

Dynamic Contextualization for Starbucks Orders



The sponsor of our project was the Analytics & Insights Team at Starbucks Corporation. We worked closely with a Senior Data Scientist and a Data Science Lead Manager on the A/I team throughout the data ingesting, data cleaning, and solution implementation.

Starbucks recently deployed a new product recommendation system on their drive-thru screens at 4,000 Starbucks locations. This recommendation system has been in use for the last year. Now the company would like to do a redesign of the interface and has tasked a UX team to refresh the screens. The ultimate goal of this project is to both optimize the conversion rate of Starbucks customers and to better communicate why the customer should purchase the items of interest to increase the likelihood of the product being purchased. The new design recommendations include more dynamic content to increase screen engagement and sales. The hypothesis is that if better communication is provided through headlines that show the customer why they are seeing particular products, there will be a higher revenue.

PROJECT GOALS

Our system predicts context labels to a requesting store based on conditions like the weather and the time of day. These context labels are then used to form potential headlines that would match these recommended products.

Out of all the potential headlines, we picked the one that would give us the highest conversion rate (customers who actually would purchase the product). Our approach involved the use of reinforcement learning in the form of multi-armed bandits to determine the optimal headline choice.

We were faced with the problem of a cold start (unsupervised learning) due to the lack of historical data regarding screen engagement with these newly generated headlines. To combat that, we adopted the Thompson Sampling algorithm, which uses a beta distribution as a parametric assumption to model the prior unknown distribution. The model recursively continues to learn and adjusts the reward model as a result.

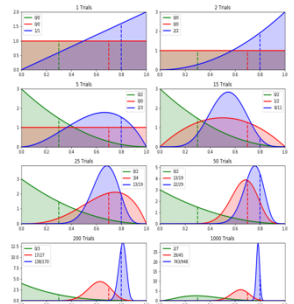
DATA USED

- > **ACTION REWARDS:** Maps impressions to successful conversions
- > **WEATHER:** Normalized weather features per seasonality
- > **STORE:** Store-level features such as ID and location
- > **PRODUCT:** Product features such as product type, name, flavors, etc.

MULTI-ARMED BANDITS

The multi-armed bandit problem models an agent that wants to simultaneously acquire new knowledge (exploration) and optimize decisions based on existing knowledge (exploitation).

The information gained from the data gathered will shift the distribution in different ways to reflect an accurate reward model.



PROJECT MEMBERS



Five UW M.S. in Data Science students tasked with this project include (from left to right): Leena Elamrawy, Anant Rajeev, Corina Geier, Christie L. Gan, Emily Yamauchi

