How a Large CPG Company Estimates Profitability of its Products on Amazon Platform

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Abstract

In collaboration with a multinational consumer-packaged goods (CPG) company that sells its products on Amazon, this study aims to provide the business an enhanced decision support system for identifying profitable as well as underperforming products, using both statistical and machine learning models.

The scope of the study includes all vendors who sell their products on an ecommerce platform and find it challenging to understand the profitability of their product catalog. It will help them to optimize product strategy and channelize the marketing efforts efficiently, via accurate sales forecasting and profitability prediction at the granular level of stock-keeping units (SKU), in different time frames.

Introduction

CPG companies are increasingly moving their product portfolio to ecommerce platforms to tap into a massive online consumer base, with products spanning over multiple categories and price buckets. Amazon provides the perfect platform to statistically gauge the different attributes associated with a product to understand and maximize the profitability of a SKU. Figure 1. shows the clout of Amazon in the CPG ecommerce space in comparison to minuscule market share of its competitors.
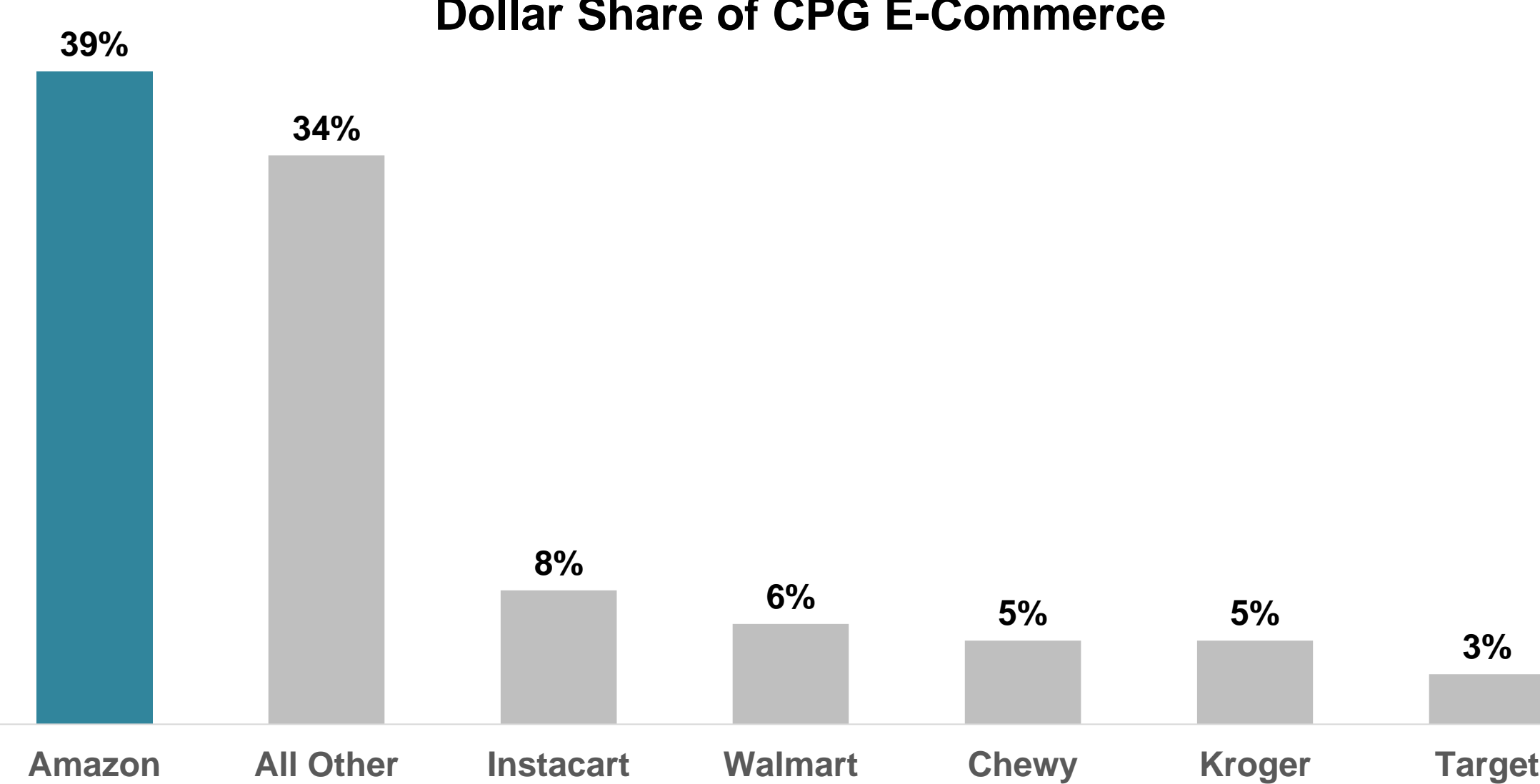
Dollar Share of CPG E-Commerce

Fig 1. Dominance held by Amazon in CPG ecommerce

Research Questions

1) How to estimate confidential Amazon metrics to better identify top and bottom performing products?
2) How to forecast weekly sales and product profitability at SKU level?
3) How to optimize profit margin, given specified business constraints?
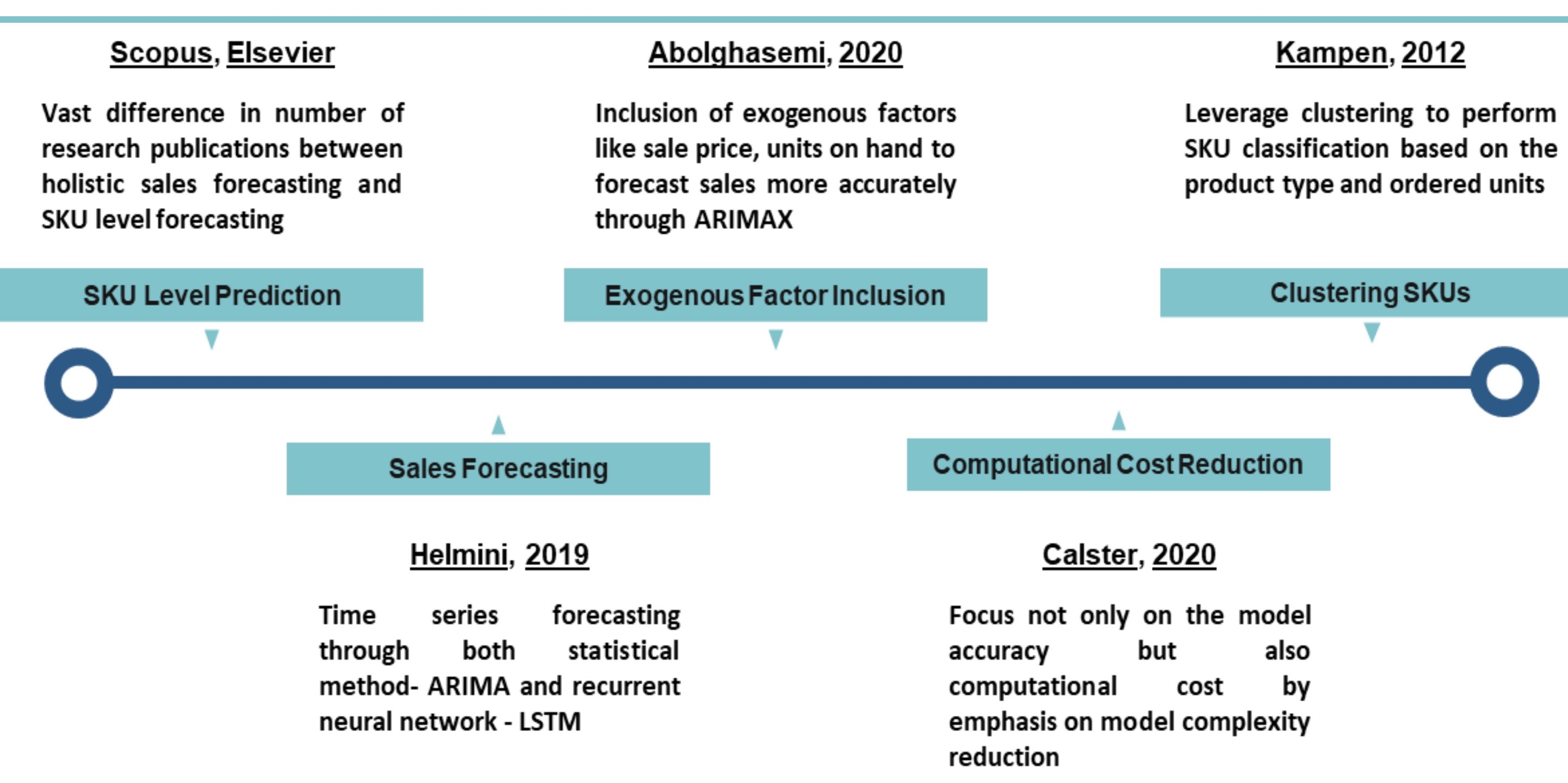
Literature Review

Fig 2. Improvement flags at various stages of study

Fig 2. shows the improvements at various stages of the SKU level research study based on several relevant research publications in the past decade.
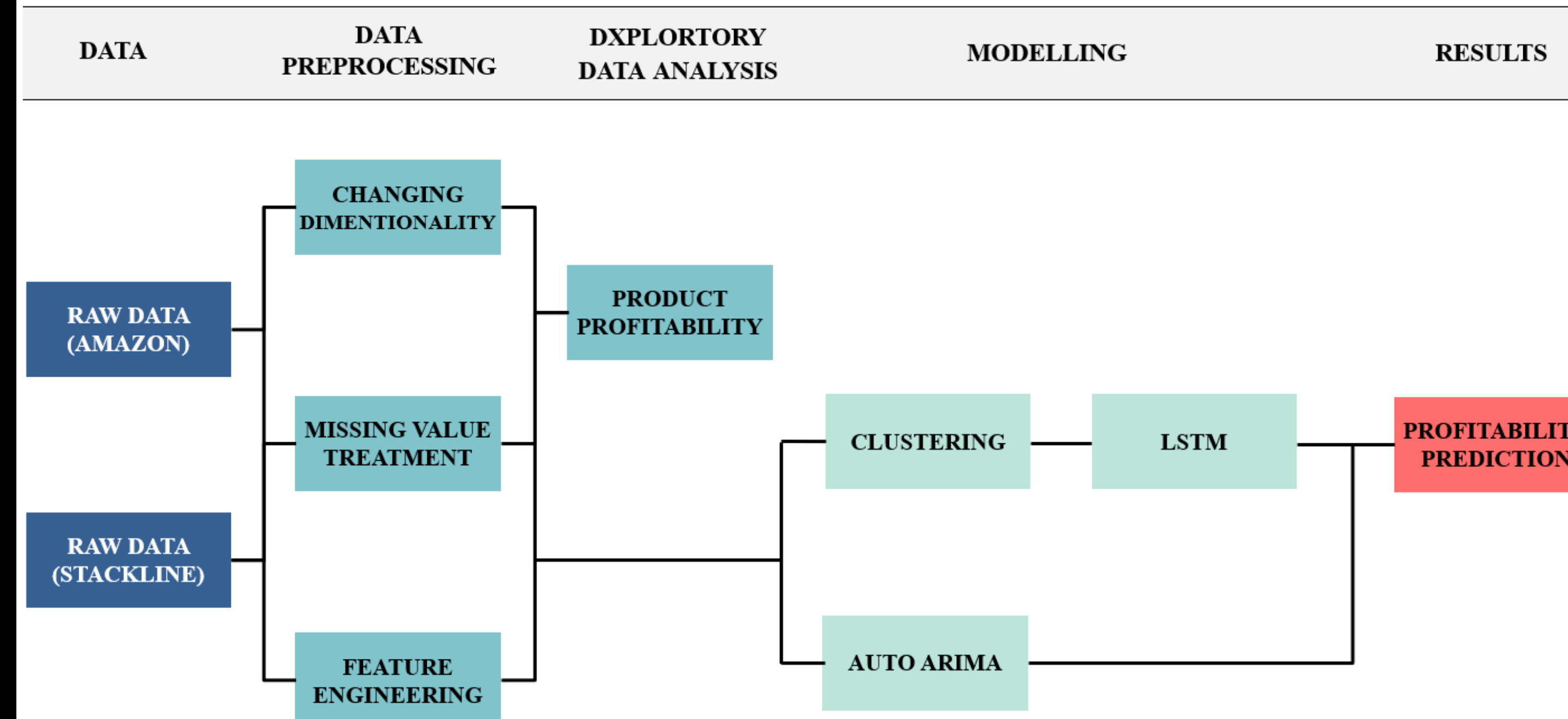
Methodology

Fig 3. Flow Chart

Data Cleaning & Pre-Processing
Structure of the dataset was converted from having long data characteristic to wide structure with null values treatment based on business acumen.
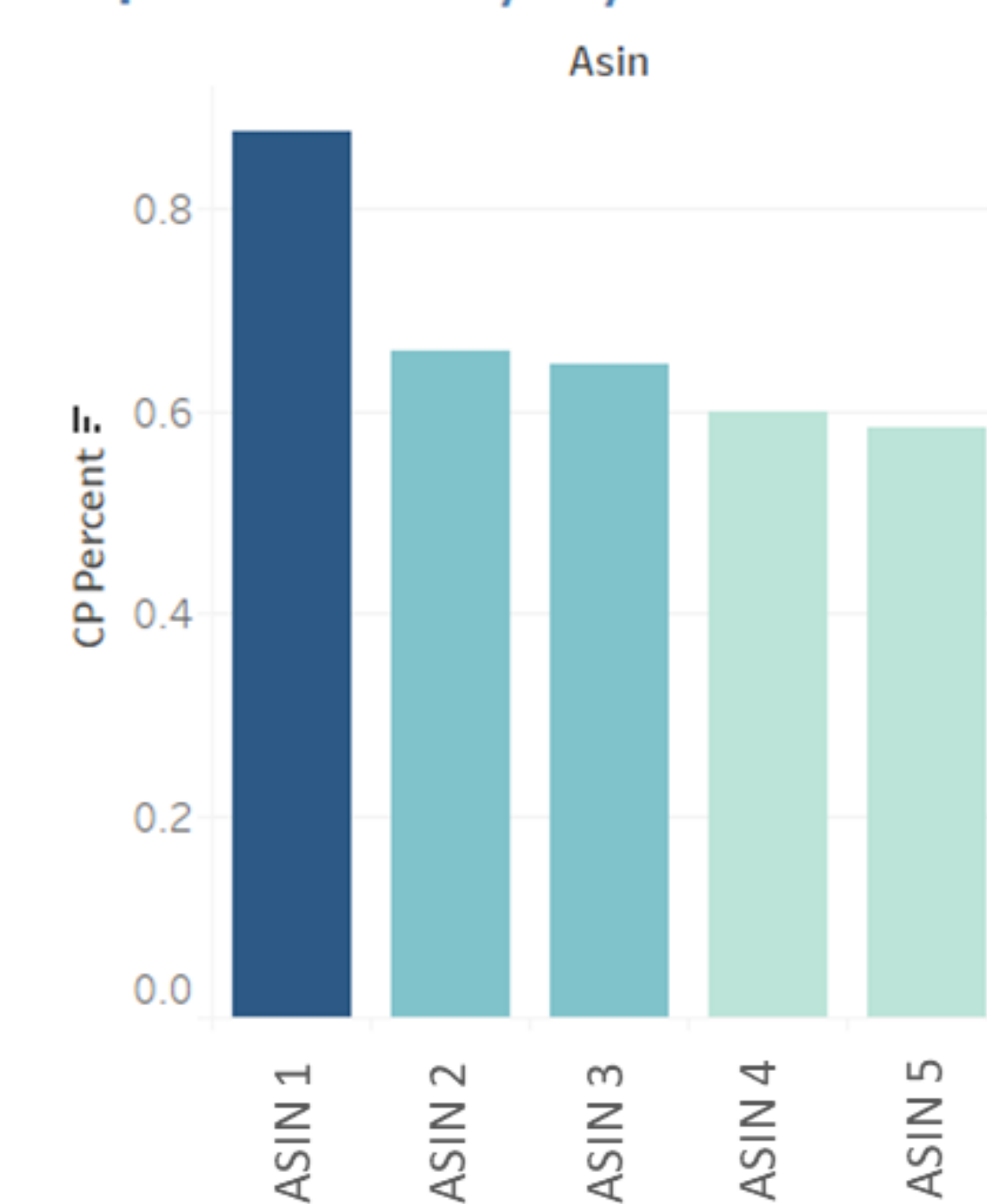
Feature Scaling
Time series data of units sold was scaled using Min-Max scaling to suppress the effect of outliers and avoid updating of weights at irregular rate in the model.

Model Implementation
The following approach was adopted to reduce model complexity and hence the associated computational costs, as per business requirements.
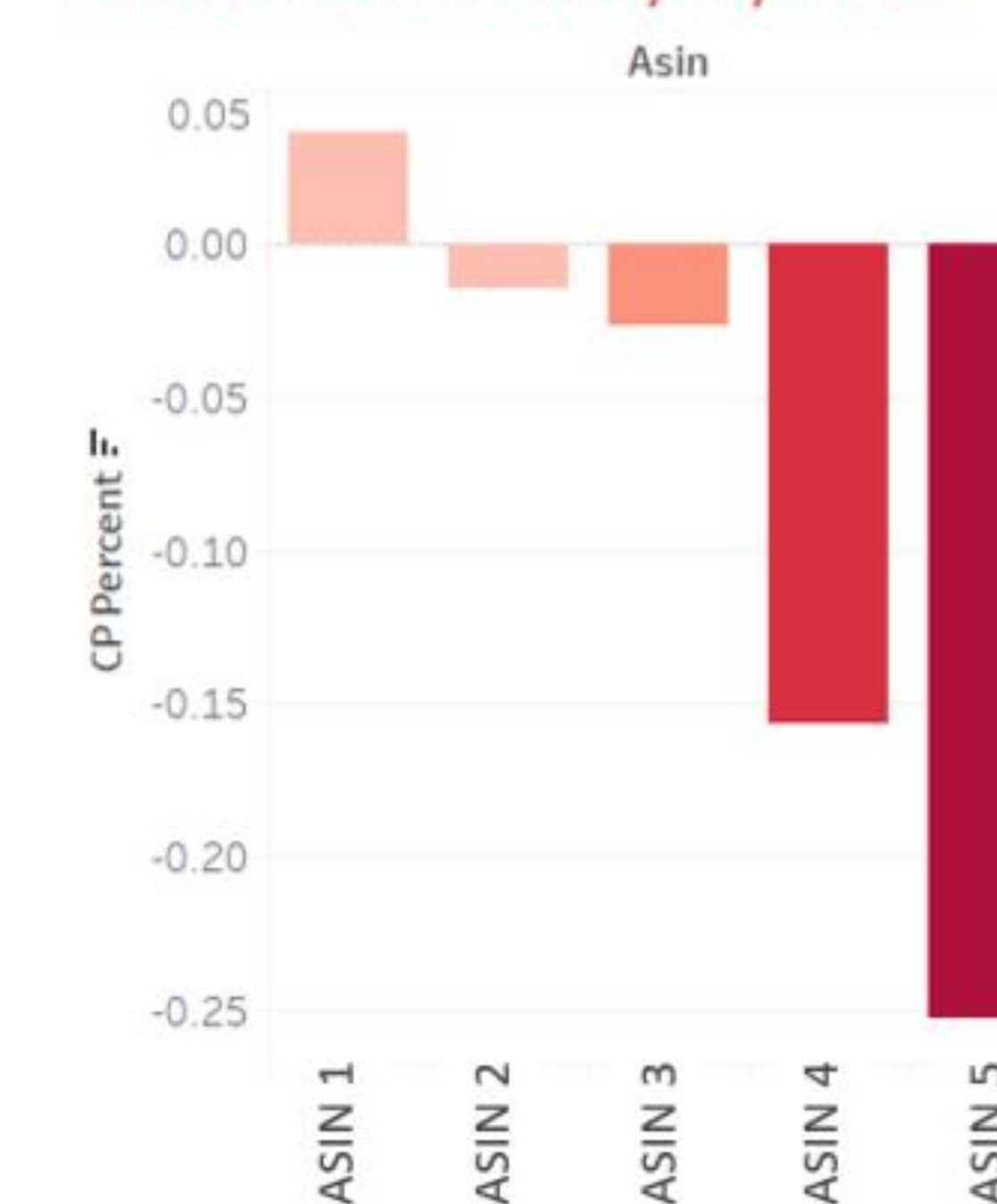
Fig 4. Best and Worst performing ASINs as per profitability equation
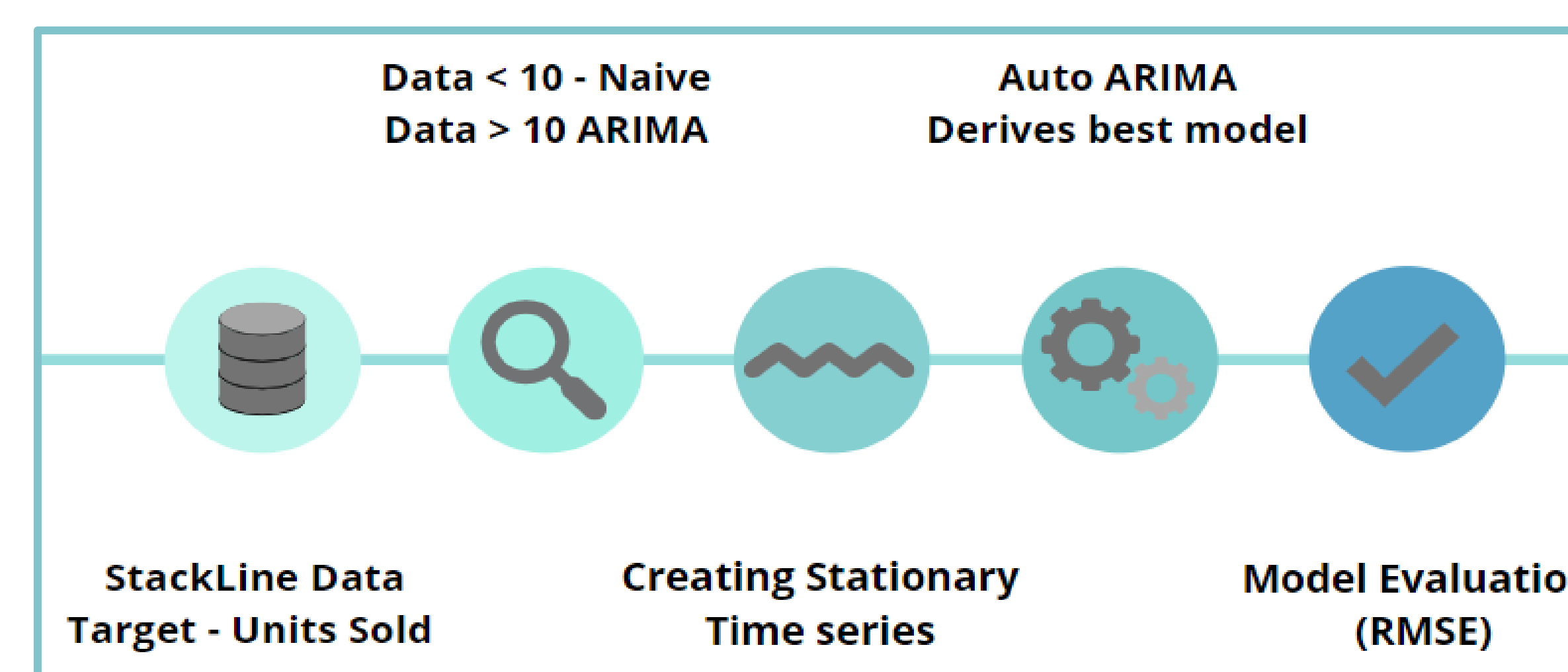
Fig 5. ARIMA Workflow
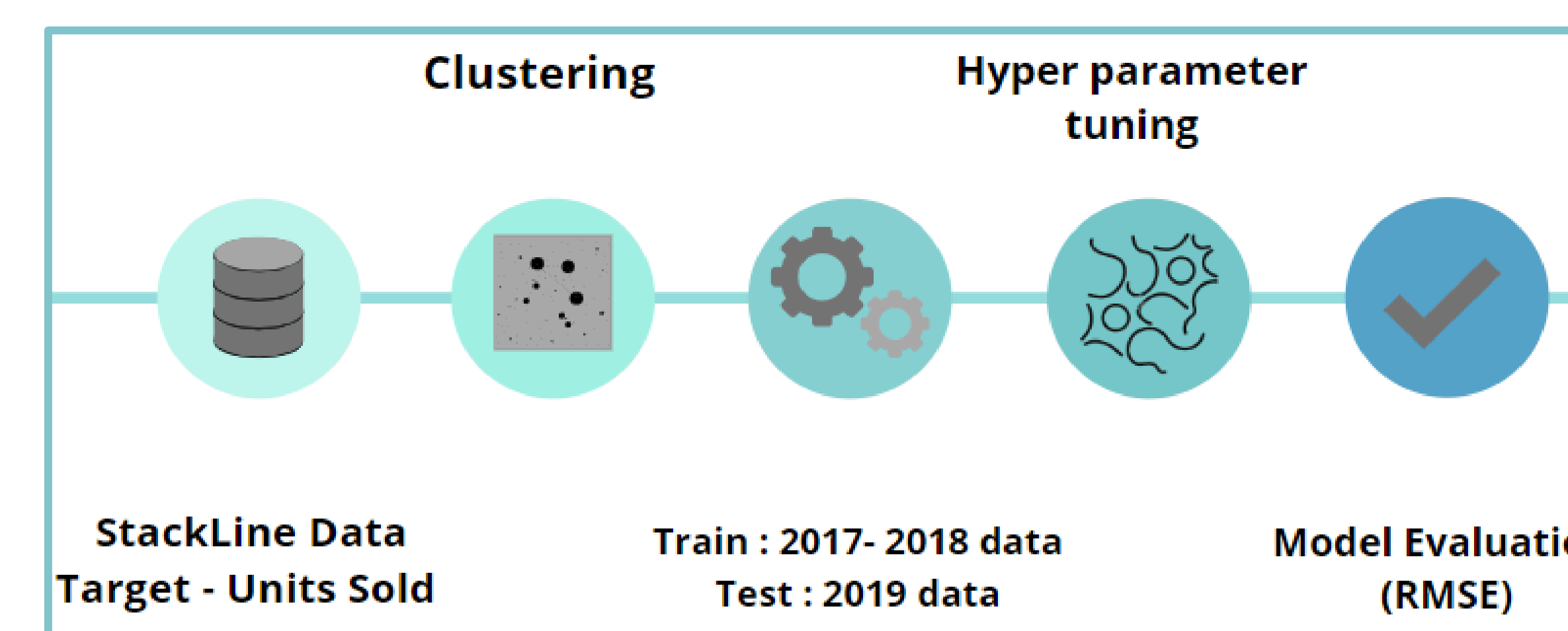
Fig 6. LSTM Workflow

Results
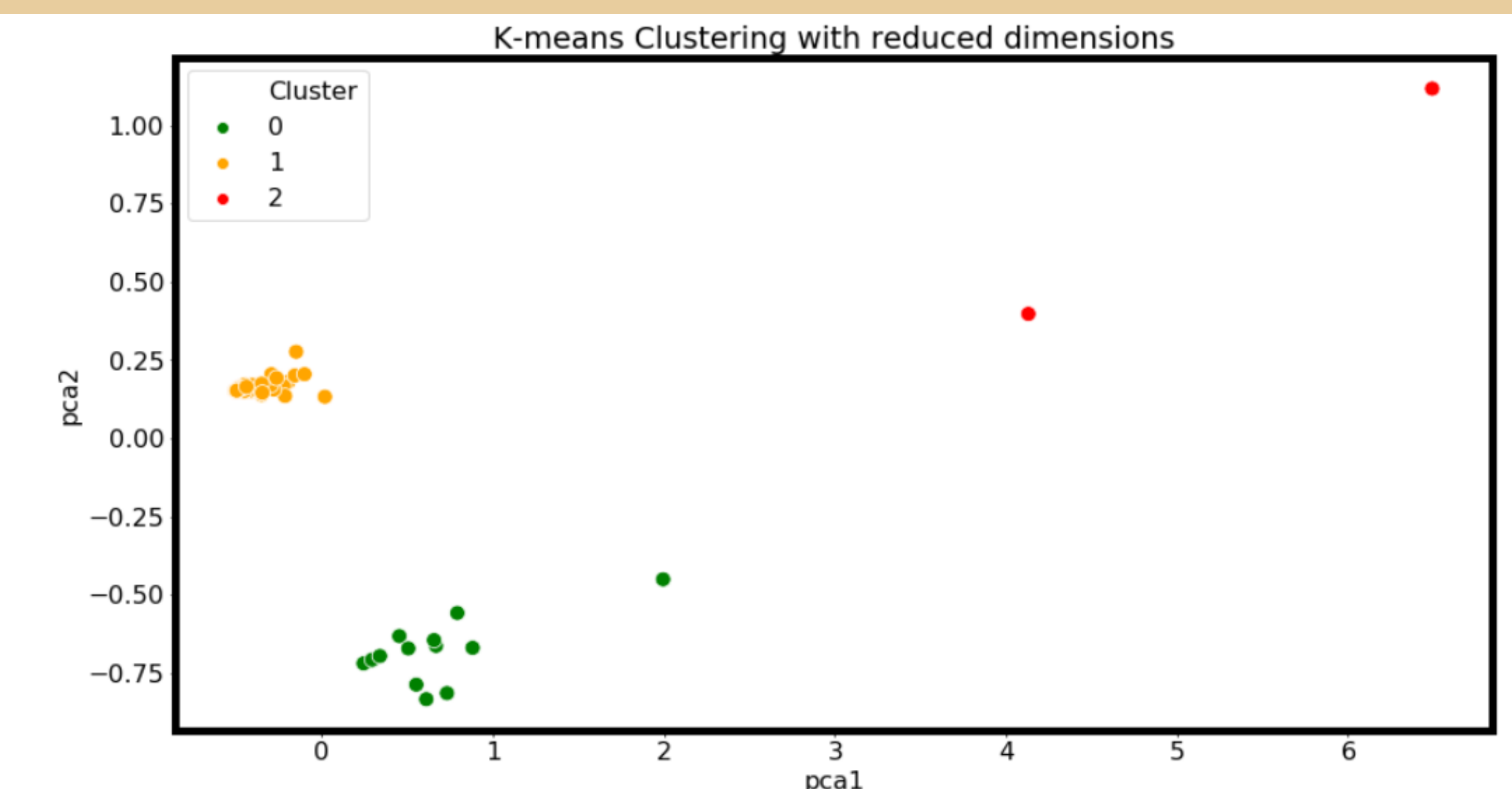
Fig 7. Clustering of SKUs

RMSE- 63

Fig 8. ARIMA Forecasting

RMSE- 38
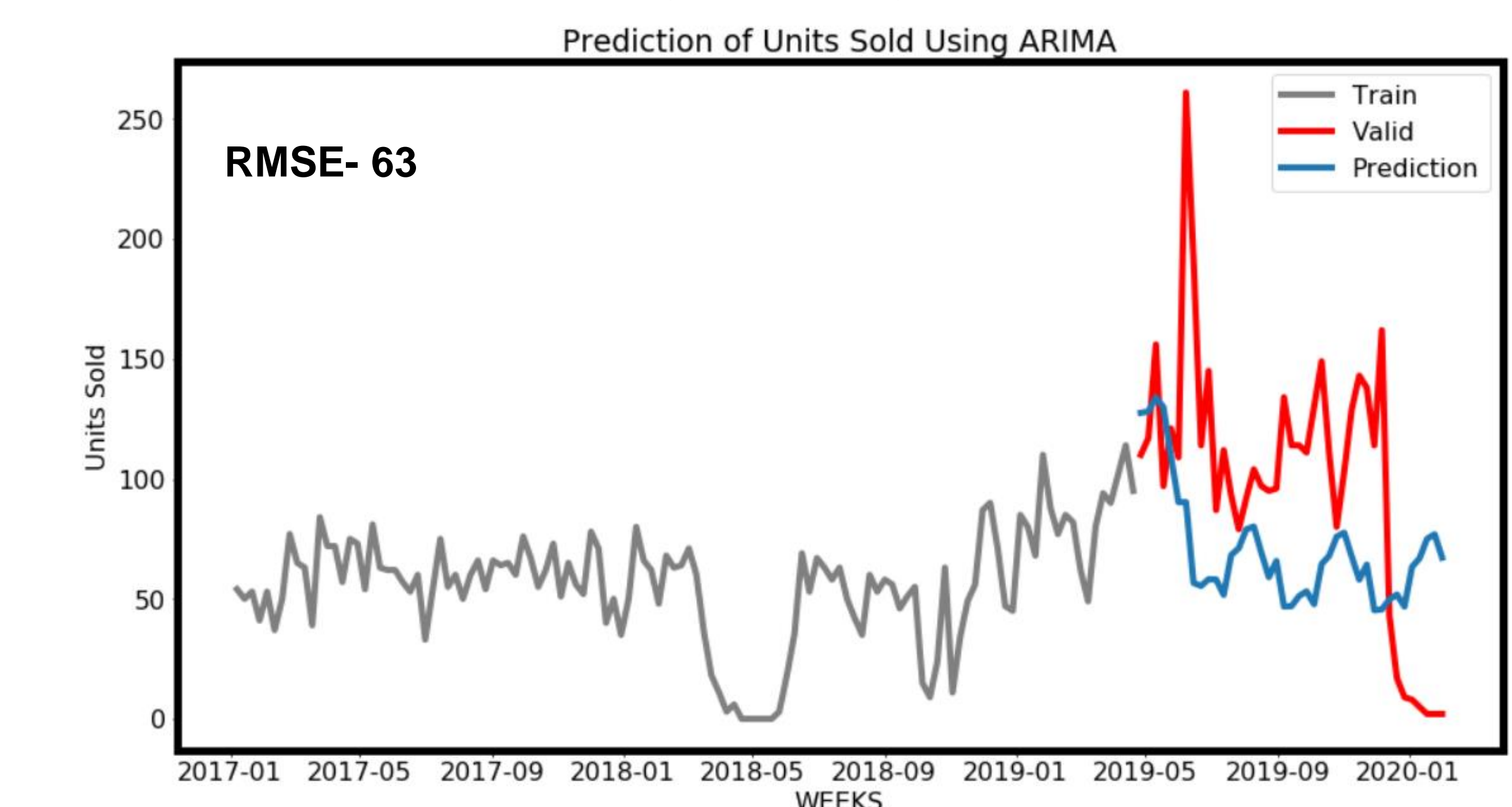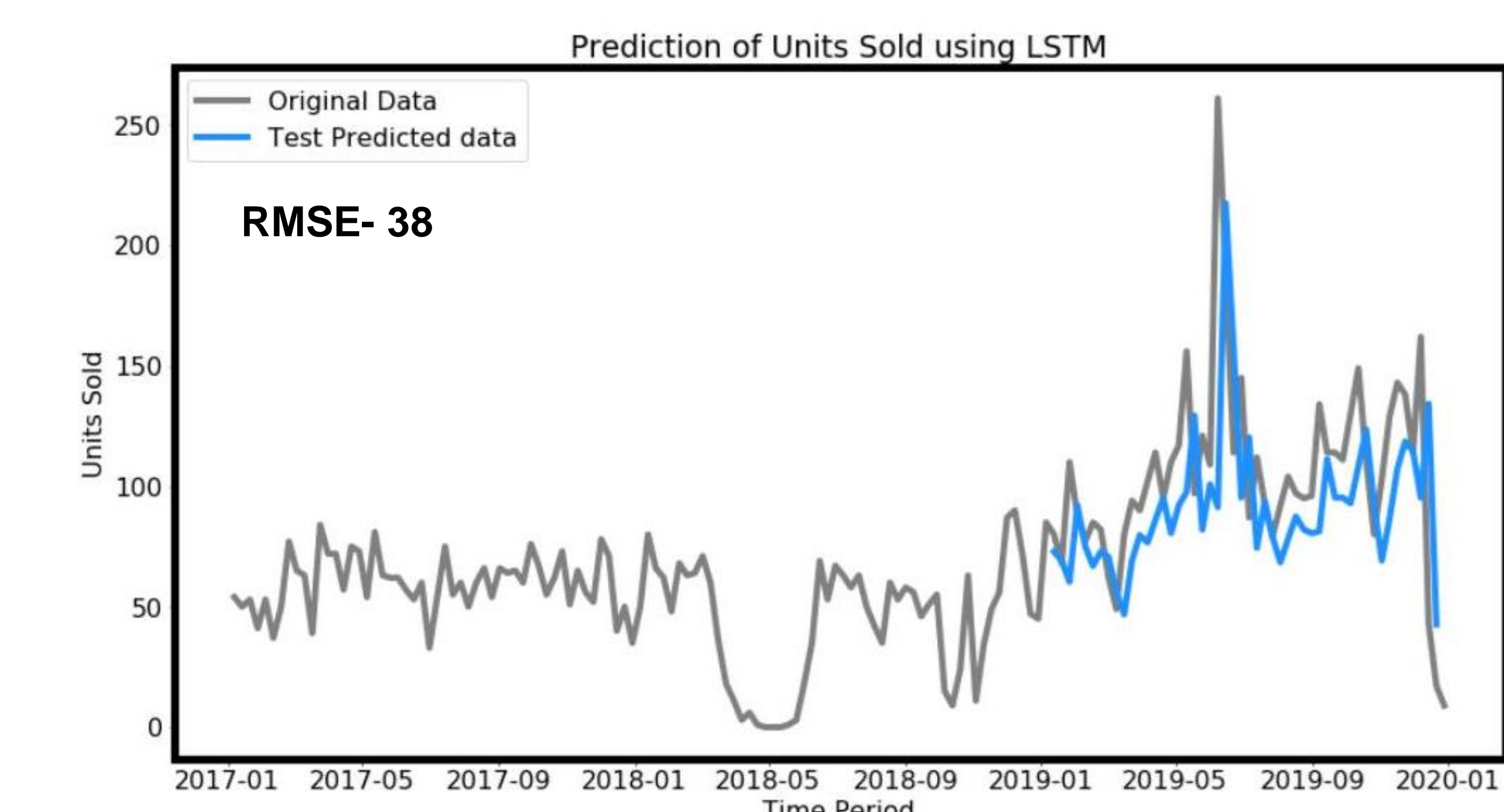
Fig 9. LSTM Forecasting

Conclusions

- Business was provided with real-time BI dashboard to identify best and worst performing SKUs listed on Amazon platform.

- Weekly sales forecast was achieved with high accuracy using ASIN drilldown approach, which was fed into profitability model for SKU level granularity.

- Weekly margin was optimized for each SKU within given business constraints by controlling key metrics such as unit sold, wholesale price and COGS.

- Future scope of the study could include incorporating exogenous factors Like competitor price and product attributes to improve profitability prediction and optimization.

Acknowledgements