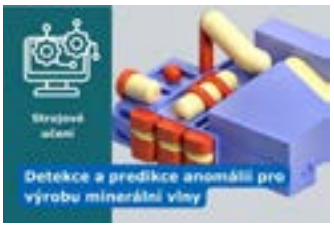
Anomaly Detection and Prediction for Saint-Gobain's Mineral Wool Manufacturing

Overview

Saint-Gobain, a manufacturer specializing in mineral wool, faced challenges in optimizing its furnace operations. The company sought to reduce coal consumption by identifying and anticipating anomalies in the furnace process. Multiple machine learning methods were applied to solve this complex issue, from LSTM models for predictive analytics to various anomaly detection algorithms.



Keywords

anomaly detection
furnace optimization
machine learning
LSTM
energy efficiency

Situation

Inefficiencies in Saint-Gobain's furnace operations led to higher coal consumption. The existing approach to address anomalies was to simply add more coal, a costly and unsustainable method. The company required a more sophisticated way to predict anomalies ideally two hours in advance, thereby allowing preventive measures to be taken.

Solution

A deep learning (LSTM) model was used to predict future pressure and temperature inside the furnace. Simultaneously, several anomaly detection techniques were deployed to identify anomalies in the furnace operation. A specialized classifier was then developed to filter these detected anomalies, focusing on those most likely to lead to problems in the furnace.

Requirements

Develop a predictive model capable of forecasting pressure and temperature changes in the furnace.

Implement multiple anomaly detection methods to identify irregularities in real-time.

Design a classifier that specifically recognizes anomalies leading to furnace problems.

Achieve a prediction lead time of at least two hours for actionable insights.

Benefits and Results

- Coal consumption is reduced, thanks to the early detection of anomalies, which allows preventive measures to be put in place.
- The deep learning model successfully predicted future pressure and temperature conditions, providing valuable lead time for operational adjustments.
- The integrated system of anomaly detection and classification offered a comprehensive solution that significantly reduced the number of false positives and focused on anomalies that could be addressed.
- Overall operational efficiency was improved, leading to cost savings and a more sustainable manufacturing process.
- The developed models and methods have potential for further optimization and could be applied to other manufacturing scenarios.
- The success of the project paves the way for further collaborations and the integration of more advanced machine learning techniques.