

Universidade de Pernambuco
Programa de Pós-Graduação em Engenharia da
Computação (PPGEC)

Proposta de Projeto de Mestrado

Área: Computação Inteligente

Título: Investigation on the state-of-the-art in industrial real-time fault detection and diagnosis.

Orientador – Alexandre Magno Andrade Maciel (amam@ecomp.poli.br)

Descrição:

Real-time fault detection and diagnosis (RT-FDD) is critical for increasing production systems' reliability by enabling early interventions to avoid downtime [1]. In general, automation systems include rule-based human implemented fault diagnostic features. However, due to the number of devices to be monitored, such as sensors, transducers, actuators, subsystems, systems, and processes, it is hard for human beings to perform this task. In addition, there is a wide variety and volume of data being collected at high speed.

Despite several contributions regarding Machine Learning (ML) applied to RT-FDD available in the literature, a tiny fraction of them deal with data from discrete manufacturing systems, and most experiments are held over different datasets. Therefore, it is difficult to compare the solutions and identify the state-of-the-art.

Given this context, the problem to be investigated in this research, the main goal, and the supportive investigation points are stated as follows:

- **Research Problem:** What are the most promising machine learning techniques for Fault Detection and Diagnosis in industrial machines?
- **Research Goal:** Identify the state-of-the-art in RT-FDD.

The key idea of this project is to perform a review on the state-of-the-art in RT-FDD, then implement and evaluate how different machine learning techniques and approaches, proposed by other researchers, perform on the same dataset.

This project will be supported by the doctoral student who is a specialist in industrial automation systems, and is working on an approach for RT-FDD[1,2,3,4] in industrial machines. Therefore the researcher will benefit from well-defined goals, available data and guidance.

Basic requirements are skills and/or interest on python programming since this project will evolve the implementation of scripts to perform the data pre-processing tasks.

Referências Bibliográficas:

- [1] Mohamed El Koujok et al. 'A Multiagent-Based Methodology for Known and Novel Faults Diagnosis in Industrial Processes'. In: *IEEE Transactions on Industrial Informatics* 17.5 (2021), pp. 3358–3366. issn: 19410050. doi: 10.1109/TII.2020.3011069.
- [2] Yosuke Furukawa and Mingcong Deng. 'Fault detection of tank-system using ChangeFinder and SVM'. In: *International Conference on Advanced Mechatronic Systems*, ICAMechS 2020-December (2020), pp. 260–265. issn: 23250690. doi: 10.1109/ICAMechS49982.2020.9310117.
- [3] Elena Quatrini et al. 'Machine learning for anomaly detection and process phase classification to improve safety and maintenance activities'. In: *Journal of Manufacturing Systems* 56.May (2020), pp. 117–132. issn: 02786125. doi: 10.1016/j.jmsy.2020.05.013. url: <https://doi.org/10.1016/j.jmsy.2020.05.013>
- [4] Fabian Westbrink, Gavneet Singh Chadha and Andreas Schwung. 'Integrated IPC for data driven fault detection'. In: *Proceedings - 2018 IEEE Industrial Cyber-Physical Systems*, ICPS 2018 (2018), pp. 277–282. doi: 10.1109/ICPHYS.2018.8387672.