostic Meta-learning" (2) which will be a starting point of this thesis.

The Neural Tangent Kernel (1) is a kernel that describes training dynamics of neural network with very large width. Here, training becomes linear and allows for an analytical expression of gradient descent trained neural network. In this project, the student is going investigate meta-learning techniques to adjust hyperparameters describing the induced kernel in order to allow for better few-shot learning.

Note: This project is very exploratory!

Prerequisites: Experience with deep learning (Pytorch, JAX, Tensorflow or similar)
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Supervising Professor: Prof. Dr. Angelika Steger, CAB G 37.2, steger@inf.ethz.ch

References

Arthur Jacot, Clément Hongler, and Franck Gabriel. Neural tangent kernel: Convergence and generalization in neural networks. In *Advances in Neural Information Processing Systems 31*, 2018.
Chelsea Finn, Pieter Abbeel, and Sergey Levine. Model-agnostic meta-learning for fast adaptation of deep networks. In *International Conference on Machine Learning*, 2017.