

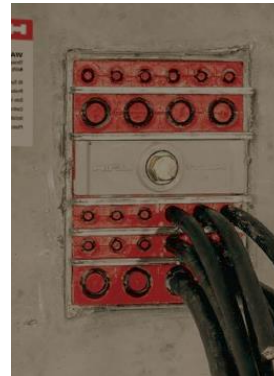
# Deep Learning Instance Segmentation Enhanced with Synthetic Data for Firestop Cable Transit Systems Applications

Keywords / Topics: Image segmentation, Firestop



## Abstract

In this work, the student gets the opportunity to apply the latest methods in image segmentation to automatically detect errors in Hilti firestop installations. The task also includes the development of methods for the generation of data using CAD models and real images. The artificial data should be evaluated based on the ability to improve the predictive performance of the neural network.



## Background

This work is co-supervised by the industry partner Hilti, which is offering firestop solutions to its customers. In this project, the student will have the opportunity to contribute to the field of image segmentation as well as provide a solution for a current industry need.

## Content of Work

Firestop is a Hilti product that is of paramount importance to the safety of a building. Nevertheless, in order for the firestop product to perform according to specifications, it needs to be installed correctly. Given the complexity of the product and the severe consequences of any mistakes, the installation check needs to be done by an expert. An algorithm that could check the validity of a firestop installation would simplify the process and could even ensure that the firestop installation is according to specifications at all times. This project will attempt to assess the feasibility of automatically detecting installation errors using the latest image segmentation machine learning algorithms. The idea is that once an image (or multiple images) of the firestop under investigation is properly segmented, it can be analyzed to understand if it has been properly installed. Given that modern image segmentation algorithms require a large dataset for optimization, the student will need to think of innovative ways to create such a database. This could involve taking real images, using data augmentation techniques as well as artificial generation methods (rendering) to obtain photorealistic images of firestop installations. The thesis should conclude with a statement on the feasibility of detecting firestop installation errors using current image segmentation algorithms.

## Work Packages

- Literature review on image segmentation models
- Investigate the firestop product, identify the possible installation errors and come up with ways to generate artificial firestop data
- Train a current image segmentation network to test the quality of the artificial data and the feasibility of detecting installation errors using image segmentation
- Intermediate and final presentation
- Written report in English

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## Information & administration

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