NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Computer Science and Engineering
College of Engineering

Demand Forecasting

by Incorporating Sales Patterns of Product Groups

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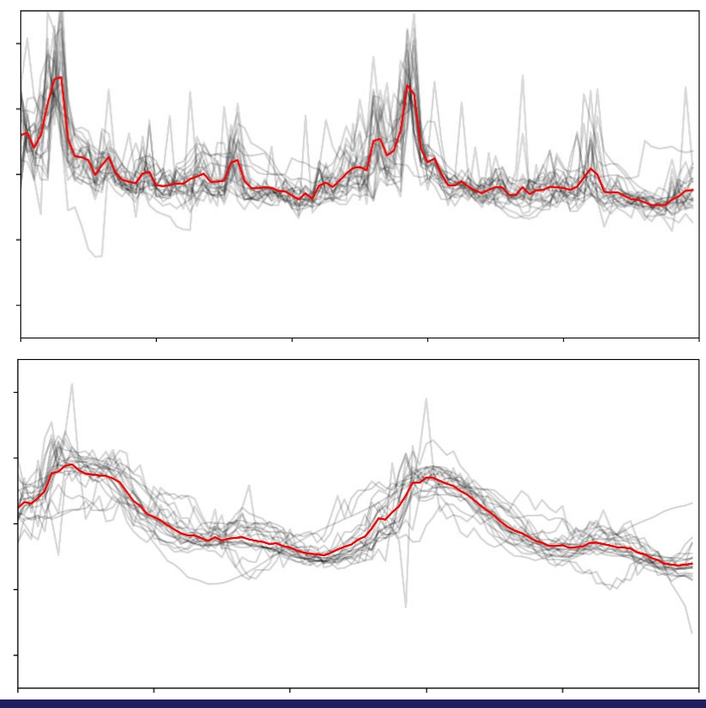
MOTIVATION

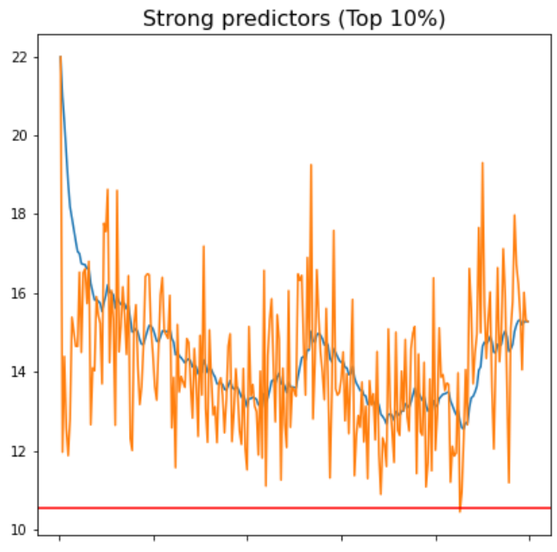
Accurate demand forecasting is crucial for industries who have both high lead time in productions and high inventory cost for holding stock. Weaker predictions were usually attributed to a lack of data. The project, therefore improving overall forecast accuracy while not compromising on explainability. In this project aim to **improve weaker performing predictors** by taking a clustering-based approach where product having similar sales patterns are clustered and predictive models are build based on product clusters.

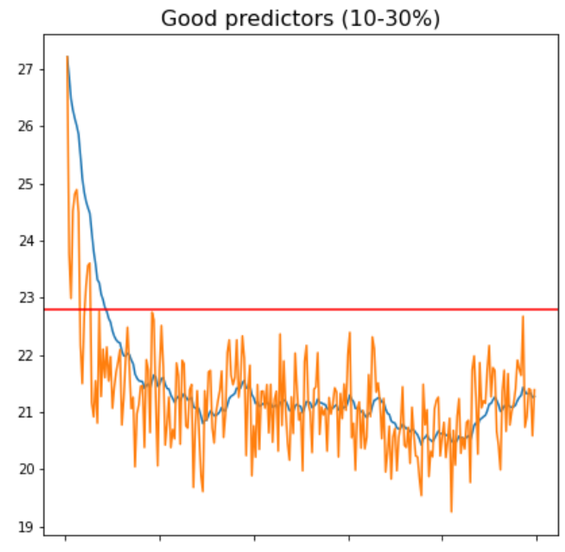
APPROACH

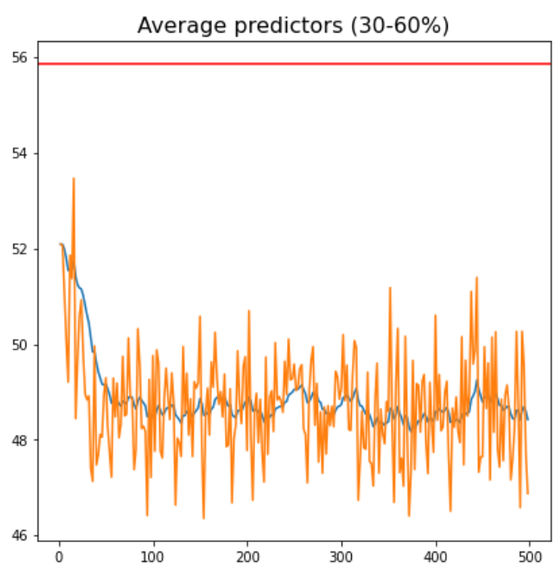
The best performing novel approach applies a 3-step routine to improve weaker-performing predictors. First, we **extract unique and meaningful features** from the time-series data and evaluate their impact for clustering. Second, we use **Deep Embedded Clustering** (DEC) on the extracted time-series features. DEC is an autoencoder-based deep clustering approach combined with feature extracted data, which allows us to capture complex patterns and relationships between similar time series data. Lastly, we use the relevant data from clustered products to **strengthen the weaker-performing predictors** in each cluster.

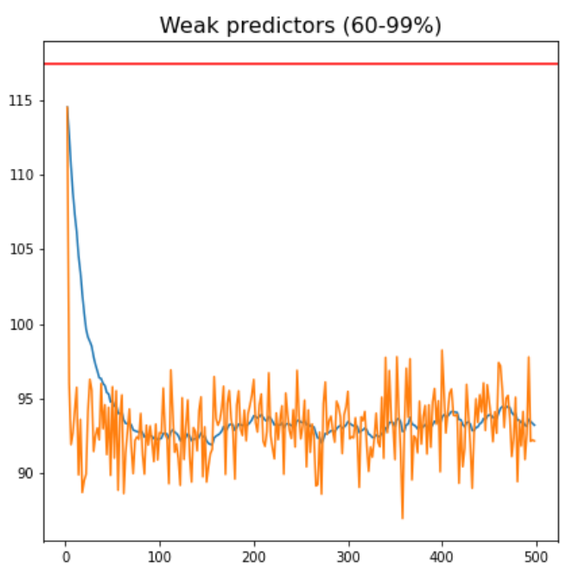


RESULTS









The red line shows the baseline model results, while the orange line shows the actual forecast accuracy calculated using Mean Absolute Scaled Error (MASE), where the **lower the error, the better the forecasting model**. The x-axis represents the number of time-series features that were extracted.

Using the red line as the benchmark, we can see that the DEC model significantly improves with

1. **Weaker predictors**
2. **Increasing number of features extracted**

In the final pipeline, the strong and good predictors are segregated out to the non-cluster forecast models to ensure that the originally strong predictors are not compromised.