Open-source Multimodal-GANs Tool for Medical Image Translation
Project Management and Software Development for Medical Applications

General Info
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Project Abstract
Generative adversarial networks have shown a promising avenue for image reconstruction or image style transfer [1]. Particularly, in medical image analysis, image translation by combining multiple modalities can better capture disease specific features. For example, in [2] we show that image translation can enhance the information for lesion detection in the brains when combining multiple modalities. Although the methods were established, open-source tools were not ready for the maximum impact of the developed methods. The goal of the project is to develop open-source image translation tools/software that could be used for research worldwide.

Background and Motivation
In medical images synthesis, multiple-to-one cross modality mapping is highly relevant as proprietary information of individual and non-aligned modalities can be synergistic. In the case of multiple sclerosis, longitudinal comparisons of MRI studies are the main reason for treatment decisions and existing lesion quantification tools require complete identical modalities at multiple time points. Potentially, multi-modality image synthesis technique can resolve those obstacles through efficient data infilling and re-synthesis. We have established a GAN-based method to combine multiple MR modalities and synthesize one or two target modalities [1,2]. The goal of this project is to pack our image translation model as open-source tools and contribute to the research community.

Student’s Tasks Description
Generally, the student will first learn the deep learning-based translation models and then contribute a package/software to PYPI (https://pypi.org/) so that our method can be easily used by researchers worldwide. Specifically, for the software design, there are three main steps:

1. Test the pre-trained models locally with a few datasets.
2. Write a description of the usage of the tool like here: https://pypi.org/project/deepbrain/
3. Upload them to PYPI (the student will be the maintainer and will be acknowledged).

Technical Prerequisites
Good knowledge in Python programming is necessary. Knowledge in deep learning is not necessary but preferable.

References

Please send the completed proposal to ardit.ramadani@tum.de, zl.jiang@tum.de, lennart.bastian@tum.de and tianyu.song@tum.de. Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in case of acceptance.