Master Thesis / Bachelor Thesis

Deep learning based anomaly detection

MASTER THESIS AT THE AUTOMATION TECHNOLOGY LAB

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Motivation

Modern production systems have evolved rapidly to meet the demands for higher productivity and production quality. The recent research agenda of “Industry 4.0” has provided ever more traction for sophisticated and intelligent systems. AI methods, specifically Deep Learning is one of the hottest and most researched topics for optimisation and diagnosis of industrial processes. Deep learning algorithms are based on the concept of how a human mind works. It learns to perform tasks using only data from the system without the need of expert knowledge about the underlying process. This task of anomaly detection helps the machine operator or the manufacturer for early prediction of failures in the system and suggestion for maintenance action to be performed. Due to the rare occurence of an anomaly in an actual industrial process and therefore, not many examples for the machine learning algorithm to learn from, unsupervised learning techniques fit aptly to the anomaly detection research problem being. Therefore, the objective of this master is to implement an unsupervised deep learning approach for anomaly detection in industrial processes.

Task

During the offered master thesis, the capabilities of existing deep learning structures like Autoencoders and Generative Adversarial Networks (GANs) as well as its applicability for anomaly detection shall be investigated. Then a concept and system structure based on these architectures shall be derived and implemented.

As an application example the well known Tennessee Eastman process and the Bulk Good Laboratory Plant in the department of automation technology shall be applied.Typical scenarios for fault shall be defined using the process and implemented. Finally, validation and test shall underline the applicability of the approach.

Requirements

Eagerness to learn about innovative and modern technologies. Good knowledge about machine learning, in general, will be an advantage. We are looking for master students of the South Westphalia University of applied sciences who want to complete their master thesis or bachelor thesis.