Transforming your Business with Machine Learning

Ten customer stories

Microsoft Algorithms and Data Science Solutions Team – August 8, 2016
Editors: Fidan Boylu Uz, Pavandeep Kalra, Neeraj Khanchandani , Ashish Bhatia, Patricia Wagner, Larry Persaud

Table of Contents

Introduction

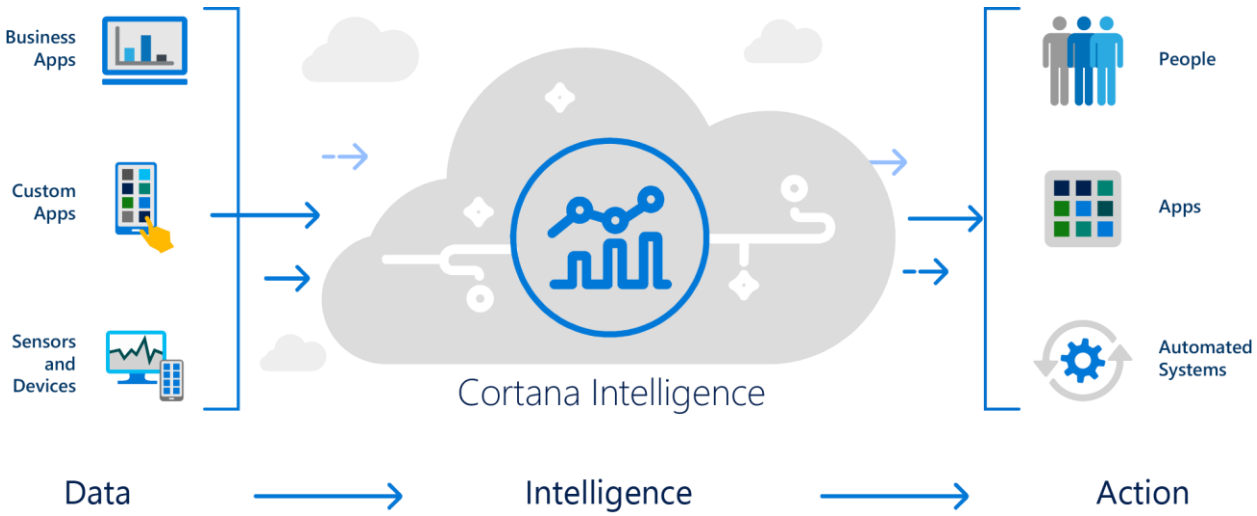
In the last few years, data from myriads of different sources has literally exploded, accompanied by a dramatic shift towards massive on-demand storage and computing in public clouds such as Azure and AWS. At the same time, tools and applications available to build sophisticated data and analytics solutions have become simpler and much more accessible. As a result, businesses and organizations are now looking for ways to use data and drive analytics-based transformation of their operations and their respective industries.

Transform your business

Given the rapid evolution of this field, customers typically need guidance on how to apply the latest analytics techniques to address their business needs or to pursue new opportunities. The C-suite executives we meet have many questions regarding data analytics, for instance:

- How can analytics help me plan my business, better manage costs, and drive greater operational excellence?
- How can analytics help me better market to my customers, drive more personalized messaging, drive better targeting, improve customer engagement and propel my sales?
- How can I manage risk to better predict issues and problems that may arise in the future using the latest analytics techniques?
- How can analytics help us innovate and get a competitive edge in our industry?

With just an internet-connected browser, the Cortana Intelligence Suite, for instance, gives you the ability to ingest enormous volumes of data in real time, store exabytes of unstructured or structured data, orchestrate complex data flows, create operationalized machine learning models almost trivially using drag and drop, and easily take advantage of rich visualization and dash-boarding capabilities. You can even use sophisticated cognitive APIs for things such as image, speech or textual recognition to create solutions that would have been unthinkable just a few years ago.



The opportunity to work with a multitude of customers—often in the different industries, but all facing complex challenges—gave us the chance to address these questions. Based on our experience, Cortana Intelligence Suite can help you transform your business.

Let's look at ten customer stories across different industries, where Cortana Intelligence transformed their businesses.

Customers	Industry	Cortana Advantage
ThyssenKrupp	Elevator	Improves Operations with Predictive Maintenance
Diebold	ATM Manufacturing	Helps Diebold Predict ATM Failures
JJ Foods	Food Delivery	Uses Machine Learning to Revolutionize Customer Service
eSmart Systems	Power & Utilities	Makes Cloud Technologies the Brain of Smart Grids
ServusNet	Software	Forecasts Wind Power Using Cortana Intelligence Suite
Carnegie Mellon University	University	Cuts Energy Use with Cloud Machine Learning Solution
UC Davis	University	Uses Cloud-Based Energy Disaggregation through Cortana Intelligence Suite
Russell Reynolds Associates	Recruitment Planning	Powers Russell Reynolds Associates' Search for the Perfect Match
If P&C	Insurance	Helps If P&C Tackle Big Data Analytics
GAFFEY Healthcare	Healthcare	Accelerates Claim Automation & Revenue with Machine Learning

Prevent service disruptions with predictive maintenance: ThyssenKrupp

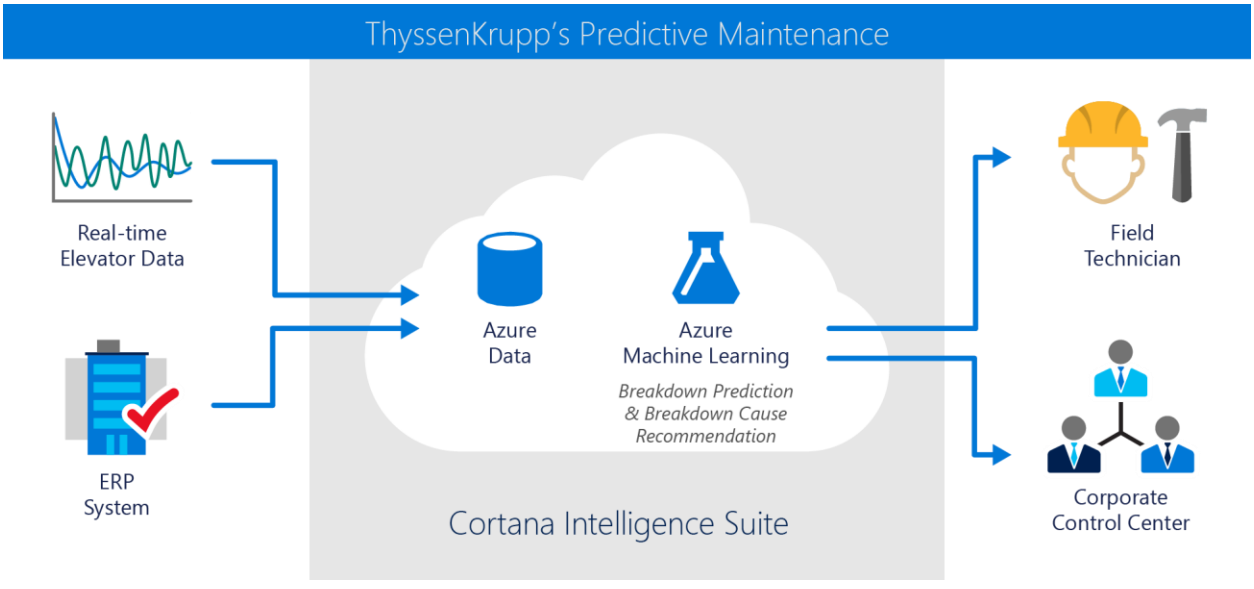
ThyssenKrupp Elevator Americas is the largest producer of elevators in the Americas, with more than 13,500 employees and more than 200 branch and service locations.

The problem. Maintenance and repair are time-consuming and disruptive.

ThyssenKrupp's request. ThyssenKrupp wanted to improve operations through predictive and preemptive maintenance. More specifically, they wanted to build a knowledge base application that would predict the potential causes of elevator failures, which would help field technicians diagnose the failure and prevent long disruptions of service.

The solution. Using Cortana Intelligence Suite, the solution was a predictive learning model. ThyssenKrupp's thousands of sensors and systems, which monitor information such as motor temperature, shaft alignment, cab speed, and door functioning, are connected to the Azure cloud. The model was developed for a mobile device for field technicians, so this information is combined into a single dashboard, where alarms indicate an immediate issue or can predict a possible future problem. Technicians get instant diagnostic capabilities and rich, real-time data visualization. This "learned" data is then incorporated into the machine learning solution, which now includes data parts from elevators, environment, usage information, and failure history. When technicians are on site, they can refer to this app for the most probable causes of that break down and the best repair options to fix the elevator as fast as possible. The result is a dramatically increased elevator uptime.

The business impact. By cutting operating costs and increasing elevator uptime with the help of machine learning, ThyssenKrupp can now claim maintenance services as their specialty. Instead of just reacting to a failure alarm, technicians use real-time data to predict and perform repairs before a breakdown happens. Other benefits are less time traveling to job sites, better efficiency overall, and reduced costs. Cortana Intelligence Suite created a predictive model and used Azure Machine Leaning to collect data, continuously analyzed that data to learn from it, and "trained" the model. Machine learning keeps the model up-to-date as well. With the help of Cortana Intelligence Suite, ThyssenKrupp can now turn many expensive, emergency repairs into routine maintenance tasks.



Predict ATM Failures:

Diebold Incorporated

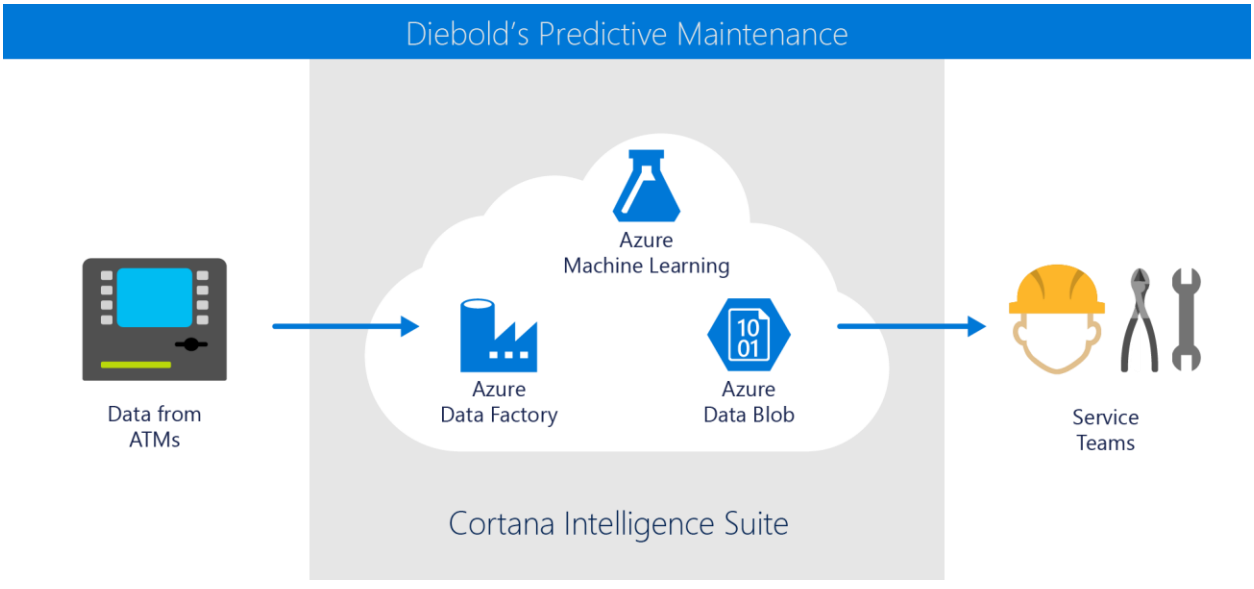
Diebold Incorporated, is the largest U.S. manufacturer of automated teller machines.

The problem. Diebold identified unplanned downtime as the most destructive problem for their business. Unplanned downtime resulted in lost revenue, high repair costs, and customer dissatisfaction.

Diebold's request. Diebold wanted to cut maintenance costs and increase ATM availability through predictive maintenance, a technology monitors the health of machines in real time and predicts when, where, and why failures are likely to occur. Service teams use this information to perform maintenance tasks in the most cost-effective manner and ensure optimal equipment performance.

The solution. The data used in the Diebold predictive maintenance solution included sensor readings, machine configurations, error codes, repair and maintenance logs, and detailed descriptions associated with each failure. Diebold used Cortana Intelligence Suite for a series of data preprocessing and feature engineering steps, followed by implementation of a predictive model. The model addressed questions such as finding the failure probability for each of the five sub-modules of a machine when the next specified number of notes are dispensed, identifying the top features that contribute the most towards the prediction of failure, and ranking the machines based on a health score to help identify the high risk population. The model was operationalized within an end-to-end data pipeline that involved several key components of Cortana Intelligence Suite. The input data stored in Diebold's on-premises data storage is periodically transferred between the SQL database and Azure cloud storage using Microsoft advanced analytics platform. The Cortana Intelligence Suite web service is used to get batch predictions on a daily basis as the new data becomes available. The predicted results are then transferred back to Diebold's on-premises data storage for downstream dashboard display and decision making.

The business impact. Using Cortana Intelligence Suite, Diebold quickly developed and operationalized machine learning algorithms to predict ATM failures. They also identified relationships between the different data sources that were not otherwise discoverable by human effort. Diebold built an end-to-end, production quality, predictive maintenance pipeline using advanced analytics capabilities in a short amount of time. With this capability, Diebold was able to reduce failures, cut maintenance costs, as well as monitor and improve ATM health.



Revolutionize customer service with machine learning:
JJ Food Service

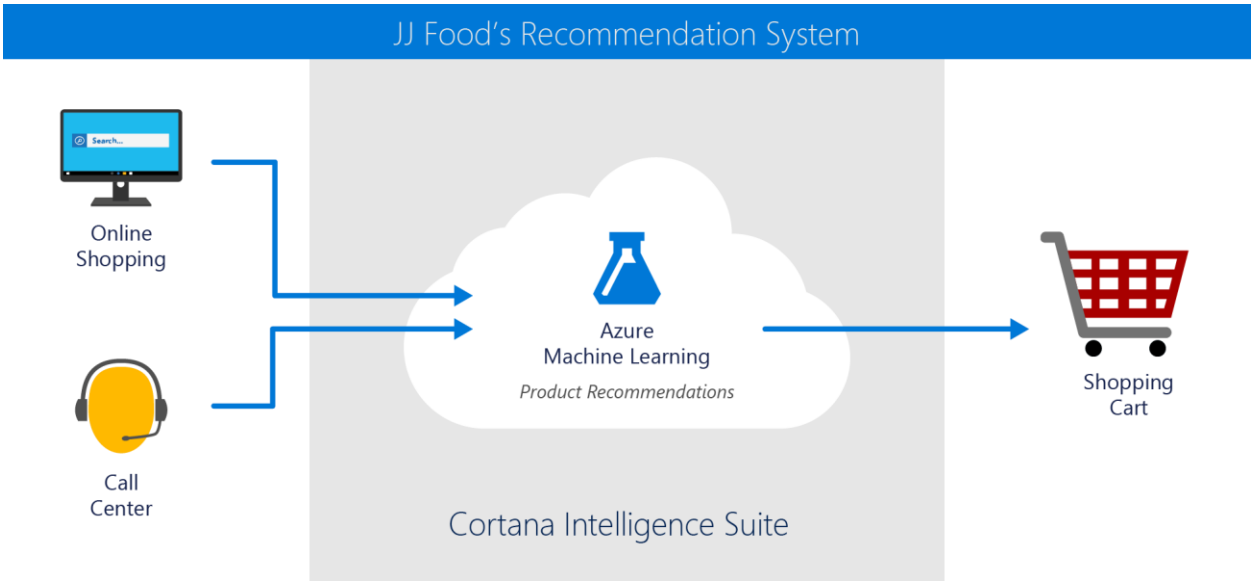
JJ Food Service is one of the United Kingdom's largest independent food delivery services. It serves about 60,000 customers across the UK, supplying food to many industry sectors such as restaurants, pubs, hotels, schools, universities, and local authorities. Customers can shop online or over the phone. More than 50% of sales come from online orders.

The problem. Online customers spent a lot of time searching for the items they needed.

JJ Food Service's request. JJ Food Service wanted to improve customer service by using their customer data for intelligent applications. The applications would anticipate customer orders and recommend additional products. Ultimately, this would reduce the time it took customers to place orders. By anticipating customer orders, JJ Foods would not only improve customer service, the company would spend less time helping place orders and more time on their food service businesses.

The solution. JJ Food Service captured customer behavior and provided three years of data to train an Azure Machine Learning model. Then they integrated the data and recommendations into their call center environment. Their system now shows predictions for the customer, based on analysis of when previous purchases were made, as well as recommendations for items they might like to order. Because the call center reps can see exactly what the customers see on the website, they can make recommendations based on the machine learning algorithm. And the system fills out the order automatically.

The business impact. Now that the call center reps see exactly the what customers sees on the website, both online and phone customers get the same level of service, including the predictive shopping list and the recommendations. JJ Food Services estimates that these recommendations currently make up about 5 percent of the total shopping cart. In addition, being able to make recommendations to customers ordering a particular item lets JJ Foods promote new products or bring customers' attention to products that they currently go elsewhere to purchase. Customers are amazed with the accuracy that JJ Foods predicts what they need.



Make cloud technologies the brain of smart grids:

eSmart Systems

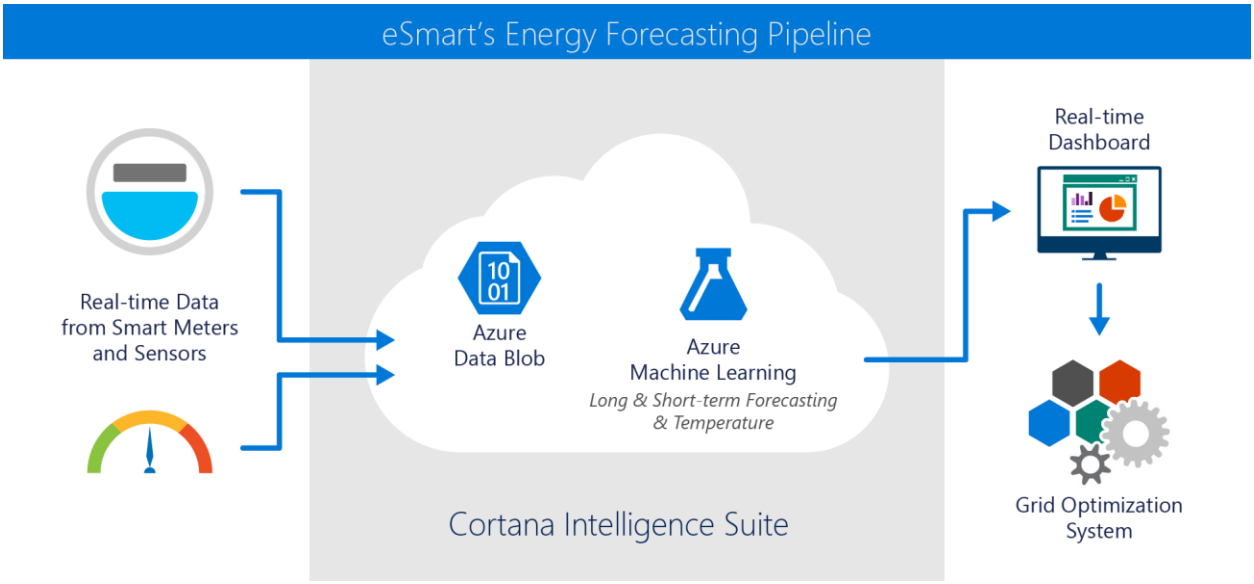
eSmart Systems helps utility companies manage and optimize their grid operations by developing tailor-made solutions for ongoing monitoring of smart grids, which are grids that have monitoring, analysis, control, and communication capabilities.

The problem. Today's electrical grids include power plants, transmission lines, and a network of substations. These complicated networks are powered by data stored in customer information systems and building meters. Utilities needed a central way to collect that data and use it in their day-to-day operations.

eSmart Systems' request. eSmart Systems wanted to supply a predictive software to utility companies that would help them optimize energy consumption by predicting bottlenecks and detecting possible problematic substations within the grid. Accurately predicting future energy demand is a critical need for utility companies because it helps to run an optimized grid and prevent disruptions.

The solution. eSmart Systems designed an automated end-to-end solution that collects data from smart meters and sensors and pushes it to the Azure cloud every hour. It then runs predictive models in Cortana Intelligence Suite to forecast potential capacity problems and automatically control power load to prevent outages. The solution provides both short-term and long-term forecasts. This forecasting information is fed in real time into a different grid optimization algorithm. The information is then visualized through interactive Microsoft Power BI dashboards. These dashboards help the customers easily monitor the results from the forecasting web services, track electricity consumption in real time, and detect possible problematic substations in the grid.

The business impact. Without predictive analytics, it was impossible for the utility companies to determine the bottlenecks in time to prevent blackouts. Cortana Intelligence Suite supplies energy and utility companies with the information they need–in real time–to optimize their grid and prevent disruptions and bottlenecks. eSmart can now provide its customers a software platform that acts as the brains of the smart grid – the actual software that operates the grid. Many different Microsoft Azure technologies connect the data together and provide grid managers a single user interface for all of their tasks.



From local to global service area with power usage forecasting:

ServusNet

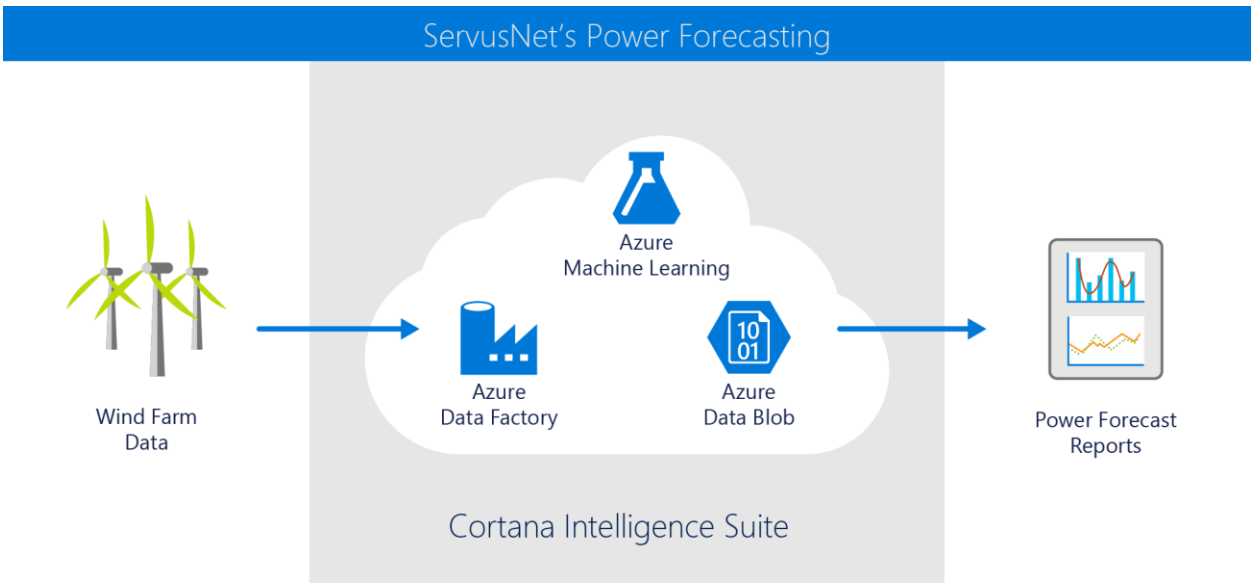
ServusNet is a software company that develops Operations & Maintenance (O&M) and Operational Intelligence (OI) solutions for the renewable energy industry, such as wind farms.

The problem. ServusNet had an on-premises solution that used daily weather forecasts to generate the final wind power forecasts at a farm level.

ServusNet's request. ServusNet wanted to deploy an end-to-end operationalized cloud-based solution so that they could scale out their product offering globally, catering to multiple wind farm portfolios and customers.

The solution. ServusNet migrated their existing wind power forecasting model to the Azure Cloud using Cortana Intelligence Suite to build a scalable, cloud-based solution. They used Azure Web App to retrieve the weather data from a remote server and the stored the data in cost-effective Azure Blob storage. Cortana Intelligence Suite quickly replicated the functionality of their existing turbine wind power forecasting algorithm. The performance of the final cloud-based model matched that of ServusNet's on-premises solution. ServusNet operationalized their final forecasting model as a web service that could then be consumed by various devices and platforms. Microsoft advanced analytics platform was used to orchestrate data movement and invoke the Azure Machine Learning web services at a predetermined schedule for similar wind farm portfolios.

The business impact. With their advanced algorithm embedded in Azure Machine Learning, ServusNet is now able to provide a global, reliable, and scalable cloud-based solution that predicts the power generated by wind farms. Using their Cortana Intelligence-based framework, ServusNet also has access to additional big data components, like the Azure SQL Data Warehouse, when more wind farm data becomes available. Additional data ensures that they are ready to customize and extend their existing solution for much larger wind farm portfolios with minimal incremental development costs.



Cut energy use with Azure machine learning:

Carnegie Mellon University

Carnegie Mellon University (CMU), a private, global research university, studies operational efficiency of their own buildings as well as other facilities worldwide, as part of the CMU Center for Building Performance and Diagnostics.

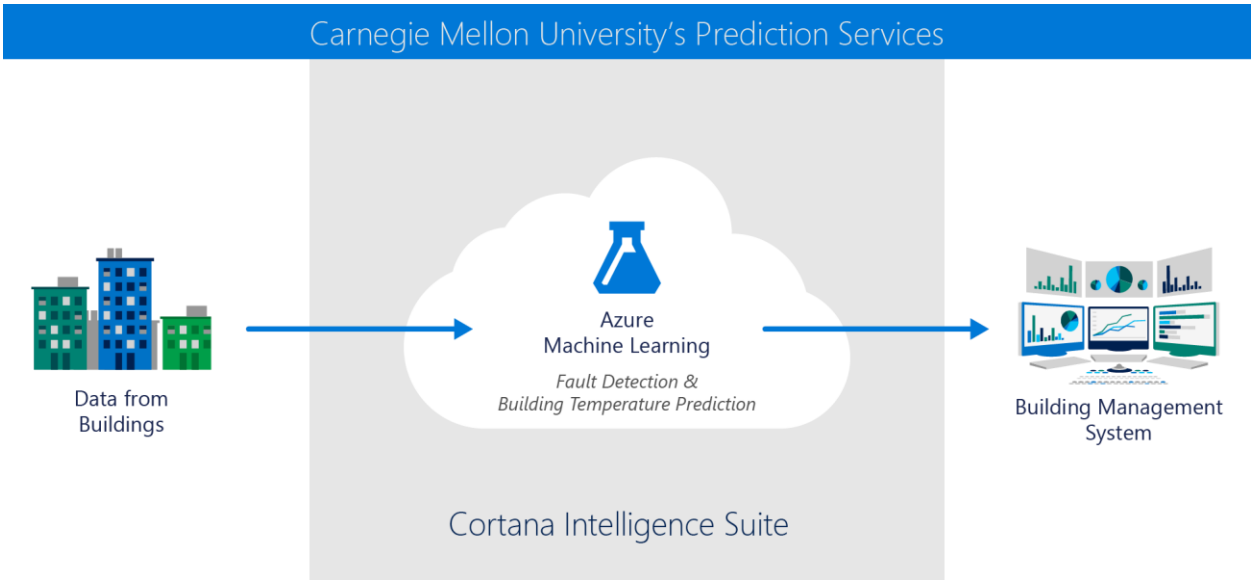
The problem. The traditional way to monitor operational efficiency relies on collecting and analyzing data from sensors that control heating, cooling, lights, ventilation, and security systems. However, these analyses can't predict failures or reduce energy use, so they can't prevent expensive system disruptions or wasted energy.

CMU's request. CMU wanted to add real-time predictive analytics so that building managers could proactively repair or replace worn components before they failed. For greater cost-effectiveness, CMU also wanted to enable automated building systems to predict when and by how much thermostats could be adjusted to anticipate heating and cooling requirements.

The solution. CMU extended its infrastructure with Azure Machine Learning. First, CMU used historical data to address the challenge of fault detection and used the temperature of the water released by a valve as a proxy measure of heating performance. They used Cortana Intelligence Suite to compare predicted and actual water temperatures, noting deviations between them to identify potential failures. The researchers also used predictive analytics to identify the ideal time to start heating the building. The heating system is typically engaged at 6 A.M. or, on warmer days, at 6:30 A.M., which wasted energy. The researchers aimed to predict the internal temperature of the building at 9 A.M. using a model that included recent internal and external temperature, anticipated solar radiation levels, and other factors.

The overall solution begins with an on-premises server that collects sensor data from across the CMU campus and forwards it to Microsoft Azure. The data is cleansed, aggregated, shaped, and transmitted in real time to a working repository of Microsoft Azure table storage, where it is accessed by Cortana intelligence Suite for analysis. The predictive insights can be accessed through Power BI, and the predictions are stored in a server for use by the building systems applications.

Business impart. CMU has added Cortana Intelligence Suite for better fault detection, diagnosis, and more efficient operations. With these capabilities, CMU personnel gain advanced analytics for improved operational insights and decisions. For example, field service technicians can access the predictive analytics to check and update remote equipment before it fails. CMU has demonstrated that Cortana Intelligence Suite will reduce energy and operational costs and based on the experimental results, CMU researchers estimate the solution could cut energy costs by 20 percent.



Cloud-based energy disaggregation:

University of California, Davis

University of California, Davis (UC Davis) is a public research university.

The problem. The technique of energy disaggregation analyzes the aggregated energy consumption recorded by smart meters and then breaks it down by individual electrical devices in that system.

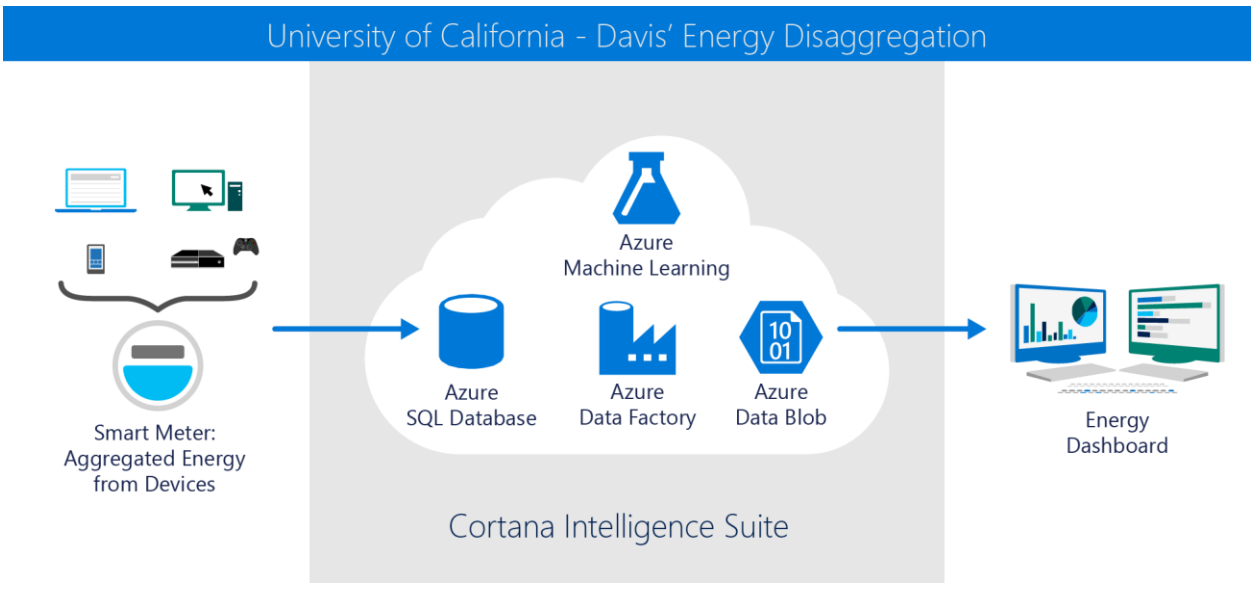
The simplest energy disaggregation systems detect power consumption spikes and find the device causing the spike. In practice, however, energy consumption graphs are much more complex. For example, for many devices there is no clear spike when the device is turned on or off. And often, there are many devices in a building, so there's a probability that several devices will be turned on or off at the same time, and those devices may also have similar power consumption patterns.

UC Davis's request. UC Davis wanted to build a large-scale system for energy disaggregation in commercial buildings.

The solution. Microsoft worked with OSIsoft and the utilities department at UC Davis to build this system. It's hosted in the Microsoft Azure cloud and gets real-time and historical data from smart meters using the OSIsoft PI System. UC Davis is using the system to disaggregate power consumption in a parking garage on campus. The disaggregation is done daily for every 10 seconds of power consumption throughout the parking structure for the previous day. This high-frequency disaggregation allows UC Davis to catch very short-term events, such as the activation of an elevator. The system disaggregates power consumption for 98 devices and is based on a novel algorithm that predicts both the energy consumption and state of each device. The system generates and stores more than 3 million predictions every day.

The end-to-end operationalized pipeline consists of several components of the Microsoft advanced analytics platform. The data from sensors is rapidly interpolated and pushed to Azure SQL DB so that it can be consumed by the rest of the components in the pipeline. The predictive results of this energy model are stored back in the on-premises servers and are used by building management systems.

The business impact. By finding the power consumption of each device in a system, UC Davis is able to understand each individual device's consumption and identify the ones that use the most power. Also, if there are any deviations from the normal power consumption pattern of a device, this can be used as a sign to check on these devices. The users can be warned and educated in ways to decrease energy consumption by informing them about their current usage habits and how to change them to conserve energy.



Search for the perfect match:

Russell Reynolds Associates

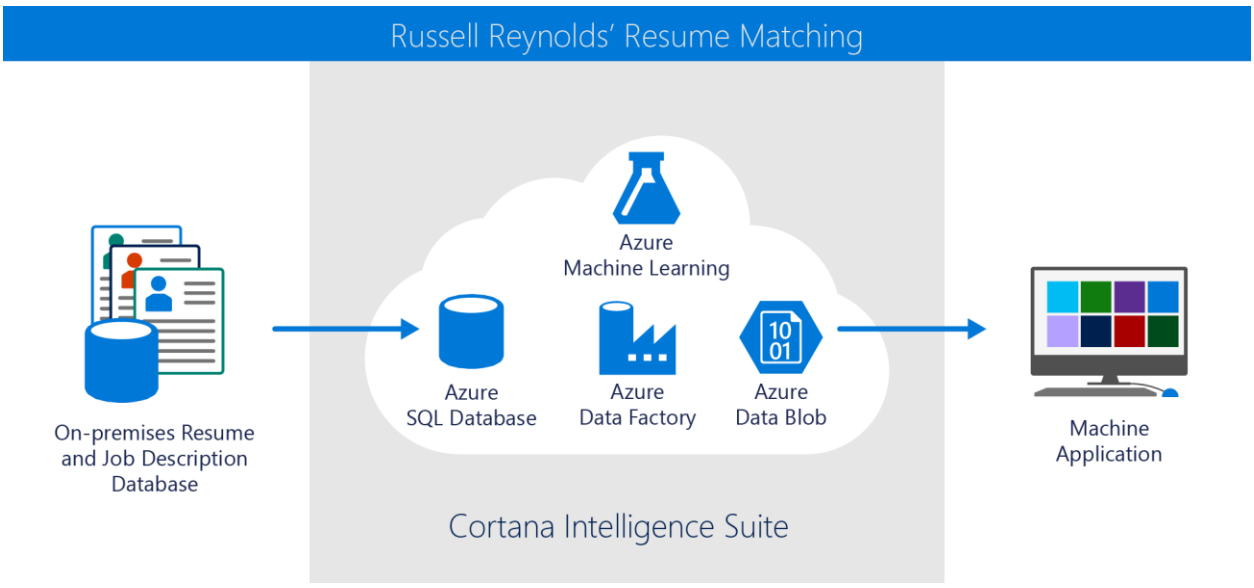
Russell Reynolds Associates is a global leader in assessment, recruitment, and succession planning for C-level roles.

The problem. Finding the best candidate for a job position has long been a labor intensive task. Traditionally, it requires human effort to match résumés with the right job positions, especially since the pool of candidates can be massive.

Russell Reynolds' request. CEOs and boards of directors wanted an automated search system to match candidates to the positions that they're best suited for. Automating this is challenging because automation requires converting unstructured text data, such as résumé and position specifications, to structured data and then applying machine learning algorithms to find the best matches.

The solution. Cortana Intelligence Suite built an end-to-end data pipeline to develop a search tool for Russell Reynolds Associates. The tool used data stored on Azure SQL Database to transform job descriptions and résumés into structured data through topic modelling. To identify ideal candidates, a predictive model determined the probability of a candidate and a job position being a match. To train the model, good match pairs were manually labeled by Russell Reynolds. Bad matches were automatically generated using a graph-based model. A matching decision was then made, based on a chosen decision threshold of match probability. To help find additional candidates and job pairs, a similarity measure was used. The similarity measure had a threshold to help filter out irrelevant candidates or job positions, based on Russell Reynolds Associates' requirements. Azure Data Factory was used to schedule periodic data transfer from on-premises SQL Server to Azure SQL Database automatically. The data was processed as it became available on the Azure SQL Database and applications such as dashboards can consume prediction results using the Microsoft advanced analytics platform.

The business impact. Using the fully managed big data and advanced analytics capabilities of Cortana Intelligence Suite, Russell Reynolds Associates is now able to offer their clients a selection of candidates who better match what their clients are looking for. This system, using Microsoft's unique capabilities, allows them to identify and pair the best talent with job positions, leveraging data that competitors do not have access to. Russell Reynolds Associates expects the new system to significantly reduce the time consultants have to spend in initial identification of candidates.



Predict churn and generate leads:

If P&C Insurance

If P&C Insurance is a leading property and casualty insurance company that serves three million customers in the Nordic region. Like all insurers, they have to ingest, process, analyze, and act on massive amounts of data from various sources – quickly and cost effectively.

If P&C uses machine learning in three main areas: churn prediction, upselling, and email text analytics. Churn prediction is used to predict whether or not a customer will cancel a policy in a 40-day window surrounding the renewal date. The Upsell model predicts if a potential upsell communication will turn into a sale. Email text analytics classifies inbound customer emails and channels them to specialized teams in customer service. Additionally, sentiment analysis automatically notifies related business units of positive or negative feedback. In the case of negative feedback, sentiment analysis will help indicate the risk of churn.

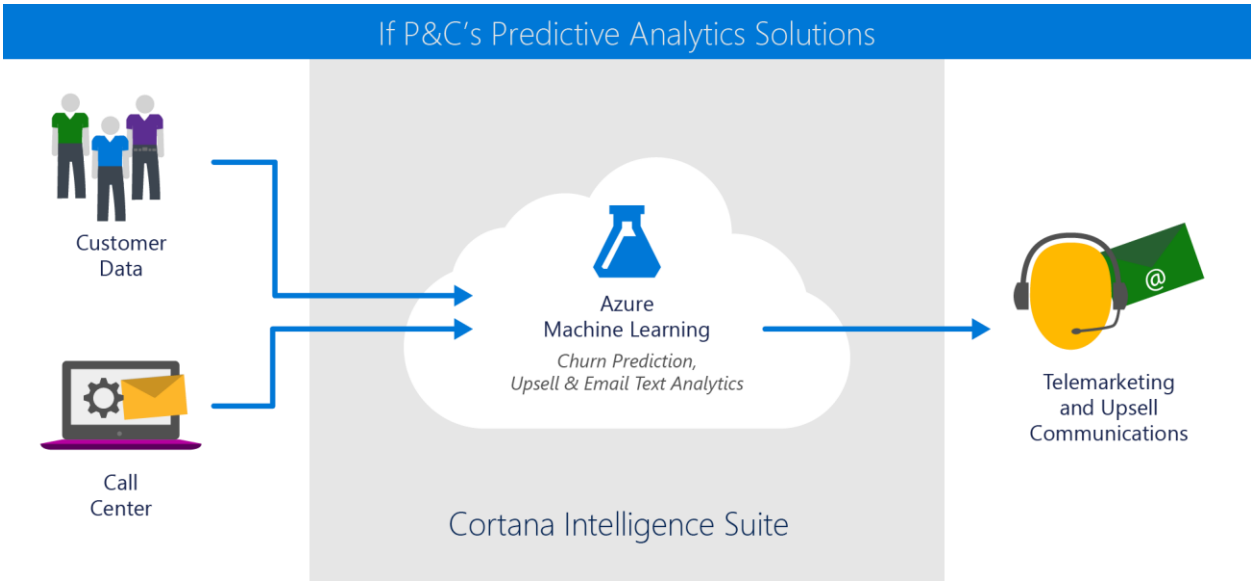
The problem. With the emergence of big data, If P&C needed to replace their on-premises, legacy data analytics platform with a strong predictive analytics platform.

If P&C's request. The new platform would have to provide the same or better results.

The solution. Cortana Intelligence Suite developed predictive models for both the churn and the upsell. The best performing algorithm was deployed as a web service. Email text analytics helped If P&C to transition from a push to a pull marketing strategy.

The business Impact. Cortana Intelligence Suite provides better results and a cost savings of 90%.

The churn model gives If P&C the opportunity to prevent customer attrition, for example, through telemarketing communications to make sure the customers are offered the right services. It also offers the opportunity to take necessary precautions to prevent dissatisfaction that might lead to churn. The upsell model also helps with lead generation and next–best offer recommendations.



Accelerate claim automation and increase revenue:

GAFFEY Healthcare

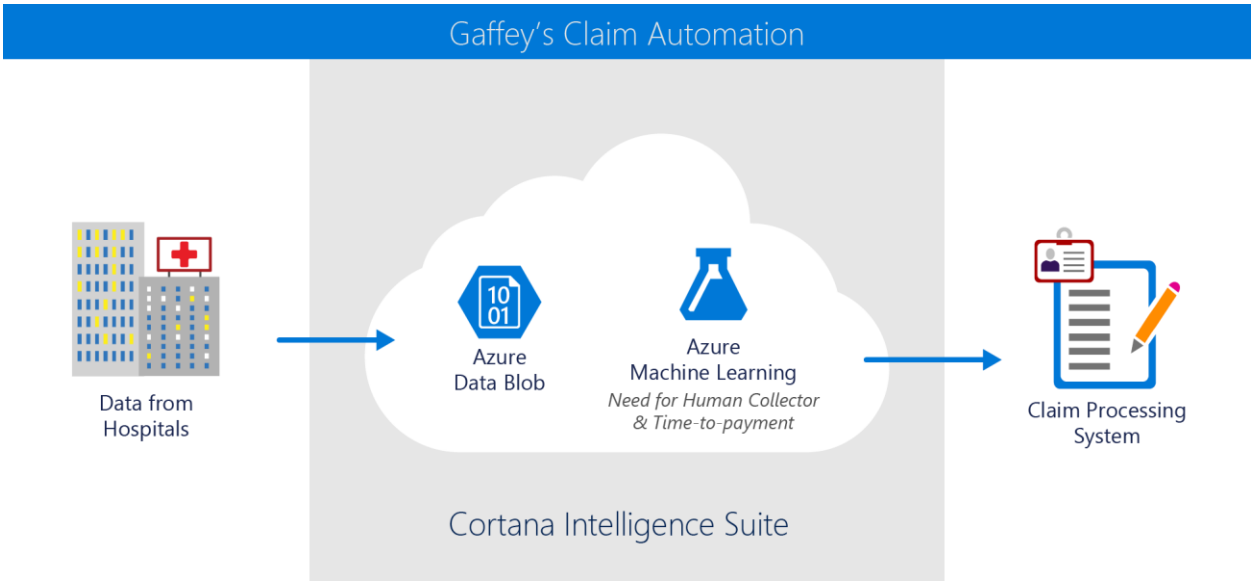
GAFFEY Healthcare is a leading healthcare technology solution provider whose customers include over 200 healthcare systems, hospitals, and physician practices.

The problem. The profitability of GAFFEY's customers is highly dependent on continuous cash flow, which comes primarily from claim payments provided by insurance companies. However, the claims are rarely processed on time and insurance companies frequently postpone them. Often, a human collector has to follow up with an insurance company. This becomes a secondary problem because the customer can waste time and effort on claims that are not likely to be paid in the near term.

GAFFEY's request. GAFFEY wanted to accelerate its customers' revenue cycles by offering them predictive analytics services for both problems: predicting how long it will take for an insurance company to pay a claim (0-60 days, 60-90 days, or 90+ days) based on historical patient and claim payment information, and whether a human collector will be needed to accelerate the claim payment process.

The solution. Cortana Intelligence Suite built a predictive model for each problem. Both models are based on the same input data, composed of insurance company and claim information. The trained models were deployed as web services, which take the claim and insurance information as the input, and output the predicted length of time for a claim to be paid and the probability of a human collector being needed.

The business impact. Cortana Intelligence Suite accelerated claim automation and cash flow. GAFFEY's customers now have better cash flow and lower labor costs. GAFFEY deploys an automated data movement and processing pipeline and by using machine learning, provides accurate predictions on which claims should be worked on and when. Payment collections are faster and unnecessary human intervention has been eliminated.



Appendix - References

1. https://blogs.technet.microsoft.com/machinelearning/2015/11/05/transforming-businesses-through-the-power-of-analytics/
2. http://www.prnewswire.com/news-releases/healthcare-it-market-size-to-reach-1045-billion-by-2020-grand-view-research-inc-533012831.html
3. http://www.grandviewresearch.com/industry-analysis/healthcare-it-market
4. https://www.gartner.com/doc/3192317/forecast-enterprise-it-spending-insurance
5. https://www.alliedmarketresearch.com/press-release/world-atm.html
6. https://globenewswire.com/news-release/2015/12/14/795128/0/en/Smart-Elevator-Market-Worth-30-55-Billion-By-2022.html
7. https://blogs.technet.microsoft.com/machinelearning/2015/04/27/how-ml-accelerates-claim-automation-revenue-at-gaffey-healthcare/
8. https://blogs.technet.microsoft.com/machinelearning/2016/02/11/cortana-analytics-helps-insurer-if-pc-tackle-big-data-analytics-workload/
9. https://www.microsoft.com/en-us/server-cloud/customer-stories/thyssen-krupp-elevator.aspx
10. https://blogs.microsoft.com/firehose/2014/07/16/the-internet-of-things-gives-the-worlds-cities-a-major-lift/
11. https://blogs.technet.microsoft.com/machinelearning/2015/09/23/cortana-analytics-suite-helps-diebold-predict-atm-failures/
12. http://blog.diebold.com/time-to-break-the-business-rules/
13. https://customers.microsoft.com/Pages/CustomerStory.aspx?recid=12792
14. https://customers.microsoft.com/Pages/CustomerStory.aspx?recid=18945
15. http://blogs.technet.com/b/machinelearning/archive/2015/12/15/cortana-analytics-suite-powers-russell-reynolds-associates-search-for-the-perfect-match.aspx
16. https://blogs.technet.microsoft.com/machinelearning/2015/12/09/servusnet-forecasts-wind-power-using-cortana-analytics-suite/
17. https://customers.microsoft.com/Pages/CustomerStory.aspx?recid=8576
18. https://blogs.technet.microsoft.com/machinelearning/2016/01/20/cloud-based-energy-disaggregation-using-the-cortana-analytics-suite/


For more information about
Cortana Intelligence Suite, visit:
www.Microsoft.com/CortanaIntelligence