PROBLEM STATEMENT

WHY?
A product's own price, as well as the prices of other products like itself, will heavily impact consumer demand.

WHAT?
Maximize revenue for Matas by placing products on promotion at the right time with the right amount of discount to take advantage of cross-price effects.

HOW?
Sparse Regression identifies top cross-price effects to include in demand models. Dynamic Promotion determines the best price to set items at each time step based on demand models.

CLUSTER WHILE REGRESS

PRODUCT DEMAND CLUSTERING

Optimization Formulation
For L clusters, we fit a demand model and assign products to the cluster they fit best.

\[
\begin{align*}
\min_{s.t.} & \sum_{i=1}^{L} \left( p_i \sum_{k=1}^{n} f_k(a_{ik}) \right) + \lambda R(f_1, \ldots, f_L) \\
\text{Minimize Loss} & \\
\text{1. Products can only belong to 1 cluster.} & \\
\text{2. Binary decision} &
\end{align*}
\]

CROSS-EFFECT IDENTIFICATION

DATA
3 years of transactions of 100 health care products

METHOD
Min: \( \sum_{i=1}^{L} p_i \sum_{k=1}^{n} f_k(a_{ik}) \)

Solve Demands Models

DYNAMIC PROMOTION

Optimization Formulation
During a specific time horizon, we find the optimal promotion strategy considering the following restrictions:

\[
\begin{align*}
\max_{f_{i,k}, t} & \sum_{i=1}^{L} \sum_{k=1}^{k_i} \left( p_{i,k} \cdot d(p_{i,k}, p_{i,k} - \Delta) \right) \\
\text{Maximize Revenue} & \\
\text{s.t.} & \sum_{k=1}^{k_i} Y_{i,k,t} = 1 \\
& \forall i, t \\
& \forall i, t \\
& \forall i, t \\
& \forall i, t \\
& \forall i, t \\
& \forall i, t \end{align*}
\]

Greedy Dynamic Programming

OPTIMALITY GAP – 0%

BASELINE IMPROVEMENT – 1.8%

SCALEABLE – Optimizes for 1000+ Products in 5 Hours

CONCLUSIONS AND RESULTS

IMPACT
• Pipeline converting readily available transaction data into pricing strategies
• 1.8% increase in revenue per year
• Finds a pricing strategy for 1000+ products for the next year in only 5 hours for 2 possible prices

TAKEAWAYS
• Cross price effects are essential to account for in accurate demand models and pricing strategies
• Optimization helps the most with improving pricing strategies with fewer, strategically places promotions

NEXT STEPS
• Data Collection: Matas plans to collect more pricing data to better train future demand models
• Dynamic Promotion: Possible prices per item will be better identified to optimize with using our greedy approach