

Project Proposal – Anomaly Detection on Time Series Data

March 12, 2023

1 Introduction

In heavy industries such as manufacturing, the reliability and availability of critical assets such as machinery, motors, and pumps are essential for smooth operations. Failure of these assets can result in production loss, which can lead to significant financial losses. Asset management programs are put in place to ensure the integrity and reliability of these assets, with highly skilled reliability engineers managing the process. Anomaly detection plays a critical role in the Asset Management program, as it allows for the early detection of anomalies in equipment behavior, mitigating risks, and preventing unplanned downtime. Additionally, it enables a more effective way of managing critical components of these assets, reducing unnecessary maintenance and minimizing the costs associated with having excess or shortage of critical components.

2 Question-Hypothesis

Can we use anomaly detection techniques [1] to detect anomalies in the sensor readings ?? of the pump and predict potential failures? By analyzing the sensor readings from the pump, we can identify patterns and anomalies that could help predict potential failures. We can use machine learning algorithms [2] [4] to develop an anomaly detection model that can detect anomalies in real-time and provide timely alerts to maintenance personnel.

3 Data

The data set used in this project is sourced from Kaggle and consists of 51 numerical features and a categorical label. The data set represents 219,521 readings from 51 sensors. [3]

References

- [1] Ane Blázquez-García et al. “A Review on Outlier/Anomaly Detection in Time Series Data.” In: *ACM Comput. Surv.* 54.3 (Apr. 2021). ISSN: 0360-0300. DOI: 10.1145/3444690. URL: <https://doi.org/10.1145/3444690>.
- [2] Kukjin Choi et al. “Deep Learning for Anomaly Detection in Time-Series Data: Review, Analysis, and Guidelines.” In: *IEEE Access* 9 (2021), pp. 120043–120065. DOI: 10.1109/ACCESS.2021.3107975.
- [3] *Kaggle*. <https://www.kaggle.com/datasets/nphantawee/pump-sensor-data>.
- [4] Mohsin Munir et al. “DeepAnT: A Deep Learning Approach for Unsupervised Anomaly Detection in Time Series.” In: *IEEE Access* 7 (2019), pp. 1991–2005. DOI: 10.1109/ACCESS.2018.2886457.