Diffusion-Based Correspondences between Multimodal Medical Images
Open Master's Thesis 2025

Keywords: Diffusion models, point correspondences, multimodal medical images, registration
Lesion tracking and image registration (finding the deformation between two images) are fundamental tasks in clinical practice for the diagnosis and monitoring of diseases. For this, establishing correct point correspondences between multiple images is essential.
Recent research in computer vision explores the use of diffusion model features for various image-based downstream tasks, including object detection, tracking, image editing, and classification [1, 2], as well as the fusion of high-level semantic and low-level geometric features [3].

This thesis aims to adapt diffusion model-based features to medical images. In particular, the student will (i) perform literature research on the topic, (ii) explore SOTA correspondence matching techniques in the context of medical images, and (iii) develop new techniques for specific tasks on multimodal images, e.g., MR and CT. The project can be adapted to the student's interests.

Requirements

- Prior practical experience with and a good understanding of machine learning/deep learning,
- Very good programming skills in Python (including PyTorch),
- Independent work style and good communication skills,
- Interest in medical imaging and the development of novel algorithmic methods.

The start date ideally is February/March 2025. The thesis is offered by the Chair for Computational Imaging and AI in Medicine (Prof. Dr. Julia Schnabel) and supervised by Anna Reithmeir and Dr. Daniel Lang.

Contact: If interested, please send your transcripts and a short motivation to anna.reithmeir@tum.de and lang@helmholtz-munich.de.

References

[1] N. Stracke et al. *CleanDIFT: Diffusion Features without Noise*. 2024. arXiv: 2412.03439 [cs.CV]. URL: https://arxiv.org/abs/2412.03439.

[2] L. Tang et al. *Emergent Correspondence from Image Diffusion*. 2023. arXiv: 2306.03881 [cs.CV]. URL: https://arxiv.org/abs/2306.03881.

[3] F. Xue et al. *MATCHA:Towards Matching Anything*. 2025. arXiv: 2501.14945 [cs.CV]. URL: https://arxiv.org/abs/2501.14945.