Faculty of Electrical Engineering & Computer Science
Master Degree Course Electronics Engineering, MSc EE

HSB
Hochschule Bremen
City University of Applied Sciences

Master 2021

Kumara Venkata Sai Santosh Dommeti

Semantic Segmentation of Intensity Images using Deep Learning and its Application to Sonar Images.

ABSTRACT - Masterthesis

Image understanding is one of the most challenging tasks in computer vision and is important to classify an image. Segmentation is one of the key ap- plications in the field of image processing and computer vision domain. It is used in autonomous driving, medical images diagnosis, satellite image processing, industrial inspection, and so on. Segmentation is of two types. They are Instance segmentation and Semantic segmentation. Due to the areas of application, semantic segmentation is considered in this thesis.

In recent years, deep neural networks have shown impressive results and have become state-of-the-art for several recognition tasks. Semantic segmentation deep learning networks can be designed by using various net- works like DeepLabv3+ convolutional neural network, fully convolutional net- work (FCN), SegNet Layers, Unet Layers, and so on. The Unet layers are mostly useful for the segmentation of medical images.

In this thesis, semantic segmentation is applied to intensity images using deep learning. The synthetic sonar-like images are created with ripples, noise, and blurring. This dataset of intensity images is used for semantic segmentation. In this thesis, a DeepLab v3+ network with a base network of ResNet-18 is used for semantic segmentation because of its performance on the datasets. For finding the ground truth of intensity images, pixel-wise labelling is required. It is obtained while generating the synthetic dataset. Then the intensity images and their corresponding labeled datasets are partitioned into training, validation, and test datasets. The DeepLab v3+ network is then trained with the training and validation dataset. Later the trained net- work is tested with the testing dataset. For getting better results, the layers of the neural network and options for training the data are adjusted. Further in this study, the semantic segmentation quality metrics are evaluated and inspected. The applications of this semantic segmentation can include the detection of objects in the real sonar images, diagnosis of diseases like cancer in the medical field, detection of enemies in the dark for the armed forces (Infrared images), autonomous driving of vehicles, and so on.