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DLR – DAAD Fellowships

Fellowship No. 515

Research Area : Space

Research Topic: **Unsupervised Deep Learning for Extracting Information of Interest from Satellite Imagery**

DLR Institute: Remote Sensing Technology Institute (IMF) at DLR Oberpfaffenhofen

Position: Doctoral Fellow

Openings: 1

Job Specification: A typical workflow in a machine learning project is designed in a supervised manner. This generally gives a structure for solving a problem, but it limits the potential of the algorithm in two ways: 1) It learns how to perform that task on its own, but it is prohibited to think of other corner cases that could occur when solving the problem; 2) there is a huge manual effort involved in creating the labels for the training. To solve this issue in an intelligent way, unsupervised learning algorithms can be used. These algorithms derive insights directly from the data itself, and work as summarizing the data or grouping it, so that we can use these insights to make data driven decisions. One example of how these algorithms can be utilized is the grouping of buildings according their roof types from satellite images. Manual labeling of such data is nearly impossible since buildings in urban areas exhibit very diverse and complex structures. Additionally, the data volume is too large for manual labeling. The knowledge about roof types is the most important component needed to reconstruct Level of Details 2 building feature for 3D modeling. While traditional solutions for roof modeling rely on detecting detailed cues (such as lines, corners, and planes) extracted from a Digital Surface Model (DSM) and RGB imagery, the correct detection of the roof type and its modeling can fail due to the low-quality of the DSM generated by dense stereo matching. Having complete data sources, such as OSM data or 3D city models in CityGML format, from which roof types can be easily extracted for any building instance, is very desirable. It will reduce time and efforts in the 3D modeling.

Therefore, we plan to address the problem of filling a gap of roof type information in popular data sources using deep learning techniques in the absence of ground truth during the training (unsupervised learning).

Required Qualification: Master in computer science, geosciences, remote sensing or in a similar field. The candidate should have a good background in image processing, and deep learning. Programming skills in Python are required. Experience in processing of high-resolution remote sensing image data is of advantage. Open communication and team spirit are furthermore expected. He/she should be able to work in a team as well as self-reliant and to present results at international conferences.

Advantageous Skills: High programming skills and knowledge in satellite/aerial imagery are of advantage.

English competence: Advanced knowledge (speaking, reading and writing) required;
See requirements on www.daad.de/dlr

Earliest Start Date: December 2021

Application Deadline: until position is filled

Further Information: http://www.dlr.de
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