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Glassbeam White Paper

Machine Learning Capabilities

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Glassbeam Enhances Predictive and Prescriptive Features with Machine Learning and Enhanced Analytic Capabilities

Virtually every product – whether a storage device, server, medical imaging system, industrial robot, automobile or ATM – generates and communicates information about itself (known as "machine data") that can disclose vital insights into system performance, health, usage patterns and more. These connected products are an integral part of the Internet of Things (IOT) phenomenon that is fundamentally altering how manufacturers build, market and support their offerings.

Gleaning insights from machine data becomes more difficult as the volume, variety and velocity of this data continue to mushroom exponentially. The challenge to extracting insight from machine data is twofold: the amount of machine data can be so large that it defies management; and the analytic tools for generating meaningful insights from unstructured machine data are inadequate.

Glassbeam's unique machine-data analytic capabilities address both these challenges. By leveraging machine learning capabilities, Glassbeam enable health care manufacturers and their customers to become proactive about heading off product failures instead of simply reacting to them.

By gleaning insights from historical data, manufacturers can predict future behavior and preempt situations that cause product failure.

Applying Machine Learning To Data Analytics

Any attempt to predict how a product will perform (or fail to perform) in the future requires three things: 1) data about past performance; 2) lessons and rules learned from analyzing that data; and 3) a model of how the product is likely to perform in

the future. At its most basic level, machine learning automates this process, giving computers the ability to learn from data, instead of being explicitly programmed. An example is an email spam detector, which is trained with spam and non-spam emails. Once trained, it can automatically classify new emails as spam or not. The logic to detect spam is not explicitly programmed.

Machine learning relies on "training" a device to apply a model of actions to be taken when a set of conditions is observed. Obviously, the more data gathered about past performance, the more accurate the prediction model will be. So while it is possible to perform these three steps just described, it is inevitable that manual efforts will be very limited in scope compared to what can be accomplished using automated methods. Modern tools allow for the collection, ingestion and analysis of very huge amounts of data; thereby enabling the creation of more accurate models that fully utilize the powerful capabilities inherent in predictive analysis and machine learning.

From Predictive To Prescriptive Analytics

Machine learning is closely tied to predictive analytics. Predictive analytics draws upon machine learning, data mining and modeling techniques in an effort to predict future events based on models informed by past experience. Well-known implementations of predictive analytics include credit scoring, fraud detection, and insurance or securities underwriting.

Machine learning is evolving to also enable prescriptive analytics (suggesting what should be done to produce a better outcome).

Integrating Apache Spark with Glassbeam's SCALAR Platform

This breakthrough in predictive analytics is accomplished by integrating Apache Spark with Glassbeam's SCALAR data transformation platform, which takes any type of data – be it structured, unstructured or multi-structured - from any type of machine and prepares it for analysis. The combination of Glassbeam's distributed machine-data processing architecture and the Spark distributed in-memory computer architecture, and its MLLib library, yields a fast, scalable analytics solution for processing large-scale IoT machine data.

For example, using historical machine data, Glassbeam can build a model that analyzes incoming data to determine device health. This prediction engine is integrated with Glassbeam's rules and alert engine, allowing customers to create rules that will automatically notify them when the prediction engine anticipates a device might fail in the near future. Similarly, a model can be built to predict when a system will run out of capacity and cause performance problems or a service interruption. Advance notification of a likely interruption or failure will enable customers to take proactive steps to prevent the problem from happening.

Core Benefits of Machine Learning

Applying machine learning to predictive analytics has two benefits. First, it automates the process of identifying potential problems, reducing the need for manually specifying thresholds. Second, it expands the number of factors that can be considered in assessing product performance or health. This makes predictions of future problems more accurate by drawing upon the largest possible pool of factual information.

When a product fails or its performance degrades, there's almost always a trail of evidence leading to the problem. But that evidence usually is obvious only in hindsight.

The possible causes of a product failure or poor performance can be numerous, and can involve combinations of factors that might never be discoverable by manual means. So, the ability to analyze large amounts of machine data – and then perform regression analysis to assess the relationships between various factors – can be extremely useful in understanding the cause(s) of product failure or poor performance. When this knowledge is gathered in the context of machine learning, rules can be created to alert users to situations that may lead to failures, allowing them to take actions that will prevent such failures.

Machine Learning In the Real World

Let's look at how things change with large-scale machine-data analytics, and the assistance of machine learning.

Case 1: Increasing Uptime

Maximizing uptime is critical for many industries to minimize costs, grow revenue, and deliver a superior customer experience. In the Healthcare industry, during these times when COVID is raging, optimizing medical equipment utilization is critical to accommodate the largest number of patients with the fleet of equipment available to deliver diagnostic services continuously.

This is not an easy task since the medical equipment used is comprised of several different modalities and many manufacturers each generating a different set of data. Glassbeam Clinsights, an AI/ML powered analytics solution, brings proactive and predictive maintenance to operations staff for medical equipment. Operations staff are alerted to potential problems and diagnostics can be performed remotely to identify and fix the issue or schedule an on-site maintenance fix before it becomes a downtime problem.

Through the application of regression analysis, more factors can be considered as possible contributors to a problem in machine performance. Clinsights fact-finding and analysis goes far beyond what humans could do, both in the amount of data studied and the number of variables considered. By applying machine learning and advanced analytics, potential problems can be identified faster, and the cause of the issue determined quickly so that machine performance can be improved, and downtime avoided. Clinsights moves 50 percent of unplanned downtime into planned maintenance windows. Proactive alerts deliver five-to-seven-day advance notification on part failures to enable the right part procurement at the right place and time.

Case 2: Improving asset utilization

83% of healthcare providers claim to have no automated visibility into their fleet wide utilization. Often, billing data and other ad hoc sources are used as quick-fix tactics to understand and optimize an imaging center's operation – both the machines and operators. For instance, billing data only tells you if an MRI was performed on a given day and what that MRI was for with no insights into information like, was there a delay in the schedule, how long did the exam take and was that duration normal, which operator did that exam, how much time was spent in prepping the patient and if it was a CT, what was the dosage within acceptable limits and more. These methods, techniques, and tools do not prepare business leaders, radiologists, and imaging center managers to keep up with the volume of patients flowing through their centers.

Glassbeam provides a single pain of glass and granular dashboards, in real-time, to manage asset utilization across different facilities, modalities, OEM models, operators, and exam types. Deriving insights from these dashboards, the operations management staff can optimize scheduling and load balance upcoming demand on these resources.

Analytics can integrate a wide range of structured and unstructured data to give management teams the ability to understand, for example, how many X-rays a machine completed in each timeframe, which operators completed the scans, how many scans was each operator able to complete, and similar metrics. With this information, for example, managers can retrain operators who tend to be slower to improve utilization. Analytics support a better understanding of reject exam frequency by facility and operators and help find the root cause by knowing reject reasons. Effective utilization analytics can also support the development of standardized protocols such as staying on top of compliance for dose usage.

Glassbeam also assists the C-Suite in making effective capital expenditure decisions when procuring new equipment. Glassbeam Clinsights allows administrators to become more empowered to make better scheduling decisions and deliver better patient care.

With Clinsights, healthcare facilities become more agile, patient care improves, and assets utilization optimized.

Summary

When machine learning, predictive analytics and machine-data analysis are combined and delivered in easy-to-use tools, the benefits to both service providers, manufacturers and their customers are clear: proactive identification of potential problems before they cause interruption or performance degradation, along with deeper insight into how products can be best used.

By tightly integrating Apache Spark machine-learning capabilities with the Advanced Analytics platform, Glassbeam now offers real-time and predictive analysis of machine data.

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