University of Basel
Department of Biomedical Engineering

BAMM Basel Muscle MRI

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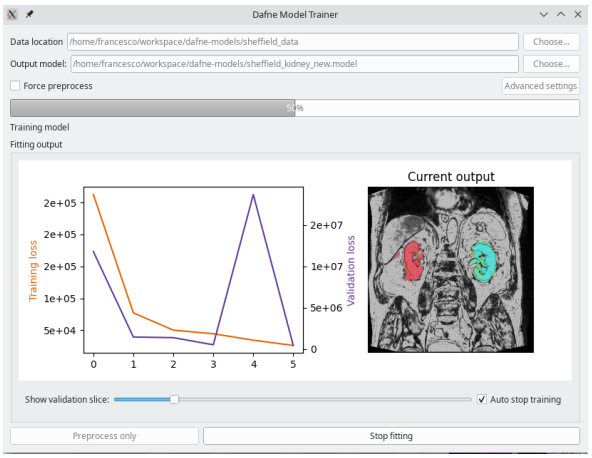
Master of Science – Biomedical Engineering

Thesis Proposal

Transfer Learning for the collaborative segmentation platform Dafne

Medical image segmentation is an important step for the extraction of quantitative values from medical images. To address this problem, our group has developed a free software package, Dafne (https://dafne.network/), that enables a deep learning model to continuously improve by exploiting the collective knowledge of the users.

In addition to the main program, a convenient "model trainer" software tool is provided, which creates new segmentation models starting from a number of manually segmented datasets.



Currently, the new models are trained from scratch, but this is generally inefficient, as it requires more data and more computational resources.

In this project, the candidate will make model training more efficient by implementing transfer learning in the Dafne models, which means that some elements of the existing models will be reused when training an algorithm for a new task.

Publicly available datasets will be used as training data and the existing Dafne models will form the basis of the tuning. The code will be released as open source and integrated in the Dafne package. A number of different fine tuning methods will be implemented: from simple replacing of the output layers of the network with new, randomly initialized layers, to potentially exploring techniques such as LoRA (Low-Rank Adaptation). The fine tuning approach will be compared with retraining of the model from scratch.

Nature of the Thesis
Literature/dataset search: 10%
Programming: 70%
Documentation: 20%

Specific Requirements
Good knowledge of Python.
Basic knowledge of neural network architectures.

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