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Hes·so Haute Ecole Spécialisée de Suisse occidentale

Signal Profiling

Owen GOMBAS

Bachelor thesis 2023

Computer Science and Information Technology – Data Engineering

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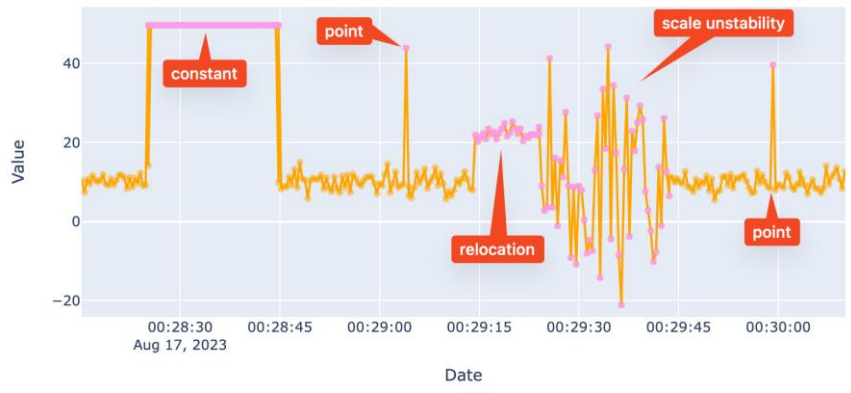
Description

The constant evolution of industry towards more intelligent and automated production methods has given rise to complex challenges in equipment monitoring and maintenance. In this contexte, this chapter presents the project carried out at Mikron in collaboration with HE-Arc Engineering Neuchâtel. The main goal of this project is to develop an innovative solution for processing and analyzinh various sets of data from sensors integrated into assembly machines. This data, representing values measured on pieces via various sensors, opens the way to early detection of problems on these sensors or within the machines themselves. This proactive detection, combined with precise indications of underlying causes, is intended to enable operators to take corrective action quicker and more efficiently, reducing downtime and therefore increasing efficiency. A realization of this promising concept requires its integration within Mikron's Digital Services platform, marking a significant step towards the adoption of Industry 4.0 principles.

Results

The advanced model excels at conducting anomaly detection within time series data, accurately classifying detected anomalies based on the provided labels an the training dataset. The meticulously designed pipeline offers remarkable flexibility, rendering it applicable to a wide array of time series datasets.



Tasks

- Establishment of project needs and objectives
- Research and state of the art on existing methods
- Tests of various existing methods and choice of method to be used
- Analysis of data and estblishment of what it represents
- Development of the anomaly detection algorithm
- Development of the anomaly classification algorithm
- Testing and validation of the algorithm using simulated data (score calculation) and real data (hands-on experience)
- Merging of the two algorithms into a single model
- Integration into the Digital Services platform
  - Setting up classes based on what already exists
  - Creation of the Python script to run the algorithm
  - Connection of the Python script to the Digital Services platform
- Writing the Bachelor thesis report

Conclusion

The results obtained in a controlled environment have demonstrated the feasibility and effectiveness of the proposed architecture. However, its application in a real-life situation will enable these results to be compared with authentic operational conditions, thus confirming the accuracy and relevance of the detections and classifications carried out. Ultimately, this project marks an important step in the quest for continuous improvement in the performance and reliability of industrial operations. The developed architecture offers promising potential for enabling predictive maintenance and helping Mikron's customers improved their productivity. The way is now open for the deployment and practical application of this solution.