Optimized Warehouse Management of Goods

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What is Warehouse..?

A warehouse is a building for storing goods. Warehouses are used by manufacturers, importers, exporters, wholesalers and transport businesses. They are usually large buildings in industrial parks on the outskirts of cities, towns or villages. They usually have loading docks to load and unload goods from trucks. Sometimes warehouses are designed for the loading and unloading of goods directly from railways, airports, or seaports.

Problem Statement:

A food delivery service has to deal with a lot of perishable raw materials which makes it all, the most important factor for such a company is to accurately forecast daily and weekly demand. Too much inventory in the warehouse means more risk of wastage, and not enough could lead to out-of-stocks - and push customers to seek solutions from your competitors. The replenishment of majority of raw materials is done on weekly basis and since the raw material is perishable, the procurement planning is of utmost importance.

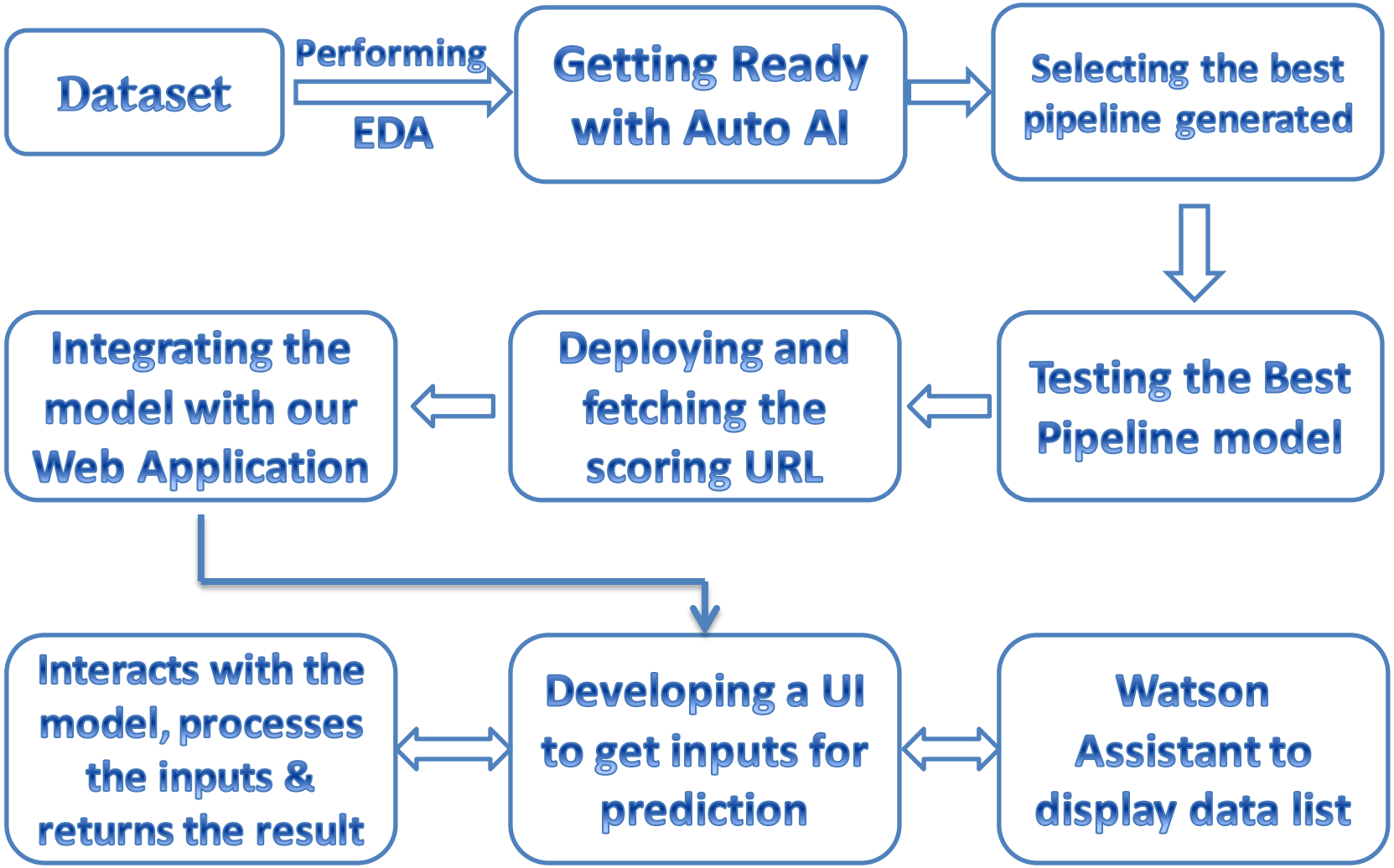
Existing Problem..!

All the existing food warehouse management models are only used to manage the goods that are already present there and they are not capable of predicting the amount of goods or stocks that will be required for the future. Knowing, storing, and using what you have at the right moment is a very complicated process. Inaccurate inventory counts are the most common issue. They cause discrepancies between what orders you think you can take and fill and what actually gets out the door to customers.

Proposed Solution

Our solution model will be able to predict the amount of goods required for the upcoming week, as the current warehouse systems are not capable to predict the goods this will be a huge advantage and uniqueness of our solution model which can predict with the help of our machine learning algorithms. We will also use the cloud technology to store the data of goods so that the count and accuracy is maintained in our solution and we have also produced a simple web application for the users to work with our model, so that they won't find any difficulties in getting the results and to access all the features available easily.

Block Diagram:



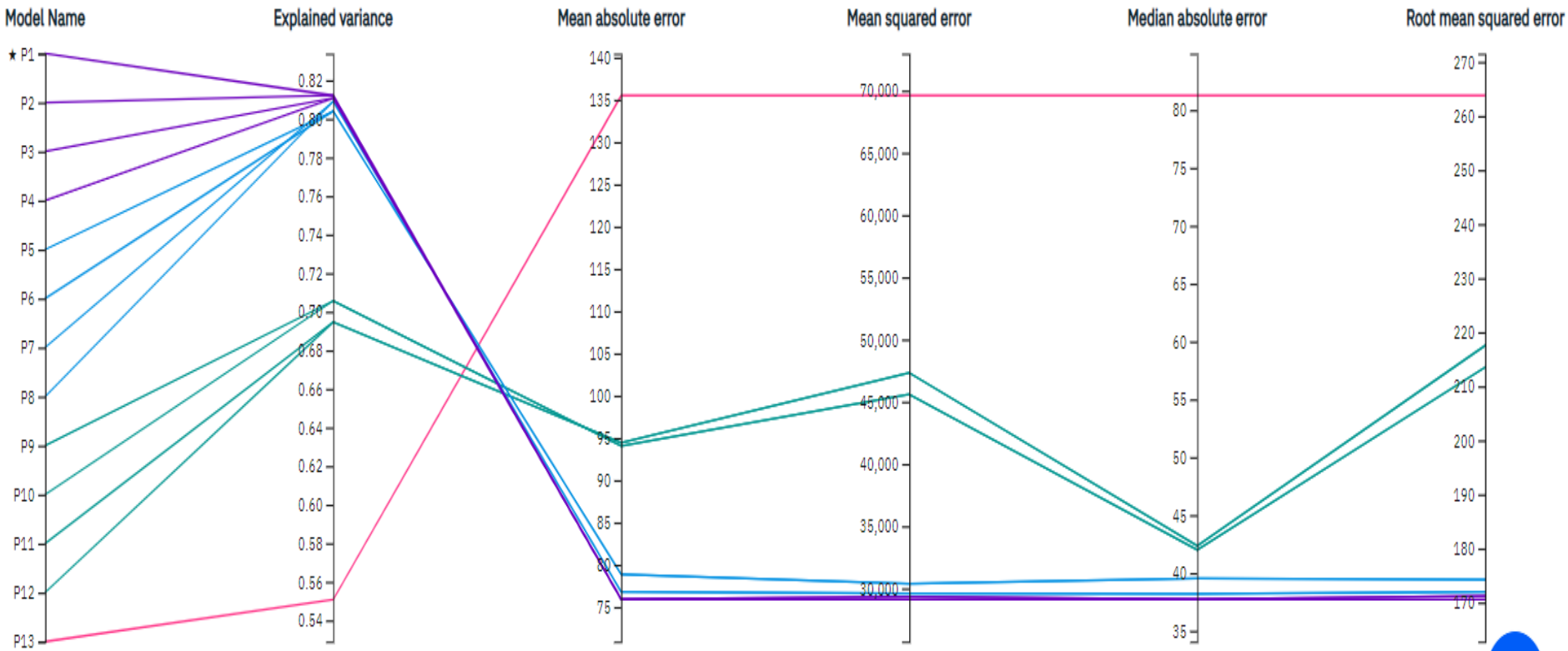
Results from Auto AI Experiment:

Rank ↑	Name	Algorithm	R^2	Enhancements
★ 1	Pipeline 1	Random Forest Regressor	**0.812**	*None*
2	Pipeline 2	Random Forest Regressor	**0.812**	HPO-1
3	Pipeline 3	Random Forest Regressor	**0.811**	HPO-1 FE
4	Pipeline 4	Random Forest Regressor	**0.811**	HPO-1 FE HPO-2
5	Pipeline 7	Extra Trees Regressor	**0.809**	HPO-1 FE
6	Pipeline 8	Extra Trees Regressor	**0.809**	HPO-1 FE HPO-2
7	Pipeline 5	Extra Trees Regressor	**0.804**	*None*
8	Pipeline 6	Extra Trees Regressor	**0.804**	HPO-1
9	Pipeline 9	Decision Tree Regressor	**0.706**	*None*
10	Pipeline 10	Decision Tree Regressor	**0.706**	HPO-1
11	Pipeline 11	Decision Tree Regressor	**0.695**	HPO-1 FE
12	Pipeline 12	Decision Tree Regressor	**0.695**	HPO-1 FE HPO-2

Evaluation Metrics of all Pipelines：

Metric chart ⓘ

Prediction column: orders



Evaluation Metric of the selected Pipeline：

Rank
1

Pipeline 1

Holdout RMSE *(Optimized)*
163.391

Algorithm
Random Forest Regressor

RandomForestRegressor

EVALUATION

Model Evaluation Measures

MODEL VIEWER

Model Information

Feature Importance

Model Evaluation Measures

TARGET : ORDERS

	Holdout Score	Cross Validation Score
Root Mean Squared Error (RMSE)	163.391	170.547
R^2	0.825	0.812
Explained Variance	0.825	0.812
Mean Squared Error (MSE)	26,696.550	29,102.729
Mean Squared Log Error (MSLE)	0.264	0.273
Mean Absolute Error (MAE)	73.391	75.876
Median Absolute Error (MedAE)	37.100	37.700

Feature importance for the chosen pipeline model:

Rank
1

Pipeline 1

Holdout RMSE *(Optimized)*
163.391

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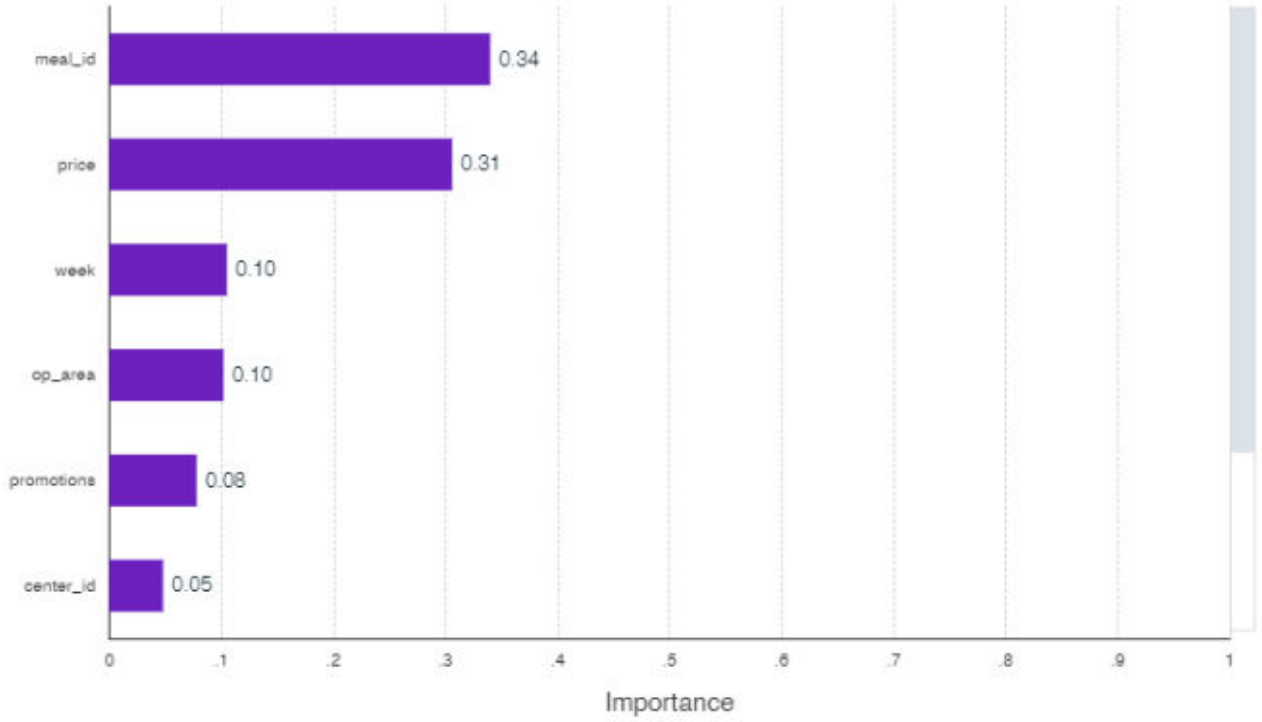
TARGET : ORDERS



Okay!! Now let's see our Web Application..!

MERITS:

- Our proposed model can predict the amount of goods required in a warehouse for the upcoming weeks with a pretty high accuracy (of 81.2%) with the past data that were provided to the model while training it.
- We have also implemented a chat-bot to respond for the queries regarding the data list of the warehouse.
- This model helps to import only required material and goods for the upcoming week or weeks. Hence, wastage of the goods is reduced dramatically and the profit of the company or industry will increase gradually, which also helps to improve their customer satisfaction and growth in marketing fields.
- The stocks in the warehouse can be maintained properly as only required amounts of goods will be present in the warehouse, which also helps the labors to continue their work efficiently.

DEMERITS:

- The model can take input only from the web application and it cannot predict automatically without any trigger.
- Our model works only with numeric data and it cannot take any images of the amount of goods or any other format for processing.
- Our model can only predict the goods for the next 10 weeks alone from now and cannot predict for the weeks after that.
- The model can only be updated manually for the upcoming weeks and has to be trained again to predict for the upcoming weeks from then.

Future Scope:

- Inventory is a strange thing. Having too much of it means you are wasting a ton of capital on rent, maintenance, and other costs related to your storage space.
- Having too little storage space, of course, means your current inventory is going unsold—and you also have no room for items that might be better for your business.
- The key is to have just the right amount of inventory space so as not to hinder your ability to fulfill your customers' needs, but not so much that it cuts into your bottom line. This is where our warehouse prediction model comes into play which can predict the required goods to for the warehouse, so that wastage of goods as well as over stock of goods in the warehouse.


Thank
You