Master Thesis Self-supervised learning for Semantic Segmentation

Collaborate within an international team with strong ties to the German Aerospace Center and contribute to the development of next-generation AI models for the advanced analysis of remote sensing imagery, making contributions with real-world applications to the sustainable development goals, climate change, and natural hazards.

Background

Semantic segmentation refers to the task of assigning a semantic label to every pixel in a given image. It has various applications including medical image analysis, autonomous driving, and Earth observation. While corresponding methods have been developed since decades, only recently with the rise of deep learning have results been achieved that are accurate and robust enough for practical use cases beyond academic benchmarks. Nevertheless, there is still a lot of potential for improvement.

Project

The task of semantic segmentation is often addressed within the context of fully-supervised learning which requires training datasets which additionally to the input images also provide semantic segmentation at pixel level. For Earth observation imagery, these are usually difficult and costly to obtain, which limits the size of such datasets. One option to tackle this issue is self-supervised learning which aims to pre-train a machine learning model (mostly a deep neural network) based on a task constructed on the data itself (e.g. via contrastive learning). The goal of this thesis is to implement and evaluate such self-supervised learning approaches for the semantic segmentation of remote sensing imagery.

Expected outcome

- Literature research on existing approaches of iterative solutions to semantic segmentation
- Implementation of an approach of self-supervised learning for semantic segmentation tasks
- Evaluation of the approach on benchmarks, comparison with relevant reference methods

Your Profile

- Scientific curiosity, very good ability to work independently, strong communication skills
- High motivation to deeply explore a given research topic
- Background in computer vision and/or machine learning
- Strong programming skills (python)
- Knowledge in remote sensing is not required

Contact

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Please feel free to reach out for more topics e.g. on Machine Learning, Deep Learning, Ensemble Learning, Computer Vision, Remote Sensing, Earth Observation, Synthetic Aperture Radar or regarding the option to conduct your Master thesis at the DLR in Oberpfaffenhofen.