



HOW MUCH WILL THEY BUY?

Optimal forecast selection for predicting a bakery's product demand



1 Introduction

SPAR-Roodeplaat is part of an international group of independently owned and operated retailers who work together in partnership under the SPAR franchise brand. The store does not only offer a wide range of day-to-day grocery products, but they also have their own in-store bakery, deli and butchery.



Problem Statement



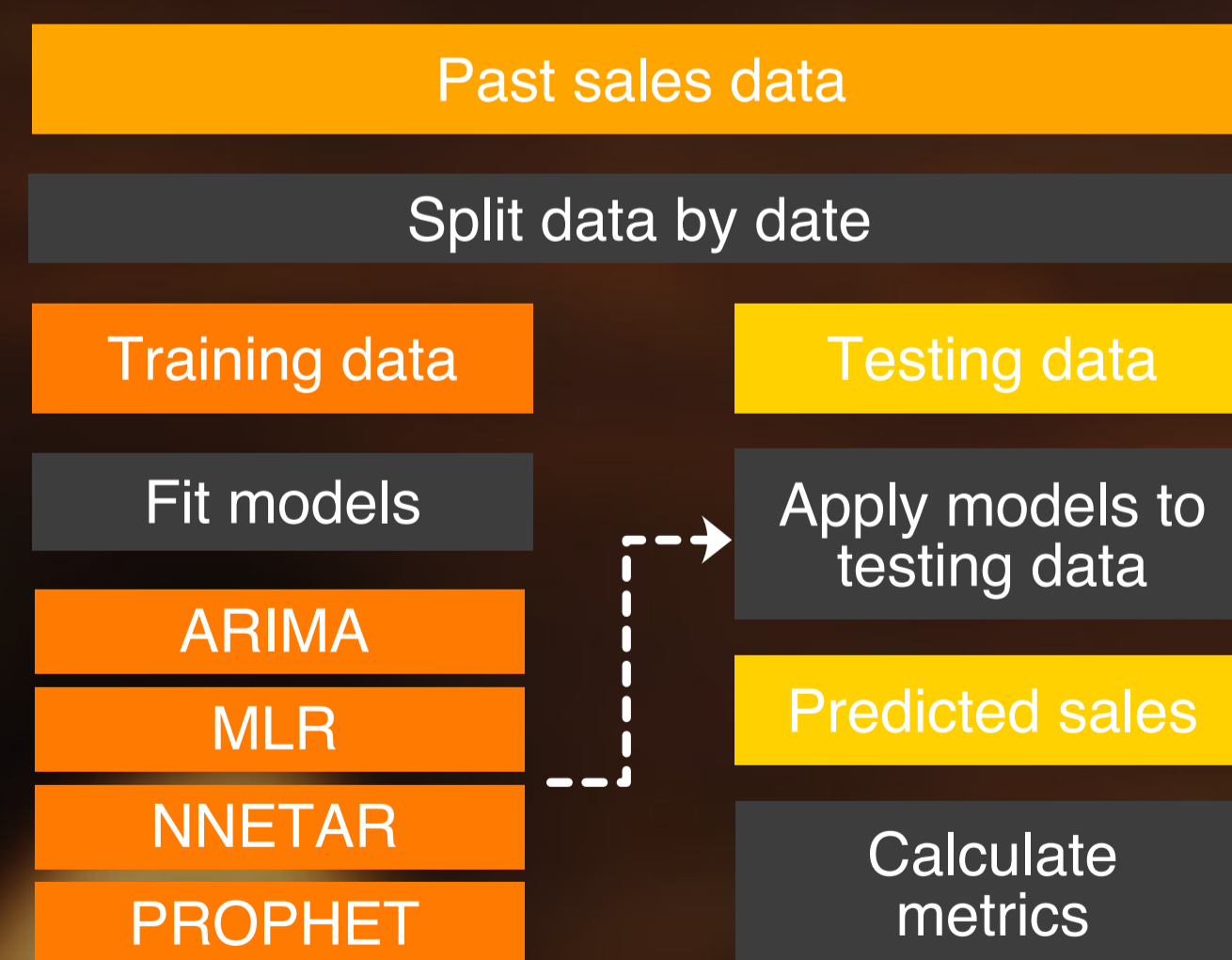
SPAR has been finding inventory management and planning of their bakery challenging as they do not have a set ordering system in place. As items produced are perishable they must be sold at the end of the day. Those that are not are considered as wastage and this leads to a loss. However, running out of stock also leads to a loss and will have an impact on customer satisfaction.



3 Approach

To reduce losses, four forecasting models were developed and then compared to select the most accurate model. The chosen forecasting techniques included; multiple linear regression, Prophet forecasting, autoregressive integrated moving average (ARIMA) and artificial neural networks (ANN) models.

The four models mentioned above were developed using **R** and evaluated using four metrics to determine each model's accuracy. Mean average percentage error (MAPE), mean average squared error (MASE), mean absolute difference (MDAE) and mean average error (MAE) were the four metrics used.

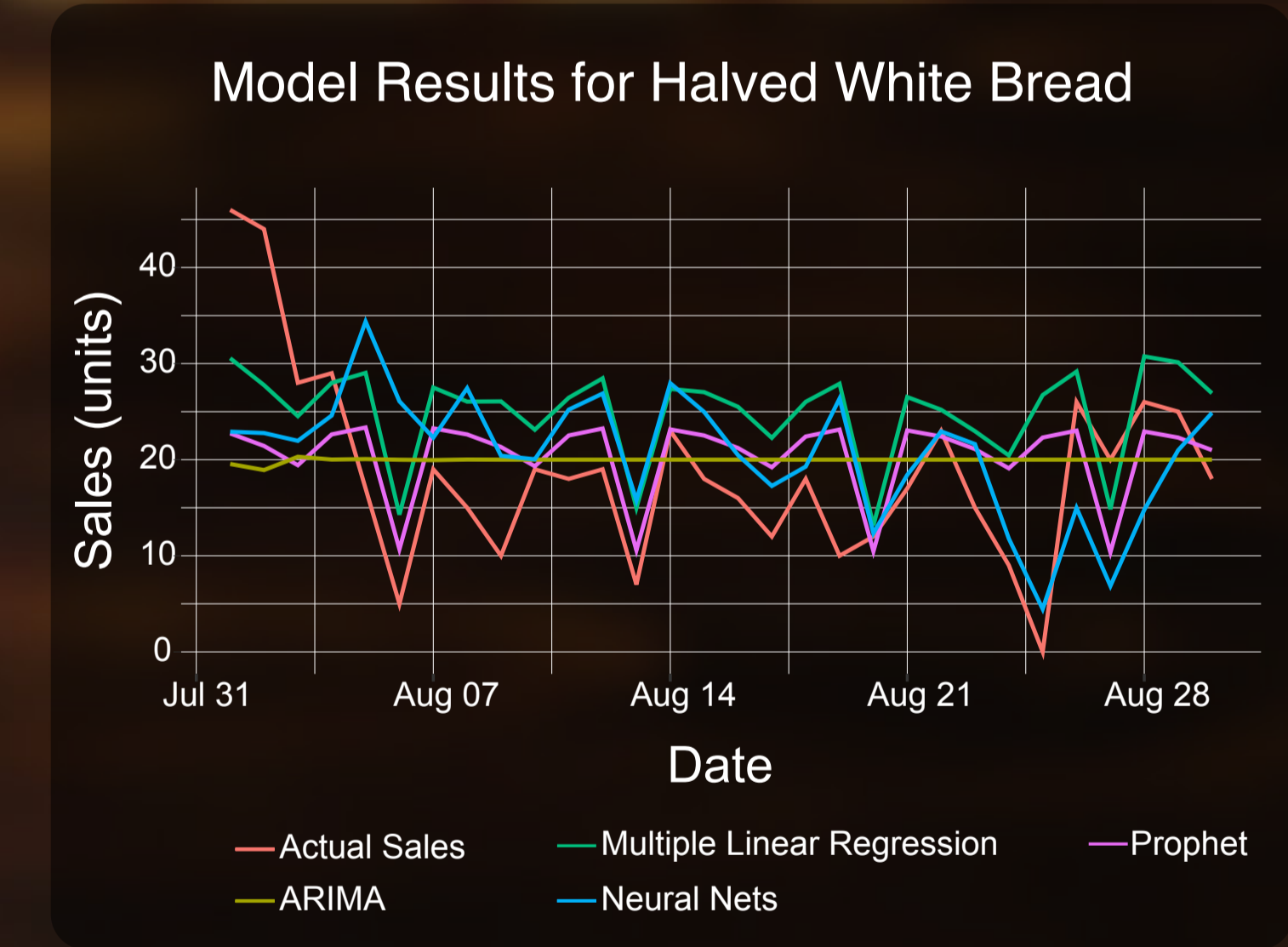
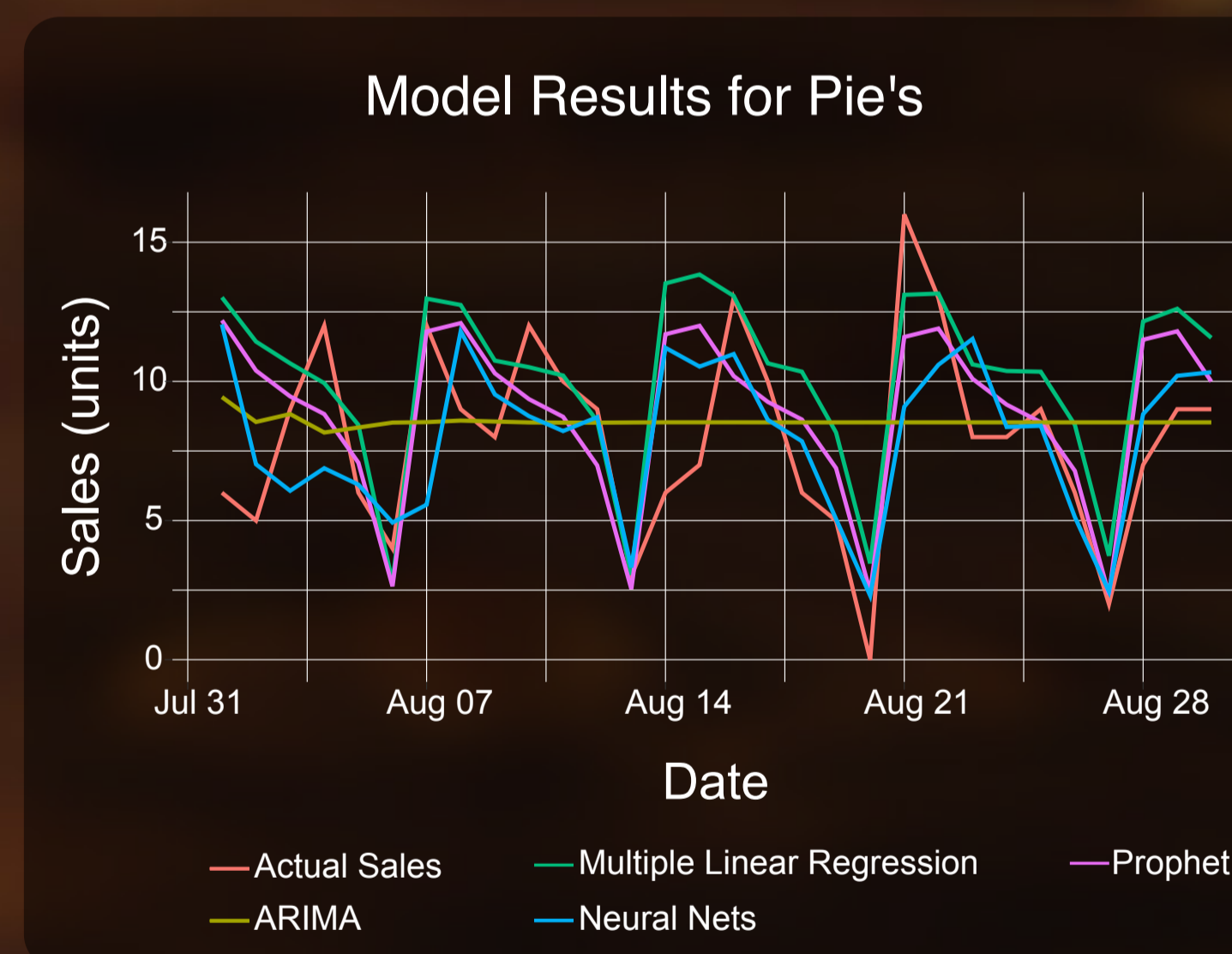
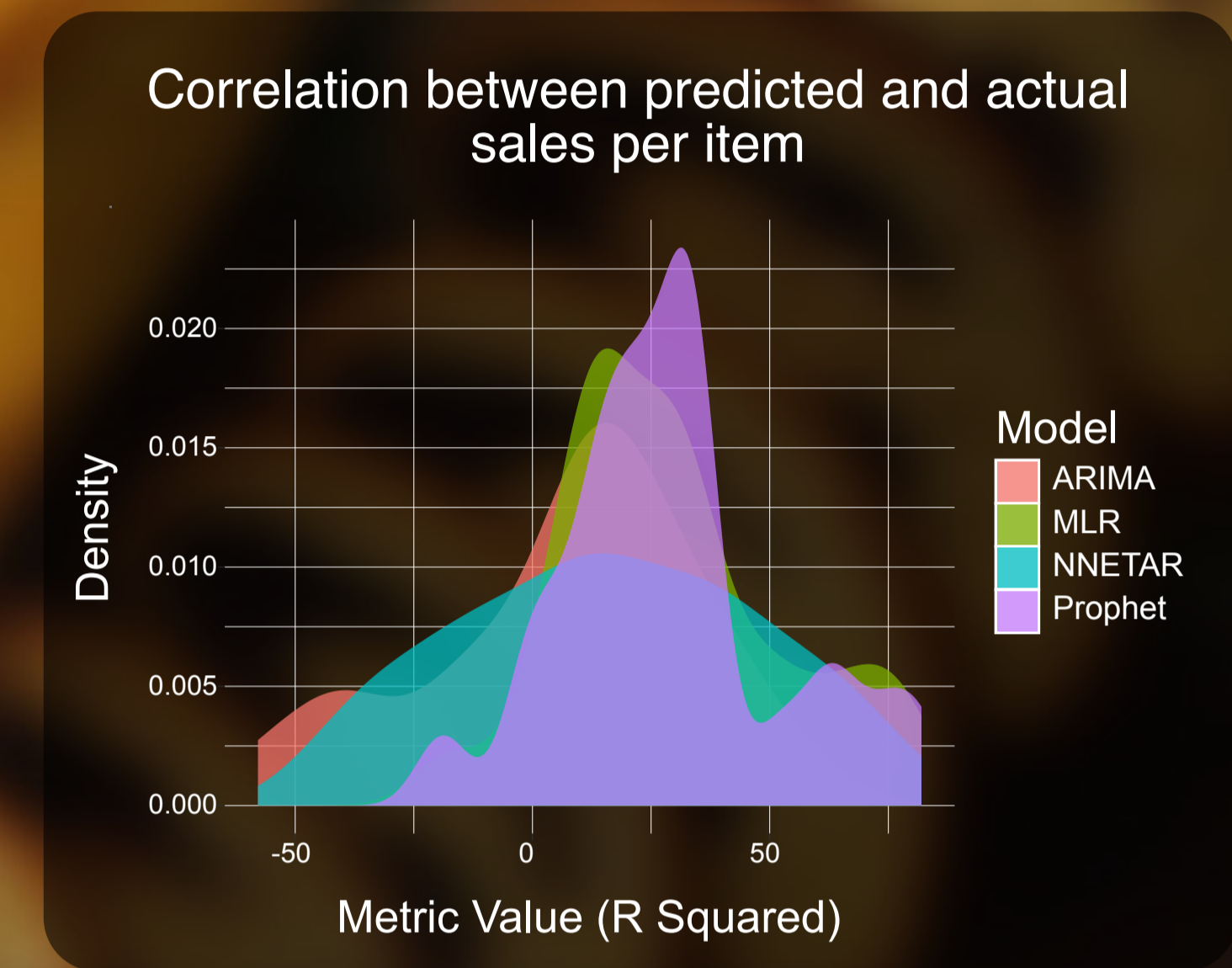


4 Results

Prophet forecasting outperformed the other models experimentally and practically. Recommended improvements to be made include further optimisation of each model, the inclusion of promotional dates and better understanding of the each product unique time series.

Bottom Left and Right : An example of two forecasted products. Some of the techniques could not capture the seasonality of the time series.

Right : The correlation between the predicted sales and actual sales for each product according to each model illustrates a multi-modal distribution. This implies that each time series has unique characteristics that influence an model's accuracy.



5 Conclusion

On completion of this project, it is apparent that an accurate forecasting model will make inventory planning easier within the bakery and deli departments. An accurate forecasting model will not only assist the retail store with production and inventory planning, but will also be useful when making important business decisions in areas of finance and marketing.

