SOLUTIONS FLYER

BUILD PREDICTIVE MODELS FOR FAILURE AND MULTI-CLASS FAILURE

Machine learning (ML) technology leveraging historical and real-time data from sensors mounted to production equipment as well as PLCs, SCADA, and other sources can accurately flag potential failures of whole machines and/or critical components before they can cause downtime. Failures may be binary in nature; that is, either a failure occurred or not. Failures can also be multi-class and fall into several different categories, including reduced speed, throughput, or quality. Obviously, the more complex the machine (or system), the more necessary it is to use ML models to effectively help prevent failures that impact productivity.

Challenges Related to Failure Predictions

Three elements are critical to the successful development of predictive maintenance models:

- Obtaining clean, consistent, and useful data
- Framing the problem appropriately
- Testing and evaluating the model's predictions properly

Get the Data

Predictive models of any kind require large amounts of accurate historical data including data on events that are known to have led to past failures. In addition, the data must include variables with high degrees of predictive power. For example, if high operating temperatures rarely cause failures but high pressures do, records of temperature data will have low levels of predictive power, but pressure records will and should therefore be given higher weights in the ML model. Essentially, simply having a lot of data is not enough; you must have the right data.

The data must also be cleansed to remove duplications, errors, missing data points, and other problems that can lead to false positive or false negative outputs from the model. This may require real-time processing for sensor data streaming from the equipment. It requires a governed and repeatable process for bringing all the information together from disparate systems into a single format suitable for ingestion by the models.

Frame the Problem

Developing a model that produces reliable results also requires that it be properly conceptualized from the beginning. It's critical that the team have a clear understanding of what they are trying to solve for.

GATHERING, CLEANSING, AND NORMALIZING ALL RELEVANT DATA IS ESSENTIAL

MACHINE LEARNING IS WELL SUITED TO THE FAILURE PREDICTION APPLICATIONS

SELECTING, TRAINING, AND TESTING MACHINE LEARNING MODELS IS CRITICAL TO ACCURACY

Begin with an assessment of your data. Is it all historical or will you be able to incorporate streaming data? Can you connect to the relevant data you need to help solve for the problem at hand? Can you be certain the data is clean and consistent? What challenges do you face to make your data a trusted source? Do you have data that is representative of the equipment lifecycle and about all the factors that impact equipment performance?

During the process of gathering and cleansing data, ensure that the statistical metrics you wish to analyze are mapped back to existing business KPIs. For example, if the goal is to understand the organizational implications of a false-positive rate, determine how expensive a false positive is in terms of the business problem being solved for? Is detecting false negatives a better metric than detecting false positives?

Altair Data Analytics to Predict Machine Failures

Altair enables analysts and engineers to develop and implement systems to monitor the performance of manufacturing equipment and understand when failures are likely to occur, which helps prevent unscheduled downtown, reduced quality output, and diminished plant productivity.

Data Preparation – Access, cleanse, and format warranty and service utilization data from CRM, ERP, and systems managed by channel partners, as well as PDF and Excel reports and big data sources without any manual data entry or coding.

Machine Learning – Altair's industry-leading visual approach to data analytics enables businesses to build and deploy ML models in almost any analytic infrastructure. Altair's automated ML and explainable artificial intelligence (AI) functions eliminate repetitive tasks, make data scientists and business analysts more productive, and enable managers to create profitable, attractive service packs.

Streaming Analytics – Build stream processing applications and sophisticated analytical dashboards without writing any code. Solve difficult problems quickly, understand complex relationships in seconds, and identify issues requiring further investigation with just a few clicks.

Learn more about Altair Data Analytics at altair.com/data-analytics

> Our customers in the manufacturing sector continue to emphasize the importance of providing manufacturing engineers and business managers with analytics tools they can use themselves, without needing to hire a lot of experienced data science people before they can even get started with developing predictive maintenance projects and the like.
>
> Sam Mahalingam, CTO, Altair

The more complex the machine, the more necessary it become to use machine learning models to effectively help prevent failures that impact productivity.