## Project 1: Detection of Road Distress from street level images by using deep learning

Road condition survey is important in the road management, and it is essential for road maintenance and rehabilitation schedule. Road condition survey collects and assesses four types of data namely roughness, distress, bearing capacity and skid resistance. Timely identification and rectification of road distress is an important part of road condition survey. Traditional manual inspection of roads is highly time-consuming, labor intensive and subjective. Some automated methods such as different kinds of road survey vehicles equipped with stereo camera, light detection and ranging(LiDAR) technique, laser profiler, and etc., also have developed and deployed in road survey, which could greatly improve the efficiency and objectivity of the survey. However, this is always regarded as high cost of money and therefore impossible for large area. Mapillary image data is collected and shared by volunteers with high coverage in urban area. These images are on street level and have record of roads. Therefore, the street level images on Mapillary might be a good data source for detection of road distress. In this project, the candidate is expected to establish a training data set for road distress by labelling them on Mapillary images and make prediction by using YOLO V3.

## Project 2: Identification and localization of traffic signs from Mapillary images in urban area

Traffic signs are of vital importance in many applications. In this project, traffic signs are detected by using the existing training data set GTSDB and Mapillary Vistas, with the purpose of testing different deep learning networks, such as Faster R-CNN, Mask R-CNN, CornerNet, and YOLO V3. The nest task is to localize the detected traffic signs on OpenStreetMap by using graph matching approach.

## Project 3: UAV photogrammetry based 3D road distress detection

Following a traditional photogrammtric work flow, 3D point clouds can be generated from UAV images. In this project, algorithms should be developed to locally fit surfaces (mostly plane) and detect the distress as its surfaces has different parameters to its surrounding regions.

## Project 4: Forest inventory by using UAV borne Laser Scanning

This project will be collaborated with the Norwegian University of Life Science (NMBU). 3D points clouds will be captured from helicopter borne Laser Scanner and UAV borne Laser Scanner at the same time. This project is to detect individual trees from UAV borne laser scanning and make a comparison with the results from helicopter borne laser scanning.

## Project 5: Forest inventory by using helicopter borne Laser Scanning

This project will be collaborated with the Norwegian University of Life Science (NMBU). 3D points clouds will be captured from helicopter borne Laser Scanner and UAV borne Laser Scanner at the same time. This project is to detect individual trees from helicopter borne laser scanning and make a comparison with the results from UAV borne laser scanning.

More project could be possible, such as tree, or façade objects detection from Mapillary images.

Contact: Prof. Dr. Hongchao Fan
Email: hongchao.fan@ntnu.no