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

HSB
Hochschule Bremen
City University of Applied Sciences

Master 2018

Yannik Steiniger

Development and Analysis of a Deep Learning Approach for False Alarm Reduction of a Diver Detection Sonar.

ABSTRACT - Masterthesis

In today's harbor security the detection and classification of divers takes a crucial role. Using active sonars, it is possible to observe the underwater area of the harbor spaciously. The detection then happens automatically by use of a special optimized signal processing chain. However, to guarantee a long term automatically observation, a high probability of detection and a low false alarm rate are essential. These requirements are not fulfilled yet. Thus, the final decision still has to be made by a sonar operator. It has been shown that for an automated decision making the classification of the contacts is a suited approach. The key idea is to train special machine learning algorithms to distingue between target and false alarm. In doing so, a significant reduction of the false alarm rate together with an almost unchanged probability of detection should be achieved.

A subgroup of machine learning algorithms is the so called Deep Learning, which gained several new applications and interest in the past few years. The aim of this master's thesis will be the development of a deep learning approach for the classification of contacts from diver detection sonar data. To train and test the developed models, real sonar data from multiple sea trails is provided. Feedforward as well as shallow and deep convolutional neural networks will be considered. The performance of the models is then compared to the performance of existing classification algorithms. Furthermore, the weights and kernel of the neural networks will be analyzed to get an insight on how the networks solve this classification problem.