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| Executive Summary |

# Objective

On April 14, 2022, Puma launched a 12-week sponsor project for this capstone course. This involved working with proprietary sales order data with one of their retail customers. Capstone groups were asked to develop a predictive model that will help them reduce product shortages which leads to cancellations and lost sales. There is upwards of $80 million in financial impacts that can be realized from the success of this project.

## How We Solved It

In the first week, our group laid out a project roadmap outlining the timeline of the project. During this time, the group examined the three data sets provided by the sponsor and brainstormed ideas for a solution. In week four, a machine learning pipeline is initiated, and three scripts are created:

Script one focused on the cleaning, merging, feature engineering of the original data set and then exports them into separate csv files which can be used later for EDA and modeling.

Script two concentrated on the EDA of either the footwear, apparel, or accessories data set.

Script three centered on predictive modeling. In the end, several models were created and compared together.

## Results

Six models were tested and scored using R2:

Prophet: .52 Random Forest: .24 Lasso: .04

Linear Regression: .04 Decision Tree: .03 Exponential Smoothing: N/A

## Conclusions

Our group believes Prophet is the most useful model for this business problem due to its emphasis on time-series forecasting with uncertainty and seasonality. Moreover, Prophet is capable of projecting daily forecast quantities which is the goal we wanted to achieve. The current Prophet model our group has created can be enhanced by supplementing the model with a list of the top 15 UPCs and iterating it to generate forecasts for all the main UPCs at one time. The files contained in this package include all the scripts needed to recreate the items produced by this group.