Adaptation Strategies for Data-Based Virtual Sensors

TECHNISCHE UNIVERSITÄT DARMSTADT

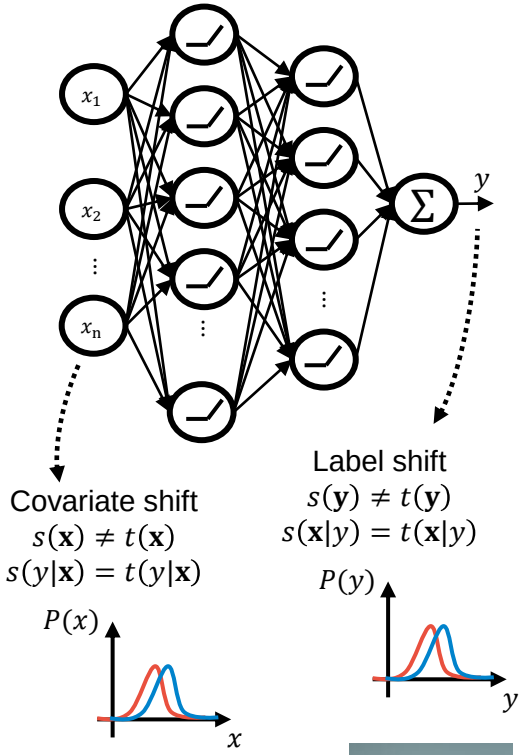
BOSCH

Master Thesis in cooperation with Bosch Research

Data-based 'virtual' or 'soft' sensors are increasingly used as part of control engineering solutions to compute an unknown quantity from available measurements [1,2]. For the training of these virtual sensors, datasets are produced in a development environment with an industrial test bench. However, due to inherent uncertainties in field operation, the distribution of operating points may deviate from that represented by the testbench dataset, leading to a decrease in the accuracy of the virtual sensor [2,3].

The goal of this thesis is to develop a concept for using the data observed in field operation to improve the accuracy of the virtual sensor with an update or adaptation. Such a concept can be realised either locally on each device in the field or by exchanging information between devices and development environment.

- Literature study on detection of distributional shifts, outlier detection, and compensation approaches
- Implementation and comparison of detection approaches for a given simulation example
- Development of an update concept and proof of concept in simulation
- Optional: Extension to measurement data from lab or field environments
- Documentation of work.



[1] L. Glass, W. Hilali, and O. Nelles - "An input-to-state stable virtual sensor for electric motor rotor temperature," *IFAC-PapersOnLine*, vol. 56, no. 1,pp. 240–245, 2023.
[2] K. Uhlig, M. Hilsch, E. Lenz, M. Woehrle, R. Findeisen – "Mitigation of Distribution Shifts for Data-Based Virtual Sensors", *in submission*
[3] I. Goldenberg, G. Webb – "Survey of distance measures for quantifying concept drift and shift in numeric data", *Knowledge and Information Systems* 60.2 (2019)

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