Progress

Progress DataRPM Cognitive Anomaly Detection and Prediction Solution

WHITEPAPER

Table of Contents

Introduction

Today's industrial organizations are being challenged to improve their operational efficiency as a means of driving profit margins and meeting market demands. This has shifted their focus to the very machines and equipment that power their production. By improving asset reliability, reducing equipment downtime and enhancing production efficiencies, businesses can not only extend the life of their asset investments but also operate quicker and more reliably.

The Progress® DataRPM® Cognitive Anomaly Detection and Prediction (CADP) Solution empowers industrial organizations to better understand their machines. Through advanced machine learning technology, industrial units can improve the accuracy and timeliness of their anomaly detection process, enabling them to optimize the performance of their machines by stopping disruptions before they even happen.

How It Works

Machine data can help compare the present performance of assets to past events or future needs. Since these data patterns evolve continuously, using the right models can help detect even the subtlest anomalies. Further, in the absence of a scientific approach to anomaly detection, false-positive results can worsen the situation leading to catastrophic losses in revenue and missed opportunities.

CADP enables companies to detect early signals at the individual asset level on the factory floor. Companies not only gain more insight into how anomalies have occurred in the past, but also into potentially unknown and unseen issues.

In essence, the CADP solution enables users to convert raw industrial data into real actionable insights. These insights can help companies make smarter business decisions with respect to their industrial machinery. Moreover, this vital information is provided without any human intervention through machine learning.

Progress®

The Input
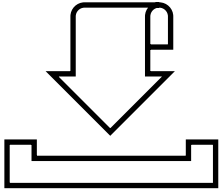
- Sensors time series data file format: CSV
- Sensors time series data file schema:
    - <asset id>, <timestamp>, <sensor 1>, <sensor 2>, <sensor 3> ... <sensor N>
- Events Data (optional):
    - Known failures, known labelled anomalies, known maintenance, etc.
- Events data file format: CSV
- Events data file schema:
    - <asset id>, <timestamp>, <event id (optional)>, <event type (failure, anomaly, maintenance, other>, <event name>, <event attribute 1 (optional)>, <event attribute 2 (optional), ... <event attribute N (optional)>
- Optional data dictionary and overview of the functioning of the assets

The Output
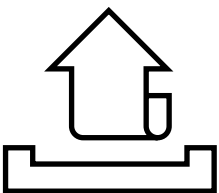
- An overview page with all the assets grouped by similarity and color-coded state of anomaly score
- For individual assets, the stages and anomalies are marked in time series, scored and explained on click
- Anomalies are identified at sensor level and then grouped to machine level
- Machine anomalies are clustered
- Filter by anomalies and sensor
- If labelled anomalies are provided, then the machine identified anomalies can be validated against them
- Provide predictions for pre-defined time windows about whether there are anomalies likely to occur in that window

Progress®

The Business Value of CADP

CADP is our unique take on anomaly detection and prediction. Here are some of the unique business value offerings that differentiate this solution from others:

Unsupervised Machine Learning:

Many anomaly detection and prediction solutions use traditional rule-based monitoring or supervised machine learning techniques. They can predict the usual 20% of all failures that have previously occurred and are generally common among their assets. In addition to doing this via unsupervised/semi-supervised cognitive machine learning, CADP also helps detect, predict and prevent the other 80% of failures that are unique to specific assets and have never occurred before.

The Differentiator:
The "random" issues that traditional supervised machine learning methods cannot help solve are effectively addressed and resolved by the platform.

Cognitive Automation Learns Normal States:

The industry uses machine learning to train for the rare failure events and struggles with large data sizes or long wait times for failures. On the other hand, the CADP framework enables business users to apply cognitive automation to learn the various normal states of each individual machine. The solution learns how an asset's normal state varies due to operational modes and environmental conditions and how it changes over time.

The Differentiator:
Unexpected behavior is detected and thereby potential issues are predicted, not just issues that have been observed previously.

Progress®

No More Labeled Data:

While the industry today relies on labeled training data, the Progress platform helps customers with readily available unlabeled raw data from machine sensors. It automatically generates labels for the data for validation by SMEs.

The Differentiator:
CADP is capable of providing accurate prediction of anomalies even in the absence of labeled training data.

A Unique Model Every Time:

Other anomaly detection and prediction solutions generally focus on providing data science toolkits for manually generating one or a small number of generalized models for all assets. CADP helps business users apply cognitive automation to generate hundreds, thousands or even millions of models automatically.

The Differentiator:
CADP can create a distinct model for each asset that uniquely tracks that particular asset's health and detects/predicts issues.

Automatically Manage Models at Production:

Other anomaly detection and prediction solutions are focused on building models in labs and running long labs-to-production manual deployment cycles. This may result in obsolete models deprived of their predictive power. CADP uses cognitive automation to automatically generate, update and manage models at production environments. This helps maintain high accuracy of predictions at all times.

The Differentiator:
CADP provides real-time automated models capable of being put to production with spontaneous prediction capabilities.

Progress®

Scaling Data Scientists:

To make the most of many machine learning and cognitive solutions, businesses often need an army of data scientists to solve even a single use case problem. By using cognitive automation to do the grunt work, CADP elevates data scientists to become strategic SMEs and focus on higher order research.

The Differentiator:
With CADP, you can optimize your utilization of data scientists and their skills to help solve multiple use case problems.

Open-Box Solution:

While the industry tends to use ambiguous black box systems, CADP provides a transparent open-box solution that enables customers to look under the hood. This helps enterprises validate what the solution is doing.

The Differentiator:
Users are able to bake proprietary algorithms and approaches into the mix and let the machine learn from them.

Unified Platform:

Many industry solutions focus on building models in a single machine lab environment with sample data requiring separate toolkits for labs and production environments. CADP provides a unified platform that enables businesses to run experiments as well as deploy into a massive parallel and distribution production scale solution.

The Differentiator:
A one-stop single solution that helps leverage all available data for accurate learning.
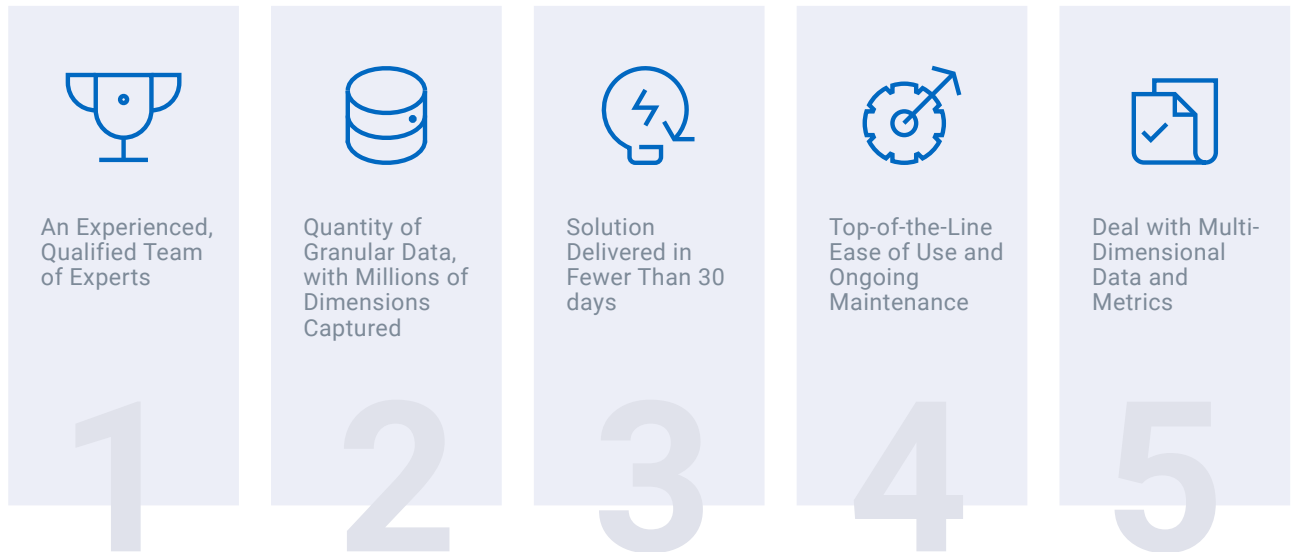
Powerful and Easy-to-Use UI:

Most industry solutions require users to write code for modeling and managing workflows or work with low-level APIs. CADP provides high-level visual recipes and process flows to build and manage complete data science workflows in the UI.

The Differentiator:
Using cognitive automation, CADP automatically learns and selects the best performing algorithms parameters and hyperparameters for every dataset.

Progress®

5 Reasons to Work with Progress

An Experienced, Qualified Team of Experts

1

Quantity of Granular Data, with Millions of Dimensions Captured

2

Solution Delivered in Fewer Than 30 days

3

Top-of-the-Line Ease of Use and Ongoing Maintenance

4

Deal with Multi-Dimensional Data and Metrics

5

A Straightforward Approach to Anomaly Detection and Prediction

A cognitive approach to anomaly detection and prediction automatically illuminates data blind spots, helping to ensure your company never misses another anomaly. By using an automated route, machine learning algorithms can analyze critical data points in real-time, alerting businesses precisely when an incident occurs. This could even include incidents that were written off as "business as usual" under manual inspection. The easy-to-use interface provides all the necessary actionable insights, without requiring intense scrutiny and analysis from a data scientist team.

Learning by Example: A CADP Success Story

A leading global commercial HVAC manufacturer wanted to detect and predict seemingly random errors in a new HVAC system. The manufacturer previously used a manual approach, which created several problems. First, this strategy was only able to analyze a small sample of assets and thus created generalized data models. Further, it depended on individual SMEs to define the rules that were then used to train these models. As a result, the company was only able to capture a small part of errors in the field due to limitations in scope and reach.

Progress®

With CADP, the manufacturer was able to drastically improve the anomaly detection and prediction process. A digital twin (a virtual representation of an asset) was automatically created for all machinery, which helped achieve scalability. Then, months of sensor data was automatically plugged in to learn normal operating behaviors. Finally, a highly accurate and continuously updated detection and prediction model was implemented, which helped achieve overall performance efficiency.

Overall, CADP helped the manufacturer detect and predict 66 times more anomalies than before.

Generating Results with CADP

Even a few minutes of equipment downtime could make or break industrial operations, impacting companies' ability to meet production demands, fulfill partner contracts or generate profit. CADP can help you achieve measurable business results, such as:

✓ Greater anomaly detection, with some customers identifying 67% more anomalies

✓ Faster deployment, delivering a cognitive solution in days instead of months or years

✓ Enhanced prediction accuracy, identifying 80% of your incidents before they happen

Progress®
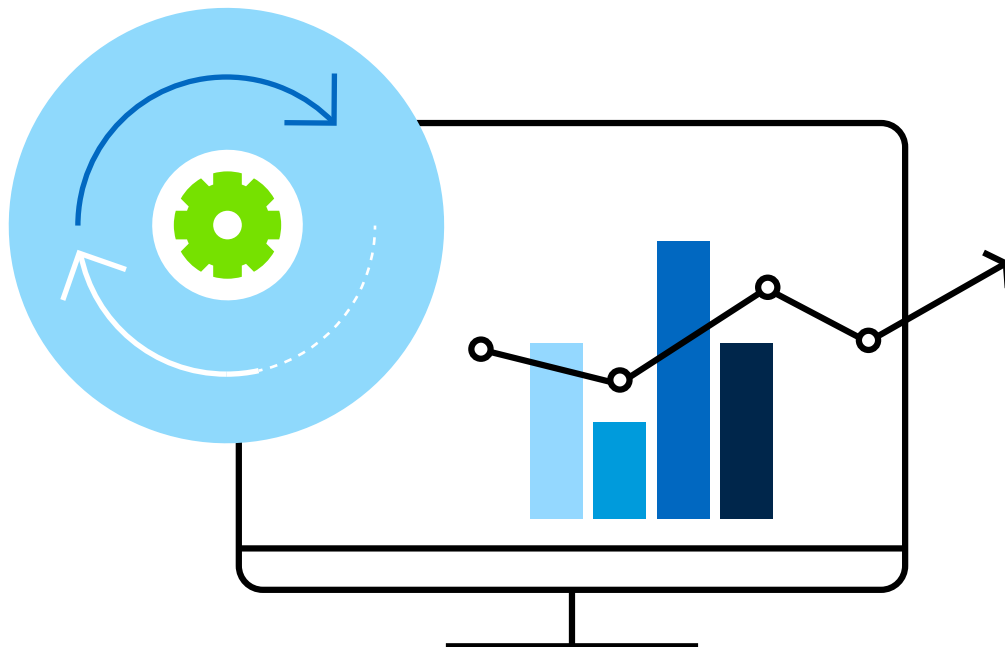
Conclusion

Industrial companies are under great pressure to improve their performance. They are being asked to drive operational efficiency while simultaneously maximizing productivity. To achieve both objectives, they need to be able to detect and predict anomalies before they result in asset failure and downtime.

Armed with a variety of sensor data, industrial companies often have the data they need to drive these process improvements. However, analyzing this vast amount of data in a timely fashion and using it to create accurate models for anomaly detection and prediction remains a major obstacle. The manual approaches commonly deployed are limited in scale and gated by how time-consuming and labor-intensive the process is.

CADP simplifies anomaly detection and prediction by automating the process through machine learning, enabling enterprises to get accurate results and prediction models quickly. This gives them a deeper understanding of their assets and empowers them to scale anomaly detection at an individual asset level.

About Progress

Progress (NASDAQ: PRGS) offers the leading platform for developing and deploying mission-critical business applications. Progress empowers enterprises and ISVs to build and deliver cognitive-first applications that harness big data to derive business insights and competitive advantage. Progress offers leading technologies for easily building powerful user interfaces across any type of device, a reliable, scalable and secure backend platform to deploy modern applications, leading data connectivity to all sources and award-winning predictive analytics that brings the power of machine learning to any organization. Over 1,700 independent software vendors, 100,000 enterprise customers and 2 million developers rely on Progress to power their applications. Learn about Progress at www.progress.com or +1-800-477-6473.

⬢ Progress®