# 1. Scope & Brief:

The objective is to minimize OOS (out of stock) at stores and improve overall customer experience and satisfaction by ensuring the products are always available on shelves as well as in stock with the stores. The solution will not only track the items availability on the shelves in real time but also predict the expected OOS in advance to ensure enough supplies are available at all times enabling synchronization between suppliers and retailers.

The solution uses computer vision technique to track product depletion from the shelf in near real-time and based on the product run rate at particular hour which is being calculated using the transaction data a threshold is decided to trigger the store management to refill the shelf for particular products.

# 2. Data Gathering & Augmentation:

It is really hard for u to gather data to our solution specific case. As we had a solution which uses computer vision and predictive modelling so we need data for both to finish our POC.

## 2.1 Computer Vision:

1. For computer vision data has been taken from YouTube video, it’s a time lapse video of a small store which shows how the customers are picking the product form the shelf and the shelf is getting emptied at different rates.
2. For video we have to change the frame rate because the frames are very less and we are unable to train the model for that. The model and technologies used has been explained in detail in the [solution](#_4.2_Computer_vision) architecture section.

## 2.2 Transaction data:

1. For transaction we have taken data from Kaggle running competition, the link for the same is [here](https://www.kaggle.com/c/m5-forecasting-accuracy/data).
2. For transaction data we have taken from Kaggle it is not exactly as per our requirement so we have to do many transformations in it.

# 3. Challenges in Solution Development:

Below are the following challenges we face:

1. Data gathering was a challenge in terms of video and transaction data also, the same has been discussed [here](#_2._Data_Gathering).
2. The approach towards the solution we presented in the idea submission will need some dedicated time and effort which we try our best, but because of limited time availability we have in weekends only we are not able to develop the solution entirely what we thought although it is possible if more times has been given.

# 4. Current Solution Approach:

## 4.1 Technology used

We have used Deeplearning technology for the computer vision solution and standard machine learning for predictive analytics solution. The whole solution has been developed in python and the libraries we have used are YOLO (Deeplearning), pandas and NumPy.

## 4.2 Computer vision

In computer vision we have made a Deeplearning model using YOLO to identify in near rea time that how many products are available in the shelf at any given time. The model predicts the percentage of products available in the shelf by identifying the total number of voids (no products) in the shelf. Further based on the matrix (number of hours \* number of days) in which value represent the run rate or sell rate for any product which is being calculated using historic data a message has been triggered to store management for refiling the shelf thus ensuring high availability of the products on the shelf increasing customer satisfaction and experience overall.

## 4.3 Predictive:

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Different products have different sell rates some are being sold for example 5-6 in an hour and some 10-15 and to fill each shelf again with the products it requires manual effort of some time, that is why we can’t trigger the message for a fix threshold for all the products and we handle this situation in our solution making it more robust and practical in nature. Dynamic threshold is calculated for each product at hour level for different stores also

## 4.4 Solution architecture

## 4.5 How to run the solution

1. Install the libraries defined [here](#_4.1_Technology_used)
2. Download the project from git the link for the same is [here](https://github.com/ankitnamdeo34/hackerearth_p-g)
3. To run the computer vision code after installing all the libraries change the directory to the file shelf\_tracking.py.
4. Run the command python shelf\_tracking.py

# 5. Work done so far:

Below are some of the key works we have done:

1. Fast moving products identification.
2. Run rate matrix calculation
3. Product depletion rate identification using deep learning
4. Products available on the shelf in real-time using health percentage.

How to identify fast moving products:

Fill only if time allows?

# 6. What more we could have done:

Based on the plan we want to integrate the solution with pipeline but unfortunately because each of us working independently for different components of the solution we are unable to and we are using

# 7. Limitations with existing Solution:

Is a person pick up the product from one aisle and drop it to another aisle

# 8. Impact Analysis & Observations:

sdfasdf

# 9. Way Forward/Future Work:

To check the store layout desing with captured data etc