HW 9

Problem Statement

Shelf space optimization to maximize sales or profit is the goal.

- More shelf space given to a product = more sales
- More sales = more complementary product sales
- If the complementary products are next to each other, the complementary effects will be greater.

Possible Recommendations to the Big Box Retailer

Before we use any analytical models, it is vital to investigate the data that has been collected by the retailer about its products and its customer's transaction. In addition, we will also need to validate whether the hypothesis made by the retailer is correct or not.

Data about the below factors should be requested from the retailer to test the hypothesis.

1. Types of products sold = Categorical Variable
2. Product sales data = Quantitative Variable
3. Shelf Space given to a product = Quantitative Variable
4. Types of Complementary products sold = Categorical Variable
5. Complementary product sales = Quantitative Variable
6. Shelf space given to a complementary product = Quantitative Variable

We can use linear regression to see whether any of the above factors had an impact on the overall sales. In order to test the first hypothesis, we can use change detection model. Since there could be other factors, such as sasonality and trends, the data needs to be detrended. A/B testing could also be used to detect the correlation between shelf space and sales. Regression could also be used.

We also need to keep in mind that for any models we use, just because there is correlation, it does not mean causation. We will need to investigate further to verify whether the shelf space

in fact increases demand or creates demand. One way to deal with this issue is to experiment by reducing the shelf space for products and check whether the first hypothesis still holds true.

In order to find which products to be placed next to each other, we can use clustering. The closer complementary products are, the shorter the distance. After the cluster has been defined, optimization model can be used to assign shelf space for each product.