E-Commerce Promotion Personalization with AWS

Affine
Data ▸ Insights ▸ Transformation

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Contents

Abstract

Amazon Web Services (AWS) offers a range of global cloud-based products and enterprise applications: on-demand, with pay-as-you-go pricing that can be made available in a matter of seconds. With over 140 AWS services available from data warehousing to deployment tools and directories to content delivery, modern services can be setting up quickly, without the upfront capital expense.

With such a vast array of available services in the market, enterprises of all sizes along with customers in the public sectors can now access the building blocks they need to respond to the dynamic business environment.

This whitepaper provides an overview of some AWS Cloud services that can be used to create a data driven personalized recommendation engine to drive growth in revenue from higher conversion rates through an enhanced system of online customer engagement.

Introduction

E-commerce Personalization is the display of individualized offers, product recommendations, and other content to your visitors based on their previous actions, demographics, and other personal data.

Personalization ensures promoting offers that are relevant to individual consumers based on their consumption pattern. Ecommerce personalization trends suggest that visitors want more, rather than less personalization.

A survey-based study on consumers acceptance of a more intuitive, tech-driven brand experience confirms a 41% consumer-switch in companies that costed businesses over $756 Billion. Over 25,000 global consumers including 2,000 from U.S. confirms that this switch was due to a lack of trust and poor personalization

Other findings from the report confirm that 43% of U.S. consumers are more likely to make purchases with companies that personalize experiences. 31% of consumers also reported in finding great value in services that automatically learn about their needs to personalize recommendations.

Today's evolving e-commerce market forces retailers & marketers to pay close attention to the user experience at the risk losing customers. Retailers must try and provide a personalized brand experience in order to engage their existing customers while attracting new ones so as to survive and adapt to the changing market requirements.

Compared to traditional retail shopping, e-commerce stores lack face-to-face personal interaction. Online stores do not have a retail clerk who can recommend products based on your interests, tastes or preferences.

To mimic this experience, e-commerce companies leverage personalization opportunities throughout the shopping journey. Similar to how online course providers replace the need for an in-person teaching experience, e-commerce is replacing the need for in-store retail experiences.

By using personal online data from your applications activity stream such as search clicks, page views, signups, subscriptions, purchase history, etc. brands transform their online stores to best serve the customer's needs and interests. For example, a video streaming website such as Netflix can help users discover additional T.V. shows of interest by providing recommendations on the home screen based on past viewing habits and demographics. Once users begin to drill down into individual programs, similar content within the same genre that they may be of interest can be also be displayed.

E-commerce retailers have very dynamic portfolio of diverse products and offers because they are not constrained by inventory and tagging effort. Personalization enables consumers to single out the products they need easily, thus enhancing the online shopping experience.

Personalization with AWS

Automated personalized promotions are the dream for any e-commerce company. It ensures the best experience for consumers without the need for any manual interventions or delay. This requires the seamless integration of advanced analytics, technology and engaging designs scalable on heavy infrastructures ready for real-time deployment and tracking.

AWS (Amazon Web Services) provide a variety of products that make it very easy to seamlessly unify different solution components to provide an automated, robust and scalable Personalize Promotion Solution based on demographic user information such as age, or geographic location.

Amazon Personalize will process and examine the data, identify what is meaningful, select the right algorithms, train and optimize a personalization model that is customized for your data.

When promotions are personalized to fit a particular consumer, the value additions to a product may be multi-folded. But none of that will matter if e-commerce fails to meet user needs in a manner to justify the investment.

Successfully managing eCommerce personalization in 2020 can boost your profits up to 15% as predicted by Gartner.

Business Problem

A leading e-commerce company based out of U.S. specializing in image publishing services such as prints, photobooks, photo gifts, etc. observed a steady decline in customer engagements from their existing promotions.

We wanted to create a personalized promotion recommendation system which will deliver a preset number of promotions to each of its customers through their online shopping portal.

The objective of personalization is to increase the engagement of existing customers and conversion of online promotions.

Output Requirements

Develop a data-driven personalized promotions engine that automatically generates recommendations on a weekly basis for three different types of promotions for individual customers based on their transactions and browsing history.

The development of such an engine would also allow the measurement of the incremental revenue driven through personalized offers.

Challenges & Innovations

Data gathering and processing for intelligence extraction is one of the biggest challenges faced by developers when trying to creating an application of such a large magnitude. To briefly explain, we are dealing with approximately 350GBs of modelling data, 2 TB of browsing data, 10 data tables from Teradata and 2 tables in BigQuery with raw browsing data.

Estimation of customer propensities across categories or the amalgamation of business heuristics and machine learning for continuous upgrades become key innovations in approach when dealing with data that is distributed across multiple sources.

Big Data Infrastructure limitations may even require enterprise wide technology migration. For instance: Data migration from Google Cloud Platform (GCP) to Amazon Web Services (AWS) due to insufficient support to handle Big Data.

Expected outcomes

The recommendation engine leverages a pool of machine learning models and business rulesets after which it sends 3 personalized campaigns per week per customer to targeted 5 Million customers.

The Journey at a Glance

Holiday seasons (Q4) in the U.S market is a period when sales promotions & marketing activities amplify. Our objective is to scale up the campaign up to 3 times in a span of 10 weeks.

In order to effectively launch the Personalised Promotion Campaign in the month of November, we will have to first develop a solutions & recommendations engine design in the month of April for the Engagement Kick Off. It is in this phase we develop Machine Learning Models for the recommendation engine from Transaction & Browsing data with the use of Data Engineering & Feature Engineering.

Post hypothesis and identification of influential factors driving engagement, we are good to launch the Personalised Promotions Program in July. This is where we roll out the campaign to test users for automating ETL process and designing the promotions tracking dashboard.

In the month of August, we will measure the effectiveness of the campaign to identify room for model improvements.

Once we have successfully completed the above-mentioned steps, we can migrate the data to AWS for effective scale up and campaign launch with additional promotions for the holiday season. The migration to AWS will be active and ongoing to ensure aligning with an organization-wide AWS migration.

And finally, the month of December will be dedicated to ongoing Promotion Optimisation which will comprise of:

- A solution design phase and approach finalization.
- Optimization of product discount depths by price & discount optimization.
- Forecasting base demand, seasonal & promotional demands, etc.

The Solution Architecture

To explain the solution architecture in simple terms we must first segregate customer segments based on browsing & purchase patterns. In this case our Data engineering will be layered around three Master Datasets:

- **Customers with only transaction behaviour.**
- **Customers with only browsing behaviour, i.e. customers yet to make their first transaction.**
- **Customers with transaction & browsing behaviour.**

The next step is to separate product attributes based on their Hierarchy level, Category and Product type. This will help classify them across different categories and identify if an item is fast-growing or newly launched, margins based on price, etc.

Once we have classified the different types of products and consumers, it is now easier to segregate promotions based on their attributes and applicability to different consumer segments.

Segmentation is key to getting personalization right. Whether visitors are new or returning, where they're coming from, the device they're using, and their behavior on your site all make a difference to the offers you show them.

Data Engineering Layers: How it works:

- **Store your inventory and user demographics data**
- **Stream user activity from applications using API, JavaScript library, etc.**
- **Automatically process and examine the data, identify what is meaningful, select the right algorithms, train and optimize a personalization model that is customised for your data.**
- **Customized personalisation provides amazon with a personalised activity stream to generate real-time recommendations in bulk.**

Amazon Web Services and its Components

AWS provide several tools and applications to train and deploy models based on this data. Developers can then use a simple inference API to get personalized recommendations at run-time and generate a brand experience for the end users according to the type of personalization model. For instance - user personalization, related items or personalized reranking, etc.

To start cracking codes with tools and applications like Teradata, Python, Google BigQuery and Tableau, we create various regression methods and KNN algorithms taking into consideration data from order attributes, SKUs purchased and their applicable promotions to effectively probe and increase foot falls for higher engagement on the website which ultimately boosts conversion rates and revenue margins.

The Analytical Approach

Data extracted from Feature Engineering is formulated into category propensities based on visits, number of orders, order value, etc. This information is fed into the Personalised recommendation system's Supervised Tree Based Ensemble Regressor using Python on Google Cloud Platform to create an order value ranking for all promotions based on order value predictions.

With all this data in place, we can now provide personalized recommendations to customers in different segments. Mentioned below are the basis of recommendations provided to each customer in the following three segments:

- **Customers with only transaction behaviour -** receives recommendations based on customer Recency (Days since last order), Frequency (number of orders), Monetary (Average Order Value) thresholds for RFM segments.
- **Customers with only browsing behaviour** - receive "my offers" and additional promotion codes on the browsing monitor. This again will act as a tool to measure the effectiveness of promotions. The customer response will be added to the master dataset for further enhancing the recommendation system.
- **Customers with transaction & browsing behaviour** – receives a combination of recommendations based on recency of visits in categories and the customer RFM segment.

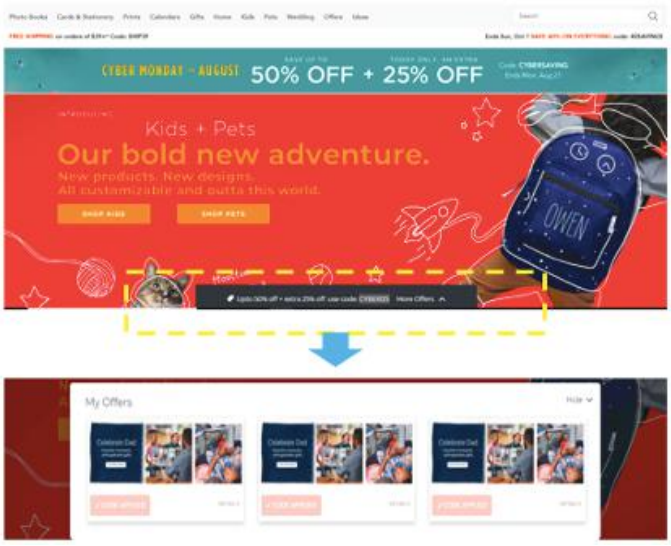
Output

Three different promotions for every customer based on transactions, browsing history and data available from similar customers. These may take the form of notifications or emails and personalised promotions available to customers visiting the website.

Promotions Recommendations on Website

Customers Notified On The Website On The Upcoming Launch Of Personalized Promotions And Offers

Once the customer clicks on "My Offers" drawer, they have an option to select from three personalized offers



The solution bought about an 8% lift in conversion rates resulting in an incremental revenue lift of over $1 Million over the period of these 10 weeks.

Conclusion

Enriching Personalization with Custom Notifications & Search Results

Timing is everything. Online users often get frustrated with irrelevant search results when they fail to find the specific item they're looking for. Product and content recommendations tailored to a user's profile and habits are more likely to result in a conversion.

If a customer has spent time browsing products on your site, you need to understand what they're looking for and respond with the right recommendations before they move on to another site. Affine's Optimized Personalization Recommendation Engine blends in data from user's real-time activity with existing user profile and product information to identify the right product recommendations for that moment.

For an optimal user experience, instead of a single or uniform consumer experience, search results & product promotions should be tailored to consider an individual user's behavior, history, and preferences as a measure of boosting engagement and satisfaction in a manner of relevance to that individual, as opposed to just the search term.

Marketing promotions based on user behavior is more likely to convert as they align with interests and context. For instance, creating attractive digital content and designs that can be adapted to different screen sizes - mobile applications vs browsing website on the laptop. Simply creating generic content hoping for the best is like blind folded target practice.

Benefits such as reduced cart abandonment or higher customer engagements & conversion rates through quality content creation based on real-time recommendations are merely the means to achieving the objective.

Affine's intent with the recommendation system was to simply ensure that each user receives the most relevant marketing communication, so you can better reach them with the right message at the right time. We believed that the rest would fall in place if we got this right!

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About Affine

Affine is a Data Sciences & AI services provider, offering capabilities across the analytical value chain from data engineering to analytical modelling and business intelligence to solve strategic & day to day business challenges of organizations worldwide.

Affine is a strategic analytics partner to medium and large-sized organizations (majorly Fortune 500 & Global 1000) around the globe that creates cutting-edge creative solutions for their business challenges.

Affine develops solutions for multiple verticals such as Oil & Gas, Manufacturing, High-Technology, CPG, Gaming, Media & Entertainment to name some and is respected as one of the Marquee names in the “Consultancies for Transformation” space.

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