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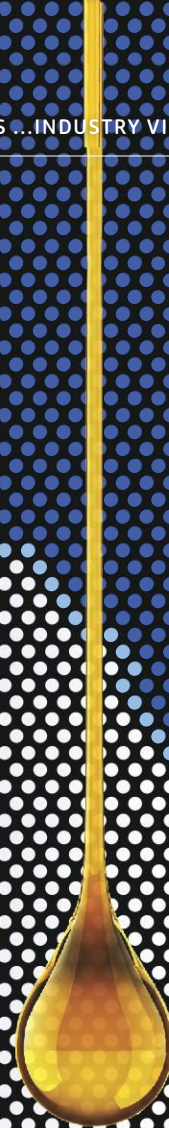
Artificial Intelligence Could Bring a Byte to Fuel Pricing

BY SAMANTHA OLLER

For decades, fuel pricing has been an art, relying on an alchemy of algorithms and human intuition. But the rise and promising potential of artificial intelligence (AI) and machine learning could help improve the accuracy and efficacy of this exercise. And a new pricing tool emerging from the pilot phase is testing the idea.

PriceAdvantage, a division of Skyline Products, had previously used linear algorithms in its fuel-pricing software to predict how changes would affect a retailer's volumes and margins. But it was an imperfect method.

"If you dropped prices 2 cents, generally those predictions were wrong by about 30%, so they were not very close at all," says Brendan Doner, assistant director of data science for PriceAdvantage, Colorado Springs, Colo. 



“It was more of a modeling approach starting at the top: Based on the economics, this is how we think it should work, so we’re going to build the model based around these assumptions, and here’s the price you should be around today,” Doner says.

For example, the model might tell a retailer that to meet its profit objective, it should raise the gasoline price at a store 10 cents higher than is historically typical, and 6 cents higher than the market.

“Our customers would say, ‘That’s crazy. Maybe I’ll make some more profit today, but three weeks from now, when everyone realizes how high I am in price, we’re going to lose all our customers,’” Doner says.

On the flip side, the old model may have suggested lowering the price to gain volume, regardless of an individual site’s dynamics. “It’s based on an economics textbook that says if you lower your price of fuel, you should sell more gallons today,” he says. “That’s a baked-in assumption.”

Another problem with linear algorithms is they don’t accurately take into account competitors’ reactions to price changes.

“You’re rarely making a price change in a vacuum,” Doner says. The more sophisticated retailers know about their competitors’ price changes fairly quickly thanks to frequent site surveys or regular Oil Price Information Service (OPIS) price data feeds. That means they can react faster, blunting competitors’ desired volume or profit increases.

The old model also did a poor job of learning from real-life pricing cause and effect and adapting its approach, Doner says. “We said, let’s throw out ‘We think this is how it should work,’ and instead look at how it actually does work,” he says. “That’s more of the bottom-up approach.”

While AI is a powerful tool, PriceAdvantage was not looking to create an algorithm that would price stores blindly, or simply generate a suggested fuel price. Instead, it wanted its economic modeling tool to supply data for fuel analysts to better understand the “why” behind the price.

“The big models behind what most people define as AI are neural networks,” Doner says. “They really are a black box—you have no idea why they made the recommendation



Loop Neighborhood stores are using AI-powered fuel-pricing software to be more reactive to marketplace dynamics.

they did.” While these models may provide the most accurate predictions on how a price change will affect volume or profit, “you don’t have a lot of understanding on why it recommended this price, and why I tend to sell more at this position or less on this day.”

So PriceAdvantage adopted a probability-based model that would give fuel analysts the chances of a price move’s success. Whereas the old model might have offered the recommended price and the gallons that would sell at that price, it did not provide a confidence level for this prediction. The new model, meanwhile, might say a price move has a 57% probability of achieving a retailer’s volume objectives.

The tool is more in tune with the quirks of an individual site and can chart the success rate of different market positions for each store over time based on their individual volume, profit or in-store sales objectives. The new model also accounts for the effect the timing of a price change has on the probability of it meeting its goal. For example, the tool might show that the retailer would have

much better probability of achieving its volume objective if a store priced a little higher than the market.

“The other insight we weren’t providing before is understanding competitor reaction,” Doner says. “If you change your price at 3 p.m. on a Wednesday, you can keep it there until the next morning. Or ... if you make a price change during the morning rush, it appears that’s when most competitors are doing their price surveys or getting their OPIS feeds, so that’s when they’re going to follow you.”

Or maybe a retailer’s site has a 24-hour window before the market responds to a price change on a Tuesday afternoon. But on Monday during rush hour, that window narrows to only 12 hours. Or a 2-cent price drop might not get much of a response from competitors, but a 4-cent drop brings the entire market down.

For Au Energy LLC, Fremont, Calif., which has 119 Loop Neighborhood c-stores in California and has been a PriceAdvantage customer for the past five years, AI offers enormous potential.

“We’re trying to use tools to really improve the experience our customers have,” says Varish Goyal, president. “One of the major items we sell is fuel. We are hoping we can use AI to make us more reactive to the market, give us quicker responses to how

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things are changing, so we are getting the best possible experience and best possible pricing to our customers.”

The traditional approach to fuel pricing is “very human-related,” Goyal says. “Somebody has to get a price survey and enter it into the system. Somebody has to go into the system, look at prices, and decide how you want to affect your prices.” Besides being alerted to competitors’ price changes, Au Energy is hoping the AI tool will help it better understand how competitors will react to its own price changes.

“Maybe the manager hasn’t done a price survey yet, or we need them to update it because the markets are moving intraday rapidly during the hurricanes, and we need to do price surveys more than once a day because we are struggling to keep up with what is happening,” Goyal says. “That’s the reason why AI is interesting: Is there a way for us to get information faster so we can react faster to changes in the market?”

Data is both the opportunity and the challenge of an AI-powered pricing model.

“With AI, because it’s so new, it requires a lot of time and thought initially—making sure you understand what the data is being presented to you, and how best you can use the data,” Goyal says.

And any data that an AI-enabled tool such as this outputs is only as good as the inputs.

“You really need good, clean data to drive any type of model,” Doner says. “You need a good volume history that’s accurate.” Sometimes a retailer’s data will not show any volume sales at one site for two days, but then one large lump sum will show up on the third day because the store manager had not closed the books for a few days. Retailers must have a process in place to ensure the reliability of the data, and close their books on a timely basis because it only improves the efficacy of the tool.

“The faster you can get data, the faster you can have a good analysis, and the closer you can get to having a real-time analysis,” Doner says. “Having it directly tied to a point-of-sale system is where we’re headed, and there are some retailers in Europe who are already there.”

In beta tests, the new AI-powered eco-

Levels of Learnings

Other fuel-pricing products have harnessed AI and machine learning’s abilities to different degrees. In Denmark, a2i Systems A/S offers PriceCast Fuel, which learns from customers’ and competitors’ behaviors to make site-by-site pricing decisions. This includes raising prices to help retailers gain margin at times when customers may be less price-sensitive, The Wall Street Journal reported.

For example, in Rotterdam, one gas station rose its gas price by 3.5 cents per gallon incrementally throughout the

day. Shortly after, a competitor 3 miles away raised its prices by the same amount. Both were using AI-powered fuel-pricing software.

“This is not a matter of stealing more money from your customer,” Ulrik Blichfeldt, CEO of Copenhagen, Denmark-based a2i Systems, told The Wall Street Journal. “It’s about making margin on people who don’t care, and giving away margin to people who do care.”

Closer to home, Cleveland-based Kalibrate offers “AI-enabled” fuel-pricing solutions, says Anila Siraj, vice president of science and research.

“AI means: Can you replicate what a human mind would do?” Siraj says. “Machine learning fits underneath that. Machine learning is the computational, statistical math approaches that allow you to have artificially intelligent software.”

While different statistical techniques, including neural networks, can perform the machine learning, Kalibrate’s fuel-pricing software is based on an adaptive-predictive model, Siraj says. “It adapts based on what happens in the marketplace and predicts what will happen,” she says. “When you feed it new data—the actual volume, what actually happened with what it predicted—it learns. That’s the machine learning.”

economic model was delivering a 10% error rate for predicting volumes, vs. 30% with the algorithm-based model. “That’s not our end goal; we would like to get a lot closer than that,” Doner says.

Interestingly, human nature can be one of the most confounding elements that AI tools such as this need to understand to create an accurate price model. One type of competitor that can be challenging for AI to model is the single-site operator. These retailers’ practices can be more idiosyncratic, in part because of their financial processes.

“Maybe they have a big expense this month and are pricing differently and not super-responsive to the market,” Doner says. One PriceAdvantage client told of a competitor who was pricing gasoline 20 cents

higher than typical because his daughter was getting married. He was saving up to help pay for the wedding.

The new AI-powered Predictive Modeling tool completed beta testing this summer and will debut at the 2017 NACS Show, where it will be demonstrated as a component of PriceAdvantage’s fuel-pricing software suite. The suite is licensed on a store-by-store basis, with volume discounts for larger chains.

While it can have an effect on day one, the AI-powered model is not intended to replace a competent fuel analyst, Doner says.

“This is a good tool, but having a good person using that tool is beneficial,” he says. “We’re not trying to replace that analyst; we’re just trying to give them a better analysis tool set to use.”

“Fuel is such a very fast-moving product in our stores. ... AI makes sense,” Goyal says. He believes that one day, the technology could replace a fuel analyst. And he sees applications in everything from store assortment to scheduling employees.

“Over time,” he says, “I see it growing across everything we do.”

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