Predictive Logistics

TIME SERIES FORECASTING

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INTRODUCTION

BACKGROUND

Certain materials have similar demand patterns. Association between buys can subsequently be used to forecast the future demand of the materials

SCOPE

Using Walmart's M5 dataset (the unit sales of various products sold in the USA, organized in the form of grouped time series)

OBJECTIVES

Identify the method(s) that provide the most accurate point forecasts for each of the time series

TECHNICAL APPROACH

1. Data Ingestion

Understanding and concatenating dataframes

2. Data Preparation

Train-test split, extracting useful components

3. Forecasting

Univariate forecasting with Croston, MLP, LTSM

4. Evaluation

Scoring methods to identify best solution

CHALLENGES

Reshaping data with relevant features

—DATA INGESTION

Scaling down and finding a suitable approach

—DATA PREPARATION

Identifying which models to use

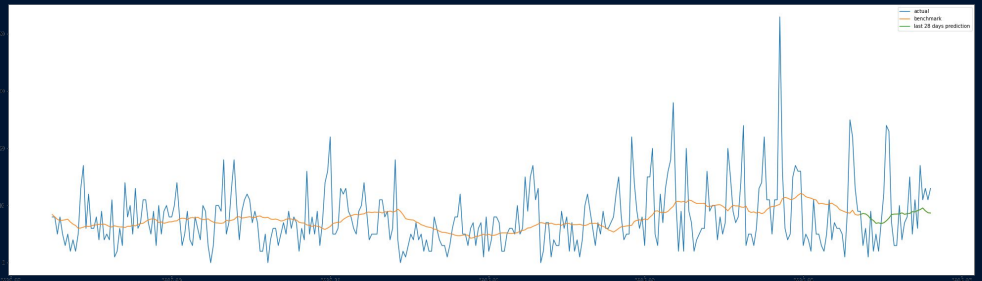
—FORECASTING

Visualizing results

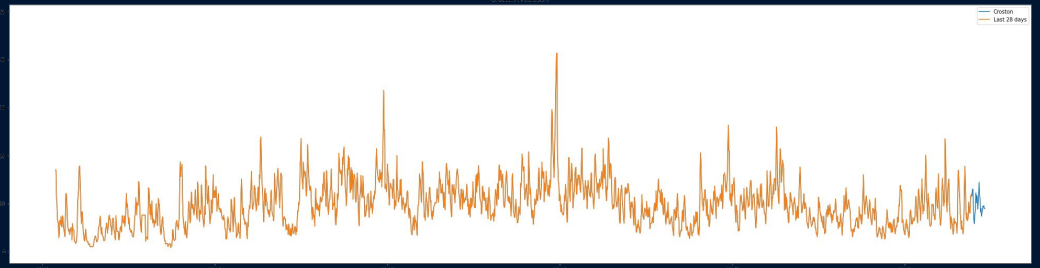
—EVALUATION

MODELLING AND ANALYSIS (1)

- Baseline model: Moving average window



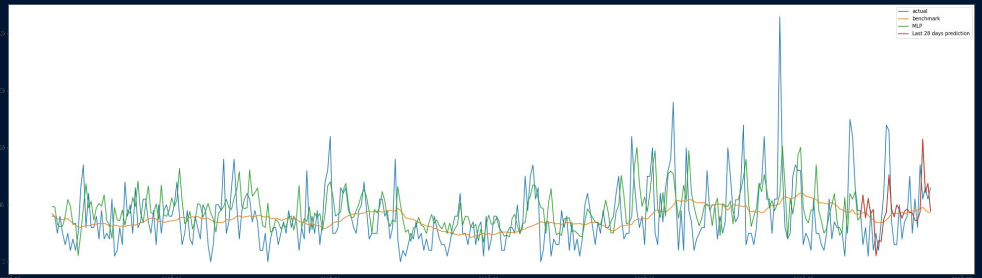
- Croston: normal + TSB



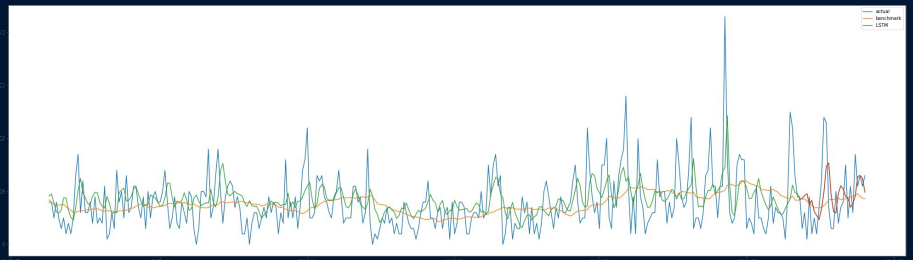
MODELLING AND ANALYSIS (2)

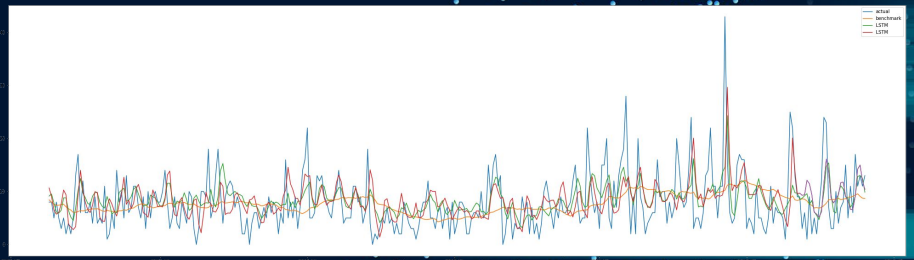
Actual
Benchmark
Model
Forecast

- Multi Layer Perceptron (MLP)



- Long Short Term Memory (LSTM) + Bidirectional LSTM





RESULTS

Neural networks generally perform better than traditional methods

	BASELINE	CROSTON	MLP	LSTM	BI-LSTM
RMSE	5.261	4.530	5.236	4.916	5.256
RELATIVE RMSE	1.000	5.261	0.995	0.934	0.999
% IMPROVEMENT	0.0	13.9	0.5	6.6	0.1
MAE	3.893	3.522	3.955	3.735	3.912
MAE TO MEAN RATIO	0.498	0.365	0.505	0.477	0.450

CONCLUSION

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Best forecast method: Croston

INSIGHTS

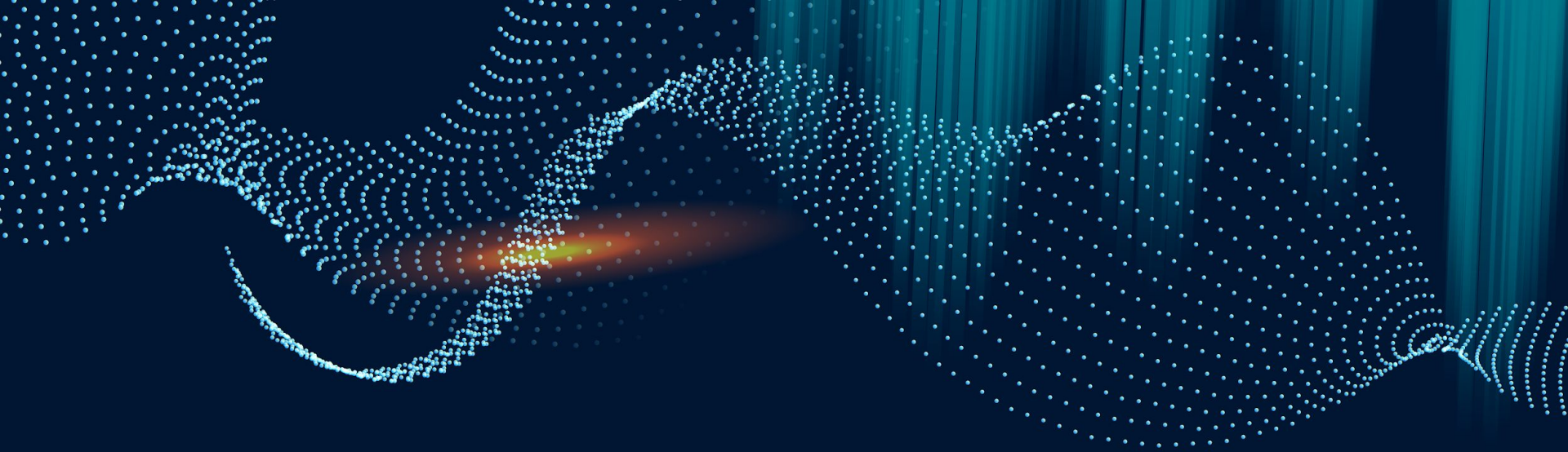
Similar methods can be used on actual logistics datasets

EXTENSION

Multivariate forecasting, grouping related items

TAKEAWAYS

Understanding multivariate data, application of various models



THANK YOU!