Semi-supervised Deep Learning for Object Detection in Airborne Laser Scanning Data

Project Description

Deep learning has become popular in many computer vision tasks such as image classification, semantic segmentation, and object localization. However, deep learning models usually rely on a large set of training data, specifically labelled data. In the task of object detection in laser scanning data, it is usually hard to create enough labelled examples as it is time consuming and not easy to manually identify and label every object. Recently, researchers have tackled this issue with semi supervised deep learning methods. In semi supervised deep learning, unlabeled data is leveraged to help with the task of learning. In general, an unsupervised clustering algorithm, parametric or non-parametric, is first used to cluster the whole data, labelled and unlabeled, thus generating pseudo labels for every object. The data along with the pseudo labels are then used to train a supervised deep learning model. Finally, the trained supervised model is fine-tuned using only the labelled data. Therefore, the goal of this project is to explore semi supervised deep learning techniques for the purpose of object detection in digital elevation models created from airborne laser scanning data.

Tasks:
- Literature research on semi-supervised deep learning
- Preprocess ALS data for the semi-supervised deep learning model
- Implement, train, and evaluate the model.

Required Skills:
- Programming skills in python
- Familiarity with machine/deep learning
- Familiarity with deep learning libraries like Keras and Tensorflow

Workflow

Digital Elevation Model
Hillshading for visualization
Semi-Supervised Learning Framework
Automatic labelling for each pixel.
Manual digitization of known objects where some regions are not labelled

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