



Artificial Intelligence and Machine Learning

Applications for Utilities

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SAS in the Utilities Industry

560 energy customers worldwide

100% of Fortune 500 US Utilities are SAS customers using SAS for an average of 30 years

80% of Global Fortune 500 Utilities are SAS customers

1976 SAS founded with 2 utilities among initial customers



Definitions

Let's get on the same page...

- Machine learning (ML) - finds hidden insights in data without explicitly being told where to look or what to conclude
- Deep learning (DL) – a category of ML that trains a system to perform human-like tasks, such as recognizing speech, identifying images or making predictions
- Artificial Intelligence (AI) – the science of training systems to emulate tasks through learning and automation

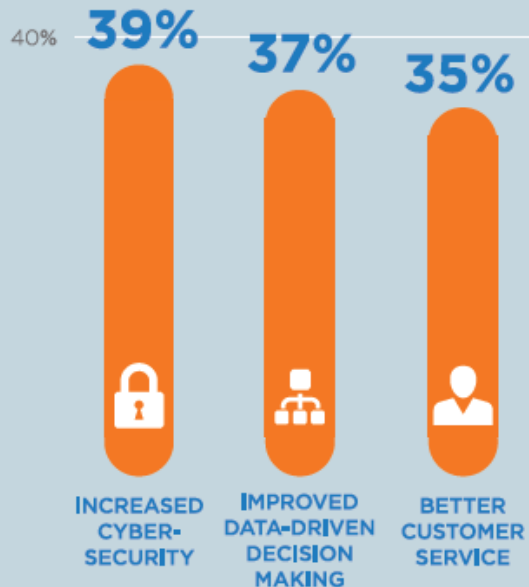
Sources:

https://www.sas.com/en_us/insights/analytics/machine-learning.html

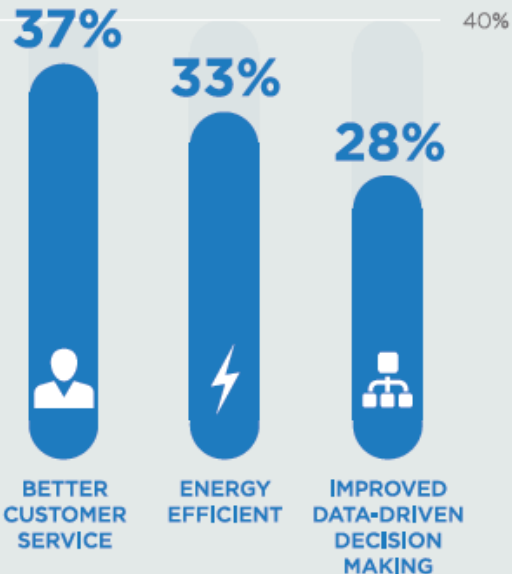
https://www.sas.com/en_us/insights/analytics/deep-learning.html

TOP BENEFITS

IoT benefits are focused more on the customer, whereas, machine learning benefits focus more on cybersecurity.



Machine Learning



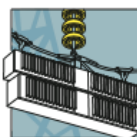
Internet of Things

Note: Percentage of respondents that placed these benefits in their top three

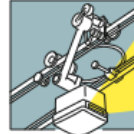


Machine learning-enabled forecasting anticipates supply and demand peaks, and maximizes the use of intermittent renewable power

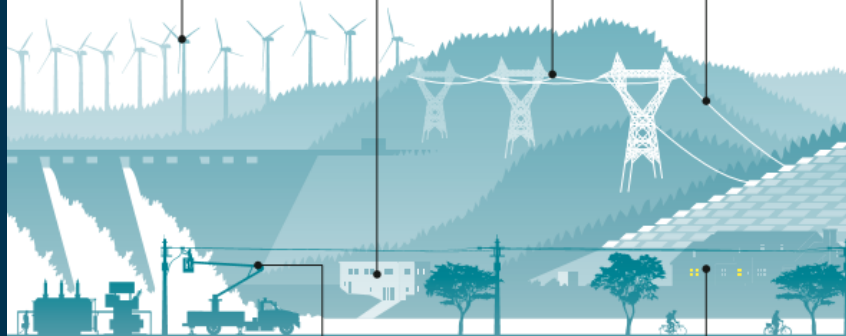
Sensors and machine learning allow for by-the-minute adjustments to maximize generation efficiency by adjusting to changes in wind conditions, for example



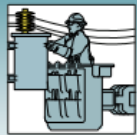
Smart wires combine with machine learning to enable real-time power dispatching, and optimize it to current grid load and to buildings' asset portfolios



Drones and insect-size robots identify defects, predict failures, and inspect assets without interrupting production



Few technicians remain, but they spend more time on problem solving; in place of logging inspection status by hand, documents are automatically logged and routed



Virtual agents automate call centers, and automatically segment consumers based on service history; machine learning offers early warning of bad debts



Field workforce receives real-time updates to decrease response times and reduce the impact of outages



Smart-meter data and machine learning enable utilities to offer services based on usage, weather and other factors

Areas of application for ML and AI

- Flexible, optimized generation yield
- Dynamic forecasting
- Predictive maintenance
- Non Technical Loss
- Personalized on-line and off-line experience
- Keyword-based workflow automation for back office operations
- Consumption modeling for Demand Response/Energy Efficiency
- Autonomous grid

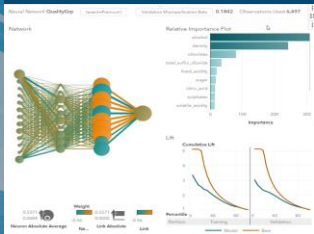
Sources: <https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/how-analytics-can-improve-asset-management-in-electric-power-networks>

<https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/how-artificial-intelligence-can-deliver-real-value-to-companies>

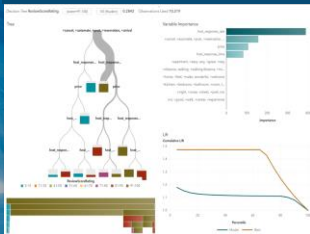
Artificial Intelligence: Key Capabilities

Core

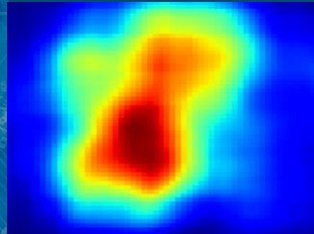
Machine Learning



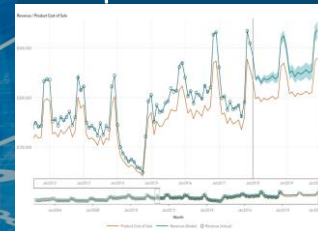
Natural Language



Computer Vision

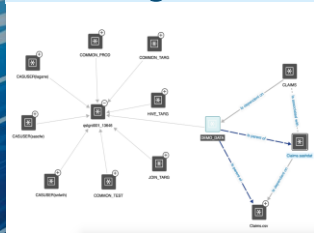


Forecasting and Optimization



Support

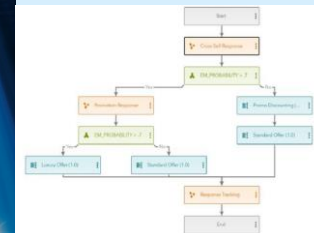
Data Management



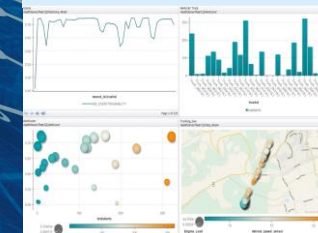
Visualization



Decision Support



Deployment



Large Utility in AP



Key Challenges

- Balancing supply and demand for electricity in one of the largest utilities in the world.
- Since the deregulation of the retail market, market competition has intensified.
- Model should account for fluctuations in demand drivers, including climate, temperature, social condition, economy and customer behavior.
- Wanted to utilize machine learning approaches to quickly adapt to changing inputs and increase flexibility of forecasting process

How SAS® supported the process



Results

- Integrated weather data and models from open source software into SAS Visual Data Mining and Machine Learning
- Rapidly improved the repeatability of short-term forecasts (day ahead baseline)
- With SAS, they will save money through improved power generation resource utilization and trading for next day demand

Powered by

SAS® Advanced Analytics

“I'll continue using SAS Visual Data Mining and Machine Learning for making possibly the best prediction of the electricity consumption with weather data.”

Utility Forecaster



US Gas Provider



Key Challenges

- Use new data coming from smart gas meters and distribution asset sensors for non-billing activities
- Create insights more quickly to enhance decision-making
- Automate some data pre-processing
- Predict safety or maintenance issues in the gas distribution network earlier
- Improve customer engagement

How SAS® supported the process



Results

- Enhanced propensity models that predicted customer payment delinquencies
- Proactively engaged customers to reduce bad debt
- Identified anomalies in the smart meters and other assets that required investigation

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