Master Thesis
If this, then that: Propagation of certainty in semantic segmentation tasks

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 usually tackled by a one-step approach: A trained model is applied to the image and produces a pixel-wise semantic map, usually with some kind of measure of uncertainty (e.g. probabilistic estimates as produced by a softmax layer in a neural network). This estimate will be correct at some places, yet wrong at others. The idea of this project is that the model will be certain for some areas of the image (the easy ones), while being less certain in others (the difficult ones). Yet, knowing the labels in the easy areas might be beneficial for deciding the label in the difficult areas.

Expected outcome
- Literature research on existing approaches of iterative solutions to semantic segmentation
- Implementation of an approach to exploit certainty in 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.