21, rue d'Artois, F-75008 PARIS
http : //www.cigre.org

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It's Time to Embrace Artificial Intelligence for the Utility Industry

D. J. SIERRA, K. R. LUNDEEN
Burns & McDonnell
USA

SUMMARY

As computing power grows, so does the potential for artificial intelligence (AI) to change how the utility industry addresses challenges. Complex machine-learning algorithms can be implemented to support everything from home energy management to job site safety. The question is, what are the best ways for utilities to begin capitalizing on all that AI has to offer?
While there are many potential ways that the utility industry can slowly start using AI to its greatest potential, there are three interesting possibilities to focus on in the near future. First, utilities can apply image recognition and drone technology to maintain their assets and to act more rapidly in emergency situations. Major applications for these advances in surveying could be in vegetation management and Rapid Response Team coordination. Secondly, utilities can use the enhancement of weather prediction and battery storage to their advantage. With the use of AI, utilities could be able to quickly determine the likely output of renewable generation technologies, such as wind and solar, that are driven by the unpredictable forces of nature. The predictive power of machine learning can forecast what the most effective type of renewable generation source would be based on the likely weather, used at the most efficient time. This could lead to a more flexible, reliable sustainable energy supply. Finally, the investment in sensor and smart technology can provide a wealth of analytic and safety data to improve operations. The most important value for all utility professionals is safety. Once safety is not a focus, mistakes can be made and lives may be lost. With the use of enhanced sensor technology supported by machine learning, it could help construction personnel work safely on dangerous work sites and save utilities countless amounts of money and stress. Additionally, there are numerous small steps utilities can begin to take by partnering with complementary software, sensor, and analytical companies to create small pilot project. The pilot projects can lay the groundwork to providing sustained, robust programs using AI and machine learning to enhance and optimize the way utilities operate and maintain their infrastructure. Once utilities embrace the new technology and the power that AI has to offer, it can be used to make utilities safer, more efficient and more profitable.

KEYWORDS

Artificial Intelligence; Future; Human Machine Learning; Smart Technology; Image Recognition; Sensors; Safety; Drone; Vegetation Clearance;

dsierra@burnsmcd.com

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Ask five people the meaning of artificial intelligence (AI), and you will likely receive five different responses. As it pertains to utilities, AI is attributed to computers or computer-controlled robots that, thanks to incredible processing speed and memory capacity, can reason, generalize and perform selected intellectual processes. In other words, AI makes it possible for intelligent devices to process and perform tasks commonly associated with humans – only faster and with more consistent quality.

In human machine learning (HML) applications, AI goes further, enabling computers to learn on their own. When computers are fed vast data sets, HML makes it possible for them to analyse information, notice patterns and produce useful insights within seconds, going far beyond normal human ability.

Utility companies – electric, gas, water and sewer – have much to gain by leveraging this massive computational power and exceptional speed. For ideas, they might begin by considering some of the emerging and converging applications in other industries.

Imagine recognition technology is commonly used for everything from identifying faces in photos to detecting vehicles in the vicinity of driverless cars. Image recognition algorithms have rapidly grown in sophistication to unlock cell phones or tag friends on social media. Many utilities can take advantage of similar patter recognition technologies in different environments and applications. Linking this new technology with the capabilities of AI will be extremely powerful.

Consider, for example, how helpful image recognition technology might have been to Puerto Rican utilities in 2017 when assessing and responding to Hurricane Maria damage. Had utilities there used camera-enabled drones to conduct baseline aerial surveys of service areas prior to the hurricane, they could have later sent the drones back into the skies to survey and assess the damage. By comparing images before and after, AI could have identified everything from missing electric poles to chemical spills. As part of a rapid response effort, AI could have then been enlisted to estimate needs for replacement poles and conductors, and to link to vendor databases to check availability, place orders and prioritize repairs. In short, AI could perform these same functions more efficiently and safely than sending crews into the field to investigate damage.

Looking forward, utilities might consider ways to use drones to perform initial surveys of vegetation and geography within service areas, linking to geological, forestry, wildlife and other existing local survey information. Mapping large data sets onto scanned territorial images would provide utility planners with better decision-making tools and could improve construction, maintenance and response plans.

Image recognition and AI tools can also help prevent outages by estimating vegetation growth rates and better predicting trimming needs. In addition to maintenance requirements, these tools can be used to estimate labor hours and materials for these tasks. Sustainable, environmentally responsible plans can then be developed to factor in the interconnected, complex natural resources involved in a service area.

HOW TO GET STARTED: Utilities wanting to be prepared for a high-impact, low probability (HILP) event might consider purchasing one or two inexpensive camera-equipped drones to conduct benchmark aerial surveys of service areas. Performing small-scale pilot programs and partnering with research organizations to link data onto the imaged area could help scale future efforts at combining and analysing large data sets to improve decision-making and planning capabilities.

HML's ability to collect and learn from weather data is helpful to meteorologists, as well as school administrators tasked with deciding when to cancel school for a snow day. Predicting the weather also empowers utilities interested in increasing the use of renewable energy.

Even though the cost of solar panels and wind generation continues to decline, the unpredictability of renewable sources has often constrained deployment. That is party changing due to battery storage technologies developed by companies like Tesla that allow excess wind and solar power to be stored for use during peak periods.

As these batteries grow more powerful and win and solar costs drop, HML's weather prediction capabilities may enable utilities to flip their energy supply to renewables. If a utility knows a massive cloud cover will be forming over a solar array on a hot summer day, it could tap into battery storage or an overproducing wind farm to fill the gap – using machine learning to determine optimal system efficiency. In other words, if HML can predict the weather, utilities could remove much of the uncertainty that surrounds the shift from fossil fuels to renewables, while creating a dynamic, sustainable energy supply.

HOW TO GET STARTED: To educate the public on what's possible, utilities could implement intelligent renewable demonstration projects within communities. For example, a utility could construct a small-scale microgrid incorporating solar, wind and additional renewables. Continuous monitoring of the output and efficiency could be studied, with tests performed for peak shaving and load balance between resources. Such studies can provide lower cost research for applying the variable mixture of resources and illustrate how to efficiently allocate these capabilities. This low-cost, high-reward opportunity can provide utilities with valuable insights to scale their intelligent renewable portfolio to service territory level.

The decreasing size and increasing power of sensing technology provides more data for AI algorithms to process and draw insights. Sensing AI technologies hold great future promise for a variety of utility applications as well. Consider the safety benefits of outfitting manholes and other confined spaces with sensors that feed data to an AI device, testing air and water quality. Sensors can also alert utility construction workers to other potentially dangerous conditions. Before entering an aging manhole, workers could use laser radar to create an image point cloud that illustrates cracks or water seepage.

Sensors supported by machine vision or learning sensors can also serve as the foundation for early warning systems. With sensors shrinking in size, "smart" sensor-enabled paints can be developed for use in detecting rising levels of carbon monoxide, natural gas seepage or seismic vibrations. After a coat of the paint is added to the structure or space, AI draws insights from the sensors to alert users to dangerous conditions before human senses might detect a problem – before a potentially hazardous situation is encountered.

HOW TO GET STARTED: Again, it often makes the best sense to start small. Utilities might consider pilot programs to test sensor capabilities in a confined space or other common applications, monitoring and adding to them over time.

It may be tempting for utilities to take a wait-and-see attitude with AI and HML, anticipating other will do the heavy lifting needed to move the technology forward. However, these are disruptive, industry-changing technologies that are readily available at economical prices – and are being deployed across other industries every day. For example, HML is currently assisting manufacturers with design optimization; equipment is shipped with routes determined by algorithms; and distribution analytic programs are monitoring customer behavior and use. For more information, visit burnsmcd.com/AssetHealthAI.

By combining the strengths of human insight and intuition with the pure raw processing power of computers, AI and HML have already demonstrated the ability to save time and money while improving safety and service. The key for utilities is to identify low-cost, low-risk opportunities to enter the AI and HML world. Think big, start small and move fast. With one eye on how they can help today, and the other focused on what they might do in the future, the electric utility industry leads other utilities (gas, water, telecom, waste water, etc.) in the development of smart cities and communities.

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