Master Project

Data-driven Fault Detection and Isolation in Electric Vehicle Chargers

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Context

The automotive industry is rapidly electrifying due to the increased efficiency and simplicity of the drivetrain as well as lower running cost of electric vehicles (EV's). In order to facilitate this rapid electrification, a vast and reliable charging network is required.

Complex and expensive systems such as this network have an increasing requirement to be more reliable and secure. As a result, one of the predominant research fields within control engineering is that of Fault Detection and Isolation (FDI).

FDI algorithms detect and predict faults in an early stage to maximize operating hours and avoid unsafe situations or total system failure and form the base for fault tolerant control.

Generally FDI algorithms are model-based, using either an FDI filter, an observer or the parity space to create a residual. Common performance issues using model-based algorithms are caused by uncertainties, inaccuracies and noise. This effect increases with model complexity.

In order to avoid these problems, data-driven methods have found a solution in many FDI problems and several machine learning techniques have successfully been applied (e.g. Random Forest, Support Vector Machine, Artificial Neural Networks, etc.).

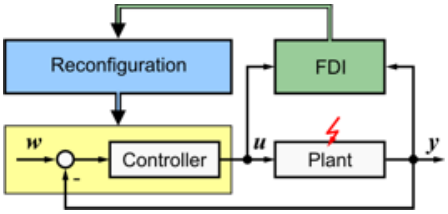

Figure 1: Fault Tolerant Control

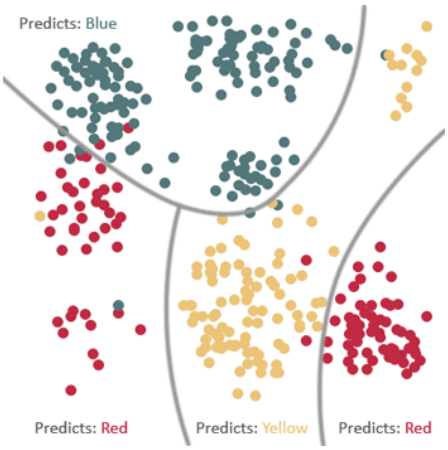

Figure 2: Classification example

Project tasks

The goal of this thesis is to explore data-driven methods in fault detection for a network of EV chargers. This thesis is in collaboration with Tritium, market leader in EV fast charging in Europe. Tritium has a large network of chargers which all send measurement data over the network to their headquarters. The algorithm should predict and identify faults in real-time. In a later stage, the algorithm(s) will be implemented and tested using the actual network in order to validate the work.