# ThermoFisher

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PURDUE UNIVERSITY | The Data Mine

ThermoFisher SCIENTIFIC

## Introduction

### COMPANY BACKGROUND

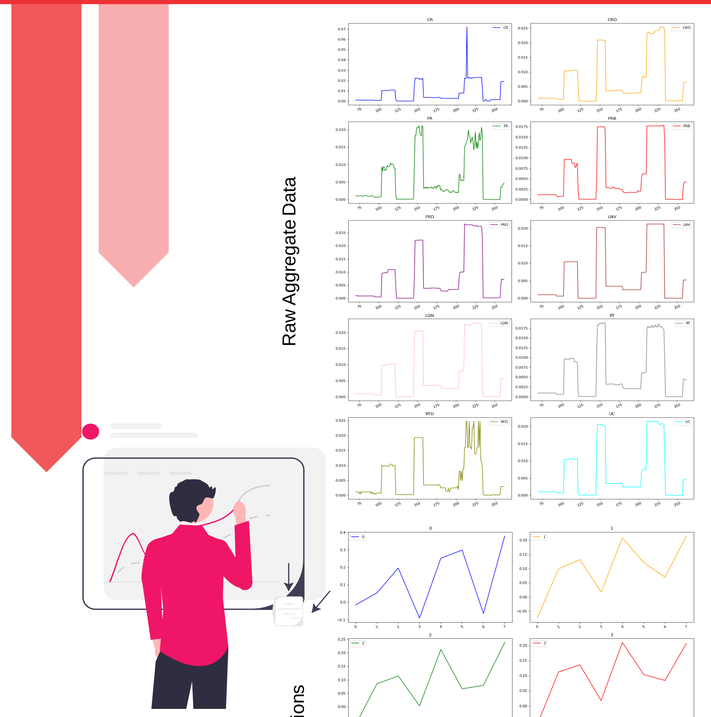
- Thermo Fisher Scientific Inc., a Fortune 100 Bio-Tech company, is the world leader in serving science, with annual revenue over $40 billion. Their mission is to enable their customers to make the world healthier, cleaner and safer.

### PROJECT SUMMARY

- Our goal is to create an easy-to-use application that can analyze their inventories' historical data of through an LSTM and forecast the necessary inventory capacity for their distribution centers.
- The model is isolated to a single warehouse, but the goal is to make it applicable by all their warehouses.

### PROJECT BENEFIT

- This project will help Thermo Fisher ensure that their distribution centers are operating at maximum efficiency, which will help researchers continue research without the fear of running out of equipment.
- It can also benefit them economically because it would avoid unused storage capacity or an overflow of inventory, which will help cut financial losses.



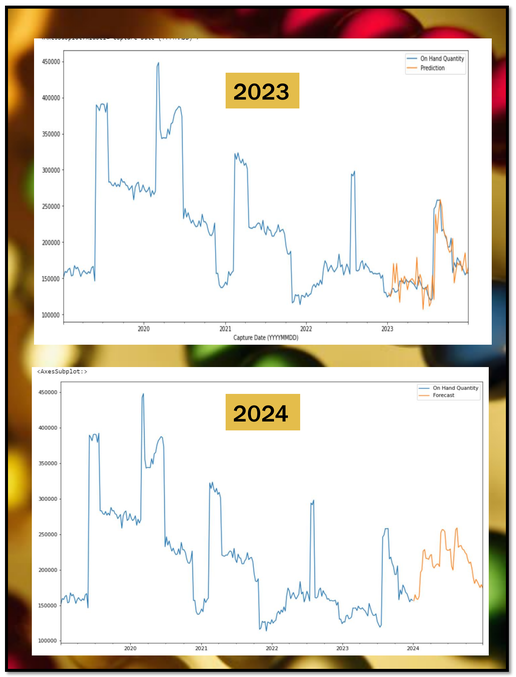

## MACHINE LEARNING MODEL

### Pre-processing the Data

- Excluded data with missing values.
- Converted the product quantity into measured volumes.
- Grouped & aggregated items by Storage Condition and time.
- Scaled data by minimum and maximum values of each group.

### The Model:

- Implemented a VAR (Vector Auto-Regression) model
- Allows us to use multivariate output as input to make multiple predictions into the future
- Utlizied Augmented Dickey–Fuller test, Granger Tests, and tested for multiple lag values prior to fitting the model




## STATISTICAL ANALYSIS

### Pre-processing the Data

- Combined five years of historical weekly inventory data to analyze the trend of inventory buildup
- Aggregated the SKUs based on storage condition type for more accurate analysis and forecasting
- Excluded anomalies in the historical inventory level data

### The Model:

- Implements a SARIMAX time series analysis model
- Investigate seasonal patterns within the historical inventory data.
- Forecast future inventory levels with a week-by-week precision.
- Utilizes MAPE for measuring forecast accuracy

### Visualization and Forecasting

- The graphs display inventory projections for freezer storage SKUs in the years 2023 and 2024.
- The forecasts are represented by an orange line, which contrasts with the actual inventory data.

## Conclusion

- We were able to create a distribution model for the California capacity center
- We hope to later expand to other Thermo Fisher capacity center locations as well

## Future Work

- Make the entire script into an API, so it can be implemented in any projects.
- Connect the work with a live database, to eliminate manual input
- Take large unexpected outliers into account.

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