The Automation Manufacturing Technology (AMT) team aims to automate parameter adjustments for a medical manufacturing machine using a closed-loop system, with assistance from a machine learning model.

The project automates parameter adjustments for a medical manufacturing machine using a closed-loop system and a machine learning model. The current method for machine tuning in our process generates approximately 20% scrap material, primarily due to the initial setup required to achieve the correct Outer and Inner diameters within needed specification.

The expander line is a complex machine with a dozen parameters, i.e., Air Pressure, Outer Diameter, Water Pressure, etc. Operators rely on their experience & intuition to setup and run the machine parameters. Using ML that can predict setup parameters will save hours and additional costs. Using a process control algorithm will also help monitor product quality which required human oversight.

The low MSE and MAE indicate precise predictions. The high R-squared shows the model explains much of the data’s variance. This makes the model effective for predictive and analytical tasks in complex data environments.

Preprocess data by eliminating redundant entries and conducting exploratory analysis on essential parameters. Create an AI model with a baseline accuracy of at least 70%, capable of iterative accuracy enhancement. Validate the model using the Cpk metric, ensuring it meets a threshold of 1.3. Integrate real-time prediction deployment into a website for dynamic user interaction.

Website Deployment

Expand data collection to ensure comprehensive coverage and representation. Use advanced preprocessing techniques and feature scaling to improve dataset quality. Explores ensemble methods and deep learning for greater accuracy and stronger model robustness. Evaluate model performance with statistical methods under varied conditions.

Emulator Features

Tubing enters the expander machine, where temperature and pressure are regulated to ensure uniform expansion. The machine adjusts speed and monitors dimensions to meet quality standards. After processing, the tubing is ready for further use.

Model Selection

Real Time Predicted Results

Calculates Cpk, a statistical measure that evaluates how well a process meets predefined specifications.

References


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FEATURES

● Model Selection
● Real Time Predicted Results
● Enhance the website UI to improve user comprehension and interaction.

Future Work

Enhance the website UI to improve user comprehension and interaction.