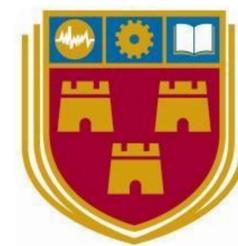# EXAMINING DIFFERENT METHODS FOR PREDICTING PRODUCT TURNOVER IN THE RETAIL INDUSTRY

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Introduction

Time series forecasting

Time series forecasting has been popular over decades in many different fields. It makes it possible to draw conclusions about the future based on results from the past.
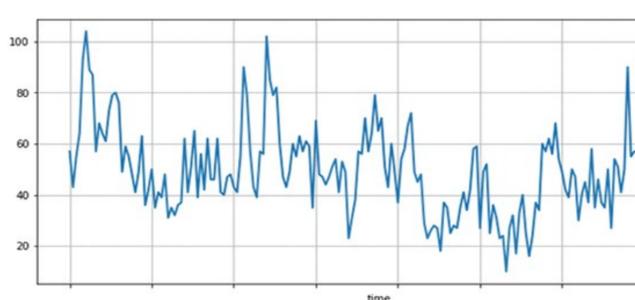
Sales planning & Time series forecasting

Time series forecasting is of great benefit to the food retail sector. An important area of application is sales planning; a highly complex task. Determining future sales through time series forecasting helps companies to optimise their production process, improve workforce-management and reduce returns.
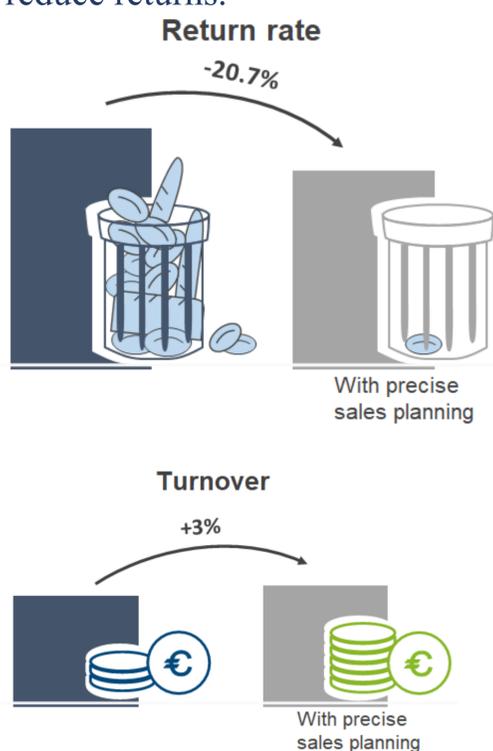
Return rate
-20.7%
With precise sales planning

Turnover
+3%
With precise sales planning

Purpose of the study

The purpose of this study is to use time series forecasting to predict product sales of one of the largest bakery franchises in northern Germany.

Research question

Since sales data of many branches is available, it is possible to use both univariate and multivariate time series mechanisms in order to predict the product turnover. This leads to the following research questions:

- Can a multivariate time series mechanism perform better than a univariate time series mechanism in order to predict the sales of bakery products?
- Can neural networks (NN) outperform well-established statistical models in order to predict the sales of bakery products?

Literature Findings

- Artificial neural network (ANN) models have gained a lot of attention in recent years by predicting time series in many different fields.
- Recurrent Neural Networks (RNNs) are a subgroup of ANNs and can take interdependencies between time series into account.
- This feature is especially useful for predicting retail sales.
- Even though RNN can provide good results for forecasting time series, traditional models are still popular for time series forecasting and can even outperform RNN. [1]

Data

meteolytix
data | weather | analytics

The data is provided by meteolytix GmbH; a German company that offers predictive analytics for companies in the retail and service sectors.

The dataset contains historical daily sales data for 3 products from 25 different branches from the year 2009 upwards.

Methodology

1. Data Pre-processing:
- Check data for missing sales
- Decompose time series to detect outliers or structural breaks
- Feature engineering
- Normalisation of the data

2. Descriptive analysis

3. Implementation of the models
- LSTM
- Linear Regression

4. Model evaluation

Technologies

RStudio | dplyr | ggplot2 | torch | jupyter | python | learn

References

[1] Hewamalage, H., Bergmeir, C. & Bandara, K. (2020). Recurrent Neural Networks for Time Series Forecasting: Current status and future directions. International Journal of Forecasting, 37(1).