ONE Marketing and DataRobot help DR Koncerthuset get in tune with concertgoers

Moving toward personalized communications

When done well, marketing operates within an understanding of each customer's journey, an interconnected series of touchpoints that occur before, during, and after the purchase of one or more services and products. Many marketing organizations have adopted applications that visualize these journeys and automate content delivery to encourage motion that improves sales, increases customer satisfaction, builds loyalty, and reduces servicing costs.

ONE Marketing, a marketing services provider for Nordic businesses, has more than a decade of experience in marketing campaigns, communications, and automation. They have found that, despite its perceived limitations, email marketing is still the king of communications, providing an efficient method for communicating detailed information about offers and flexibility in segmentation to customers.

"Email continues to be the preferred channel for many individuals, and successful marketing demands that businesses become proficient in email communications," explained Kim Gregersen, a solutions architect and leader in client innovation at ONE. "With email marketing, organizations commonly start by broadcasting the same information to all their contacts. Next they evolve to segment-based approaches where everyone in the group gets the same content. But segments can be broad, and increasingly customers expect to receive personalized content."

ONE Marketing creates real business value with DataRobot

- Machine learning lifted ticket sales by 83%
- Personalized emails have a 14% higher open rate and a 24% higher click-through rate
- DataRobot models integrate seamlessly with existing marketing automation system
- Reduced spam for a large chunk of customers

Marketing automation applications enable the delivery of personalized content by providing rules-based technologies that declare who should be delivered what content under which circumstances. Rules represent how we think our world operates, but reality constantly surprises – and when it does, rules prove to be inflexible and brittle.

Establishing the rules that govern how content is delivered is painstaking work that can consume days or weeks of effort. As the world changes, we must revise and maintain these rules, which can prove as expensive and time-consuming as their creation.

Machine learning improves on rules-based systems

In the spring of 2017, Kim decided to explore the use of machine learning to improve ONE's email targeting efforts. "I envisaged replacing rule-based marketing dialogues with a data-driven approach where predictive models determine which content is delivered to individual subscribers," he said. Having discovered DataRobot through Internet research, Kim recommended that ONE's management team fund a project to investigate machine learning's potential for marketing automation.

Olivier Poivey, CEO at ONE, recognized the value that machine learning brings to the table. He suggested that ONE invite DR Koncerthuset (Copenhagen Concert Hall), an existing customer, to join a pilot project to evaluate machine learning for email marketing. ONE developed a data mart for DR Koncerthuset that includes their subscriber list and information about which events each customer has previously attended. Kim suggested that it would be worthwhile to create and implement machine learning models with DataRobot to personalize email communications and measure the impact on ticket sales.

DR Koncerthuset, which is considered one of the world's greatest modern concert houses, is a public institution that caters to Denmark's broad musical tastes as well as those of international visitors. Every year, DR Koncerthuset hosts a diverse range of more than 400 events in a number of halls and studios. "In their situation, a broadcast email that sends the same message to everyone inevitably leads to poor targeting. This creates risk that some subscribers consider their email as spam, and should they unsubscribe, then DR Koncerthuset loses contact," explained Kim.

The DR Koncerthuset/ONE pilot project's objective was to foster and maintain strong relationships with subscribers by only emailing relevant information to them. Kim had another objective, as well: "My own objective was for the pilot to prove that machine learning could successfully predict those events for which subscribers would buy tickets," he said.

Getting smart with marketing data

When implementing machine learning, one of the most important challenges is identifying relevant features. In his book Pattern Recognition and Machine Learning, Chris Bishop, Fellow of Darwin College in Cambridge and Fellow of the Royal Society, defines a feature as “an individual measurable property of a phenomenon being observed.” Kim investigated information in the DR Koncerthuset data mart in order to identify relevant information he could use as features in machine learning models. These models would then use those features to predict for which events each individual subscriber would purchase tickets. He identified about 400 features that might serve as good indicators of ticket purchases from the stored data of subscribers.

Using the ticket sales for 2016 as a training data set, Kim put DataRobot to work. DataRobot created a competition between dozens of different machine learning models, each based on a different algorithm. Kim selected the most promising model and tested its accuracy at scoring data representing sales made for tickets during the first quarter of 2017. The model performed with an accuracy of 44%. This means for a total of 63 concerts, the model predicted the five events for which each customer was most likely to purchase tickets, and 44% of ticket purchases were for those events. As Kim observed, “This was a good start, but not a great success.” His next challenge was to determine how to increase the accuracy of the model.

The first thing Kim thought about was the way DR Koncerthuset classifies events: Classical, Rhythmic, Entertainment, or Jazz. Kim determined this was too general a categorization scheme for predictive analytics to reach the desired level of accuracy. Classical music is a broad term, and a subscriber interested in attending a Mozart piano concerto may never intend to buy tickets for an evening of cantatas by Dieterich Buxtehude. To improve upon the classification, Kim asked music experts to classify concerts based on attributes such as the fame of the work to be performed, the conductor, or the soloist. “However,” as Kim observed, “this proved very hard work and did not improve the accuracy of the model.”

Kim then turned to artificial intelligence (AI) to improve his feature engineering. He harnessed the services of IBM Watson Natural Language Understanding to analyze semantic features in the description of each concert as published on the DR Koncerthuset website and created a semantic profile for each customer. He used the results of these semantic analyses to create new features for DataRobot, segmenting subscribers as Classic, Rhythmic, Entertainment, and Jazz. Kim set DataRobot to work to create individual machine learning models for each segment and scores for semantic matches that answer the question: “Is this concert of interest to this person with this profile?”

Kim then tested the new models against the same data collected for sales across 63 concerts, and the results were highly encouraging. For each subscriber, the models ranked the 63 events by the probability of that person buying a ticket. When Kim compared the models’ predictions In

with actual ticket sales, he found the new DataRobot models were 61% accurate in determining which single event was most likely to generate a purchase and 91% accurate across the five events ranked most likely to generate a purchase.

There was a stipulation, though. "When we look at the details, we find significant differences across segments and their models," observed Kim. "For example, more than 90% of the feature impact for the Classic model is generated by the semantic match, whereas for the Rhythmic model about 68% of the feature impact is generated by the semantic match." For Kim, this was a minor issue. "Regardless of technical details, we now have success," he noted.

Machine learning delivers on its promise

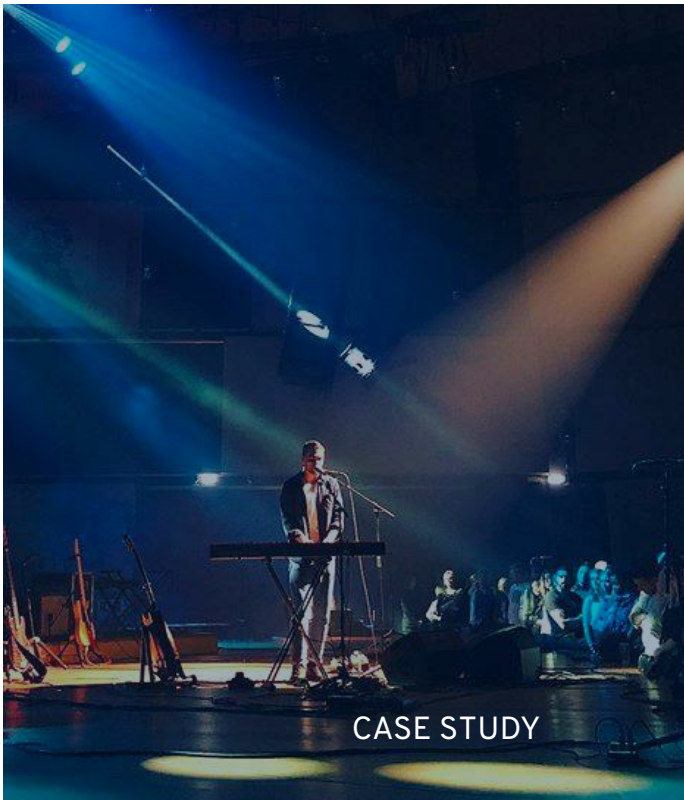
Having successfully tested the models on historic data, Kim was ready to put his models to work in the real world. Each week, DR Koncerthuset's marketing team sends subscribers an email listing six or seven upcoming events. Kim and DR Koncerthuset agreed to use the Rhythmic segment for A/B testing on these subscribers: Group A received the regular newsletter, but Group B received a highly personalized email containing only events that the models predicted would be highly probable to generate a ticket sale from that individual. The scores for each event were used to list the events within each email, with the highest scoring event appearing at the top of the list. Additionally, the email's subject line mentioned the events ranked one and two.

The results were impressive: "The marketing team at DR Koncerthuset sold 83% more tickets when emails were personalized using individual scores. Personalized emails sent to Group B had a 14% higher open rate and a 24% higher click-through rate compared to Group A's unpersonalized emails. Also, personalized emails were opened much sooner than the regular emails of Group A," said Kim.

Kim's efforts were succeeding in both objectives he had established for the pilot program. DR Koncerthuset was maintaining strong relationships with subscribers by sending them relevant emails, and Kim was proving that machine learning could successfully predict the events for which subscribers would buy tickets.

The following week Kim tested the models he developed for the Classical segment. Everyone who had been an active subscriber to the Classic newsletter was sent a personalized email. While nearly 62,000 subscribers received emails, Kim's models predicted that 50,000 subscribers would not be interested in the events taking place that week and the majority of sales would come from a core of only 11,800 people. Based on how the models scored the interest of each individual subscriber, the email listed between one and six concerts which were then ranked and displayed by likelihood of interest.

In total, the marketing team sent out 429 different emails. When the concert hall analyzed ticket sales, the 11,800 subscribers the model had determined would have the highest probability to purchase had bought 72% of the total tickets: in other words, it was a huge success. Kim has since improved the accuracy of the model by allowing for different response types.



Augmenting Marketing Automation with Machine Learning

Having to send as many as 429 different emails in a single campaign underlines the value of marketing automation systems – no team of individuals could handle that level of personalization at that scale. As a Pitney Bowes partner, ONE supplies DR Koncerthuset with Pitney Bowes' Portrait Dialogue marketing automation system to manage interactions with their subscribers. Kim and the IT team at ONE have directly integrated DataRobot with Portrait Dialogue using the DataRobot API.

"The integration is simple and the result is easy for marketing professionals to use. Working within the familiar Portrait Dialogue interface, DR Koncerthuset simply adds an operation to their flow chart diagram instructing DataRobot to score these events for this segment," Kim observed. "DataRobot returns the scores and their marketing team takes actions like instructing Portrait Dialogue that everyone with a score higher than X receives an email promoting that specific event. Then, they set-up the email template so the event ranking number one for the subscriber is presented in this field, and DataRobot returns the appropriate content."

Machine learning as the engine of data-driven marketing

The pilot project was an unequivocal success and is enthusiastically supported by all involved. Now, ONE is developing a data-driven marketing service for DR Koncerthuset: the regular weekly newsletter is being replaced by communications driven directly by the event schedule. "Data-driven marketing communications result in subscribers receiving fewer, better-targeted emails which strengthen relationships between DR Koncerthuset and its subscribers," Kim observed.

As DR Koncerthuset continues to master data-driven email communications, their next step is to engage ONE to personalize content delivery on their website. Currently, each subscriber's home page is the same – but starting in spring of 2018, it will display a list of

"This really is data-driven marketing, but what I personally find cool is that we have augmented the work of the marketing team at DR Koncerthuset with artificial intelligence, but in a way that doesn't disrupt how they have learned to work with their marketing automation system [Portrait Dialogue]."

— Kim Gregersen
Solutions Architect

five or six events that machine learning models have predicted will be of most interest to the subscriber but for which they have yet to purchase tickets.

So what is the next phase of data-driven marketing? Kim has identified web interactions as a key driver. “We will record each subscriber’s navigation and clicks and use these to enrich the semantic profile managed within DR Koncerthuset’s data mart. In turn, this data will be fed back into DataRobot to improve the accuracy of the machine learning models. Also, these profiles will increasingly play a role in digital advertising, allowing us to serve personalized content as subscribers interact on social media platforms.”

Beyond marketing, Kim is working on plans for AI augmentation for the concert hall’s management team. DR Koncerthuset can be viewed as a complex system: it has many halls, multiple times slots for concerts, a myriad of performing artists, and a host of audience members. The management team must annually plan a schedule of potential events for the next financial year. Kim is confident that ONE can use DataRobot to provide DR Koncerthuset with a system to model the revenue impacts of changing the event schedules, including locations and times. These models will allow the concert hall’s management team to better satisfy the needs of their subscribers while meeting their revenue plans.

ONE innovates its business with machine learning marketing service

Buoyed by their success with machine learning models at DR Koncerthuset, the team at ONE is developing a data-driven marketing service to offer to all their clients. “The concept of a semantic match has proven to be useful and reusable across different clients with very different data,” Kim observed. “Semantic match is content agnostic, meaning it doesn’t matter whether the subject is concerts, insurance policies, washing machines, or telecommunications services. So for our new marketing service, we will start with a basic model and improve it by working with the client’s data. DataRobot is very powerful in this regard, as it analyzes each client’s data sets to identify features that will improve the predictive accuracy of a model.”

There is a reason ONE has chosen to develop its new marketing service with DataRobot. “We could not do it without DataRobot. It would be simply impossible to create the number of models we need,” said Kim. “Also, DataRobot frees us to do real data science. We can theorize about features that might affect a prediction, then we put DataRobot to work and experiment to test our theories. We quickly learn whether a feature does or does not have an impact on a model’s predictive accuracy. We use this knowledge to evolve our models. This creative and experimental approach would be impossible using the old-fashioned approach of manually developing machine learning models. It would require too many people and take so much time and be so prohibitively expensive that no company could afford it.”

ONE is keen to prove that marketing automation and sophisticated data-driven strategies are now accessible to every organization, regardless of the size of their marketing team or depth of their budget. “The economics of automation with DataRobot means we can provide this data-driven marketing service to

smaller organizations," explained Kim. "Previously, the approach of using many of hours work by expensive data scientists put data-driven marketing out of reach of many organizations."

Kim is confident the new service will usher in a more productive future for marketing. "If you can predict the most probable next step or activity your customer will take, you can then deploy your marketing resources to encourage progress down that route. DataRobot models will predict which of your activities will deliver the greatest impact or best outcome to move a prospect or customer through their customer journey."

By building on valuable experience at DR Koncerthuset, the team at ONE is confident it can deliver this future with minimal disruption to their clients' business operations and systems. "We can quickly put models developed in DataRobot into our clients' operational systems," Kim explained.

DataRobot as the enabler of business-focused machine learning

Kim has found working with DataRobot to be very easy. "I am not a data scientist," he declared. "I have not had to spend time figuring out how to use DataRobot. Instead, I just focus on working out which features to test in our models and on finding creative approaches, such as our semantic profiles and semantic matching, to help our clients deliver marketing communications that are valued by their subscribers. DataRobot frees people to experiment and try different approaches, with no real cost."

Freeing the team at ONE to experiment with complicated machine learning and predictive modeling technologies allows the company to develop more solutions more rapidly than would ever be possible without the DataRobot automated machine learning platform. Not only does automated machine learning transcend the capabilities of rule-based personalization in marketing, but as ONE Marketing has realized, it results in tangible business value for all business functions across any organization, regardless of size.

"Existing systems just need to call an API. Implementing machine learning with DataRobot is very clean, and the existing systems and their IT support teams don't need to know anything about predictive modeling. This makes our new service available to all clients, not just the largest enterprises."

— Kim Gregersen

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