DXC.technology

Industry perspective

Improving healthcare with industrial machine learning

Big Data

Data has become a corporate priority for many large enterprises. According to research firm Frost & Sullivan, more than half of Fortune 1000 firms report having big data initiatives in place across the enterprise.

The true value of these initiatives is the ability to obtain rapid insights and implement relevant changes that drive benefit. However, as the volume of data grows (Frost & Sullivan projects global data traffic to cross 100 zettabytes annually by 2025), it becomes more difficult for businesses to extract meaningful insight.

When done properly, big data and analytics require a combination of digital infrastructure and data science skills to produce insights at enterprise scale. Hospitals are beginning to make the necessary investments. A recent IDC survey found that for the healthcare providers they spoke with, 36.7% of technology spend increases are focused on analytics.

Despite making large investments in technology to store, analyze, report and visualize data, many enterprises have not seen a return on their investment. They spend too much time manually interpreting and reporting results and too much money hiring personnel that can't completely meet the demand.

While many organizations wrestle with this dilemma, the challenge is especially felt in healthcare. The industry has intense volumes and varieties of data coming from multiple sources, including electronic health records, digital scans, genomic data, wearables and smartphone apps.

The goal is to find a way to consistently produce data-driven insights at enterprise scale. This can be done with industrial machine learning (IML), which provides a scalable solution for ingesting data, building algorithms, deploying them into production, and generating continuous insights to ongoing business problems.

In healthcare, IML makes possible the kind of personalized care that organizations are hoping to achieve, one that goes beyond predictive analytics to add context to large varieties of data and distill them into something actionable.

A method with a modern twist

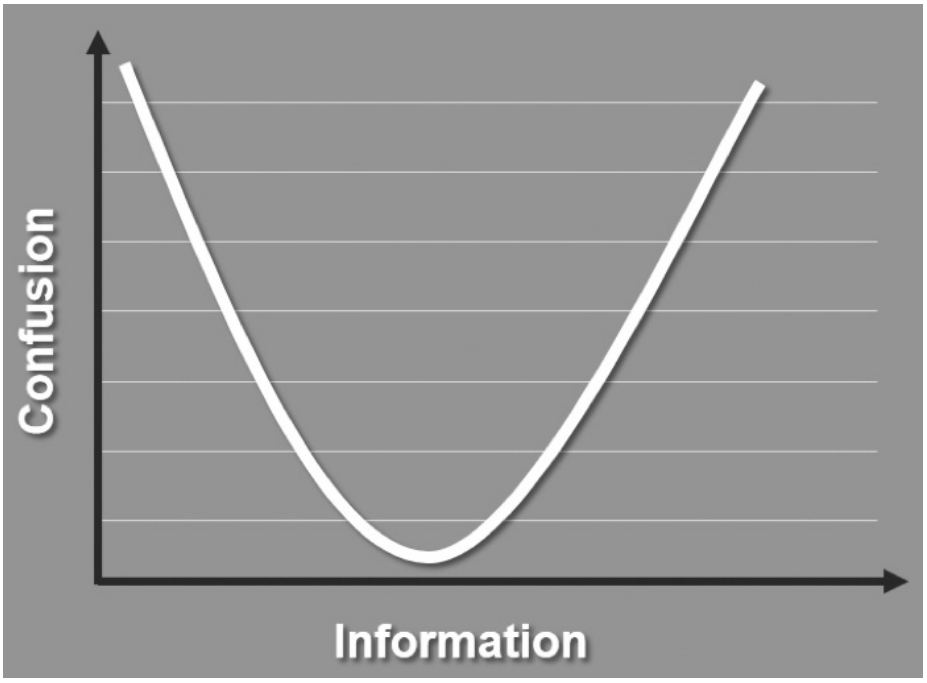
IML is a modern take on a very old idea: the scientific method.

Data scientists start with a hypothesis and collect data that could be useful in evaluating the hypothesis. They then generate a model and use it to explain the data. They evaluate the credibility of the model based on how well it explains the data observed so far, and how well it explains new data that will be collected in the future. When it comes to discovering insights, this method works consistently well.

The modern twist comes in by using digital infrastructure that allows this method to be done on an enterprise scale. The evidence becomes a continuous pipeline of data being collected; the models are business algorithms running in production; and the experiments are done in very short sprints that force data scientists to focus on discovering insights in small, meaningful chunks.

Take, for example, the task of reducing the amount of time a patient spends in the hospital after a procedure. Reducing patient recovery time lowers expenses for the

It becomes increasingly difficult to extract meaningful insights from data as the volume of available data grows. This makes it challenging for businesses to get a return on big data investments.

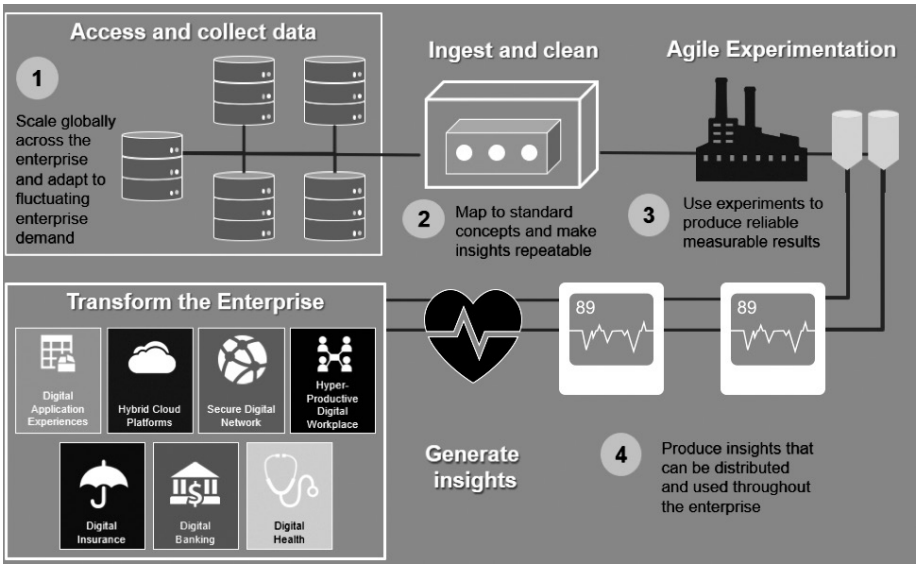


hospital and signals an improved level of care for the patient. Length of stay is also a factor in determining hospital throughput, so by reducing length of stay, hospitals make treatment available to more patients.

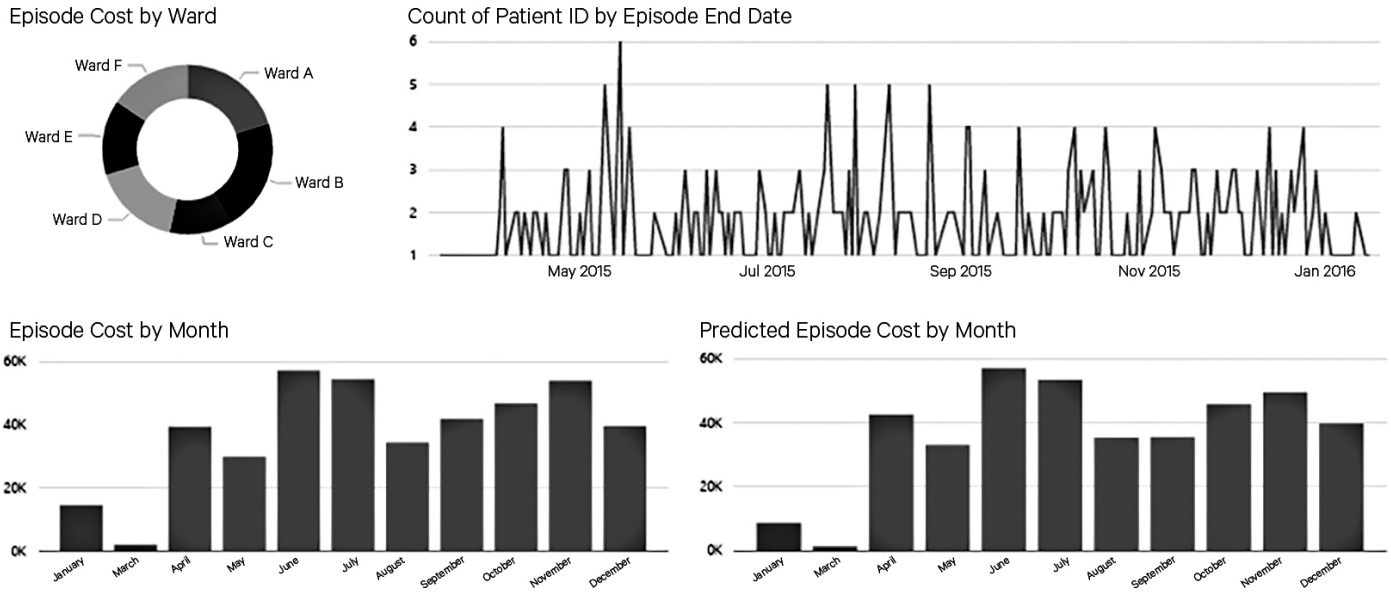
While an organization should seek to understand the factors that speed patient recovery, in reality, thousands of factors could affect a patient's recovery time. What's needed is an approach that can determine the factors that really matter for each patient and how the hospital can take action.

By combining data science and the scale of digital infrastructure, IML can help generate those kinds of insights.

Industrial machine learning is the idea of using digital platforms to automate data-driven experiments and produce business insights at enterprise scale. The practice can drive personalized healthcare.



Healthcare Insight aaS Sample Hip and Knee Replacement Procedure LOS Predictions



Predictions form the basis of a dashboard that predicts future hospital costs and identifies patients likely to experience problems during recovery.

An example using patient data

We applied this method to investigate the hypothesis that it's possible to use patient and procedure history to predict the amount of time a patient spends in hospital after a procedure.

We started by using digital platforms to access new sources of healthcare data. For example, to produce a model to predict length of hospital stay, we used a data extract of routinely collected administrative data supplied by the healthcare purchasers for a specific geographic locality.

We then used machine-learning algorithms to extract new insights. We looked for features that were most important in predicting length of stay for patients undergoing hip or knee replacements. We found key leading indicators (such as the patient's age, the patient's core healthcare providers and the secondary diagnosis) for predicting lengths of stay.

We built a regression model using the leading indicators, which allowed us to predict a patient's stay. Those predictions became the basis of operational dashboards that alerted hospitals about future costs and helped identify patients who might experience problems in recovery.

This process led to insights that can help improve patient care and hospital outcomes.

Using the IML approach, we can supplement hospital administrative data with rich information from the healthcare provider, including electronic patient records and other routinely collected data. We can extend the solution to make use of patient-generated data (wearables, social media, etc.) to make predictions that lead to better clinical decisions, lower rates of readmission and fewer adverse events.

A richer data experience

Using the IML approach, we can supplement hospital administrative data with rich information from the healthcare provider, including electronic patient records and other routinely collected data. We can extend the solution to make use of patient-generated data (wearables, social media, etc.) to make predictions that lead to better clinical decisions, lower rates of readmission and fewer adverse events.

There is no shortage of data. Organizations in healthcare and indeed every industry must now produce reliable, data-driven business insights at enterprise scale, or find themselves at a serious disadvantage. This is the beginning of a new phase of big data, one that has little to do with data capture and storage and everything to do with producing understandable and useful insights at enterprise scale.

The shift to IML can help organizations put their data to better use and drive better insights, faster.

To learn more and see other applications of this approach, visit DXC.technology/analytics.

Ben Bridgewater is director of DXC's healthcare strategy, UK, Ireland & Nordics. Ben was formerly a cardiac surgeon and a pioneer for the British National Health Service's clinical transparency agenda. He has published many peer-reviewed articles on risk adjustment methodology and is an honorary professor at Manchester University.

Jerry Overton is a data scientist and distinguished engineer at DXC. He heads DXC's advanced analytics research and is a pioneer of DXC's Industrial Machine Learning (IML) offering. In his blog, "Doing Data Science," Jerry shares his experiences in leading open research in data science.

Rebecca Poe is the business manager for DXC's Healthcare & Life Sciences research network team. She and her team focus on market intelligence and analysis for payer, provider and life sciences.

MD_6250a-18. May 2017