

## Exercise Sheet 3: Sequence Models

January 12, 2023

For the following exercises, it is best to use a deep learning framework like *pytorch*.

You can choose one of the two setups described in exercise 2) a (corresponding to a multi-step model with several output values for the different horizons) and b (corresponding to a model with the prediction for the next day as single output value) of exercise sheet

1. Repeat the evaluations of the predictions with each model.

### 1) MLP

- a) Predict the demand of all product-location-date combinations in `test.csv` using a feed-forward neural network (if you want with several hidden layers).
- b) Include embedding layers for the categorical variables product ID (potentially also for product groups) and location ID to replace the one-hot encodings.
- c) Use t-SNE (for example from *scikit-learn*) to visualize the embeddings from the previous exercise.

### 2) CNN

Predict the demand of all product-location-date combinations in `test.csv` using a CNN. (Hints: You need to prepare sequence samples corresponding to time windows as inputs. You can go multivariate by means of several channels.)

### 3) LSTM

Predict the demand of all product-location-date combinations in `test.csv` using a LSTM. (The structure of inputs and outputs is very similar to CNNs.)

### 4) Transformer

Predict the demand of all product-location-date combinations in `test.csv` using a transformer, e.g., Temporal Fusion Transformer from *pytorch\_forecasting*.