Case study: The Woobles: The power of recommendation systems to drive sales

Previously, you learned that data professionals use machine learning to discover patterns in data and make informed predictions. This case study describes how [The Woobles](#), an online retailer based in Cary, North Carolina, uses machine learning and website analytics to grow their business and enhance customer experience. You'll learn how machine learning generates personalized product recommendations to save time and increase sales. You also learn how chatbots enabled by machine learning can improve customer service.

Company background

Founders, Justine Tiu and Adrian Zhang, established The Woobles as an online retailer of crochet amigurumi kits. **Amigurumi** is the art of crocheting (or knitting) miniature figures. The word is a mashup of two Japanese words, "ami," which means crochet, and "nuigurumi," which means stuffed doll. The penguin, shown below, is one of its most popular kits.

When Justine began teaching herself how to make amigurumi animals, she encountered many roadblocks to learning - from having to piece together videos, blogs, and incomplete instructions. Only after many mistakes and multiple iterations did a cute penguin emerge out of her efforts!

Justine thought there must be a better way, and that inspired the creation of The Woobles. Each kit offered in the online store contains everything anyone—from a beginner to an advanced creator—needs to be successful with crochet amigurumi. Resonating with the current trend of people desiring to upskill, The Woobles store on the Shopify e-commerce platform helps people prove to themselves (in a fun way) that they're capable of learning something new.

The challenge

E-commerce stores display product recommendations as links to products a customer might also be interested in purchasing. Product recommendations on The Woobles' website help drive product sales. The biggest challenge is making sure that the right products are recommended to the right customers at the right time, all in hopes of increasing sales.

The Woobles gets some help from Shopify's machine learning. Businesses that implement product recommendations with machine learning don't have to worry about the details to create or personalize them for each customer; they can focus their time on other important matters. As Adrian described it, "Working with machine learning is a black box. You plug things in and hope something good happens. It's helpful to know what machine learning is looking at, but as an entrepreneur, I wouldn't want to know all the ins and outs."

As entrepreneurs and business owners, Adrian and Justine do not have the time or expertise to develop their own recommendation systems. To them, these systems seem like a black box, but to the data scientists who create them, they're quite understandable!

The approach

The Woobles relies on a combination of machine learning and analytics to ensure that product recommendations displayed to customers lead to the greatest increase in sales. It uses an automated and manual approach to managing product recommendations on its website. Website metrics from Google Analytics and analytics data from Triple Whale inform both machine-based and human decisions about which recommendations to display.

Automated recommendations on product pages

The Woobles displays product recommendations at the bottom of each product page to encourage customers to continue browsing and shopping.
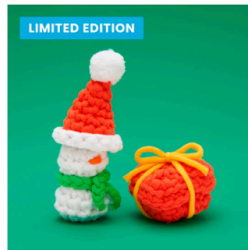
LIMITED EDITION SNOW MUCH FUN ACCESSORY BUNDLE
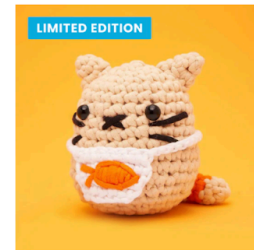Beginner+
$12 $15
SALE

WOOBLY WONDERLAND TIN
The Woobles
$5

TINY CROWN KIT
★★★★★ 2 reviews
Accessory
$5

CAT CROCHET KIT
★★★★★ 63 reviews
Beginner+
$25–$30

Because The Woobles is hosted on the Shopify e-commerce platform, Shopify's machine learning algorithm automatically generates these recommendations. The algorithm relies on purchase history data to recommend products that have historically been purchased together. It also relies on product descriptions in the store to recommend products with similar descriptions.

These recommendation algorithms are complex and closely guarded proprietary secrets, as they are very valuable in today's e-commerce landscape. They can make use of elements from both content-based and collaborative filtering. They also can make use of some natural language processing (NLP) techniques, as is the case here.

In this case, the algorithm might use content-based filtering to compare all of the items that The Woobles sells and assign each to a place in a featurespace. For instance, beginner-level kits might be closer to each other in this featurespace than expert-level kits.

At the same time, the model can use collaborative filtering in conjunction with average item scores on the website. For example, if a person shows interest in product A, and the highest similarity score from a content-based filtering approach returns product B with a 3.9-star rating, and product C is in second place by similarity score but it has a 4.9-star rating, it may combine this information to offer product C to the customer.

Finally, the algorithm uses NLP techniques to help determine product similarities. To do this, it might use a "bag of words" technique. This is a method in which, for each product, the description is "tokenized," or separated into its individual words, which are then used as features. The words are then counted. So, if the words "needle," "pattern," and "expert" appear five, three, and two times, respectively, these counts are captured. This is repeated for all of the products, and the resulting word counts are put into what's known as a "document-term matrix"—essentially a table with words as columns and products as rows. Then the algorithm calculates the distance between each product

vector. There are many different ways of doing this, and they can be very complex. Ultimately, the products with the least distance between them or the greatest similarity are then recommended.

Key benefits of Shopify's product recommendations

- Shopify generates the links to the recommended products and the process is automated using Shopify's machine learning algorithm.
- Shopify uses customer transaction data to ensure its product recommendations algorithm has up-to-date information when selecting products to recommend.
- The cost to increase sales via auto-generated product recommendations is minimal.

The results

Automated product recommendations enhance the customer shopping experience by helping them find relevant products, while maximizing cart order values. There are many ways that online retailers can try to increase sales, but implementing product recommendations is a cost-effective option that has been proven to pay off for The Woobles. In particular, product recommendations that are auto-generated by Shopify's machine learning algorithm provide a personalized shopping experience to each customer. Customers save time by having product links presented to them, and this personalization is achieved without any manual work or additional time commitments by The Woobles staff. In fact, The Woobles estimates Shopify's product recommendations on product pages saves five hours per month in manual labor since the process is automated through machine learning.

The future

Product recommendation isn't the only way for a small business to leverage machine learning. As their business has grown, so too has the number of questions related to product information, shipping, billing, and other routine aspects of commerce. A lot of time is spent responding to these inquiries. To help them, The Woobles would like to implement another solution enabled by machine learning: chatbots. **Chatbots** are software programs designed to simulate conversation with human users, especially over the Internet. The Woobles envisions that chatbots could help answer questions potential customers have after they watch any of the crochet tutorials offered on the website. Chatbots can assist with certain aspects of customer acquisition, such as customer education.

Like recommendation systems, chatbots are highly complex, multilayer algorithms that make use of multiple techniques. For example, a chatbot might break down sentences into bags of words or "n-grams" (combinations comprised of *n* number of words), then use unsupervised learning to

reduce the dimensionality of the resulting vector matrix and cluster it, and use supervised learning to predict the words most likely to follow a given prompt. The result, ideally, is an experience that is indistinguishable from chatting with a human being.

Key takeaways

Below is a summary of the main insights from this case study.

- **Recommendation engines can use combinations of content-based and collaborative filtering.** Products can be compared based on intrinsic similarities *and* offered based on collaborative satisfaction ratings. NLP can be used to help determine content-based similarity metrics.
- **Businesses that implement product recommendations with machine learning save time.** By using an ML-driven solution to product recommendations, The Woobles don't have to regularly spend time manually updating recommendations as new data and products come in.
- **Analysis of current sales data and customer trends is critical in selecting the products featured in product recommendations.** An automated approach to managing online product recommendations is an effective component of The Woobles' strategy to increase sales and maximize cart order values.
- **Chatbots enabled by machine learning could also be implemented to assist with other time-consuming tasks**, such as the customer education aspects of customer acquisition.