TÉCNICO LISBOA

DS 2025

Data Science Project

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FORECASTING MODELS

1 Exponential Smoothing

1.1 Hyperparameters study over data

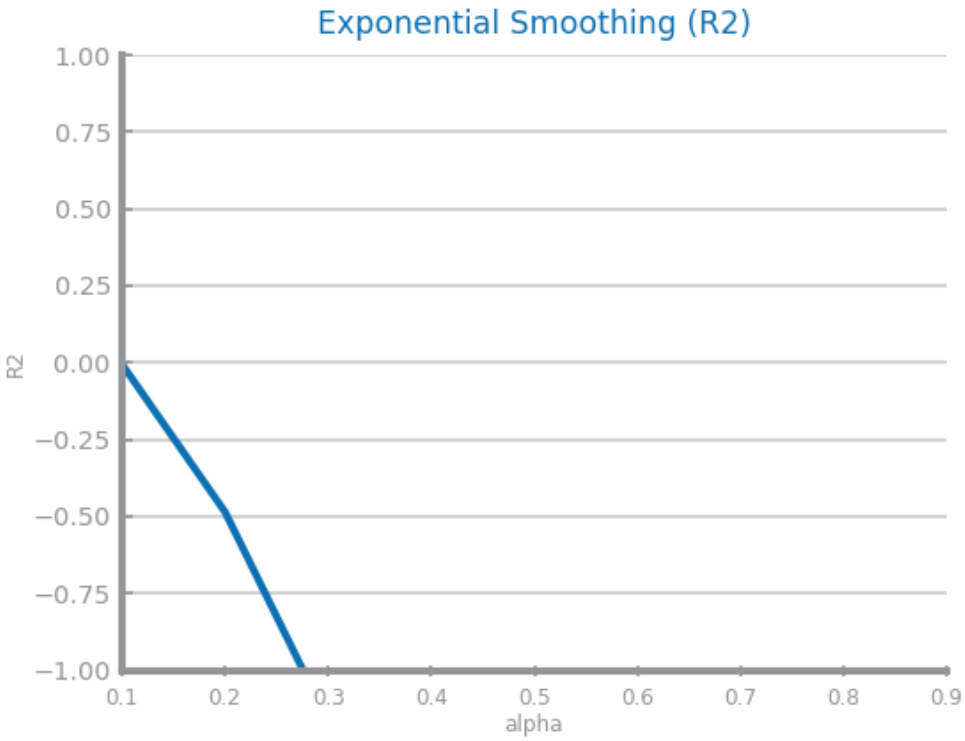

Figure 1: R^2 as a function of alpha for Exponential Smoothing

1.2 Best model's performance

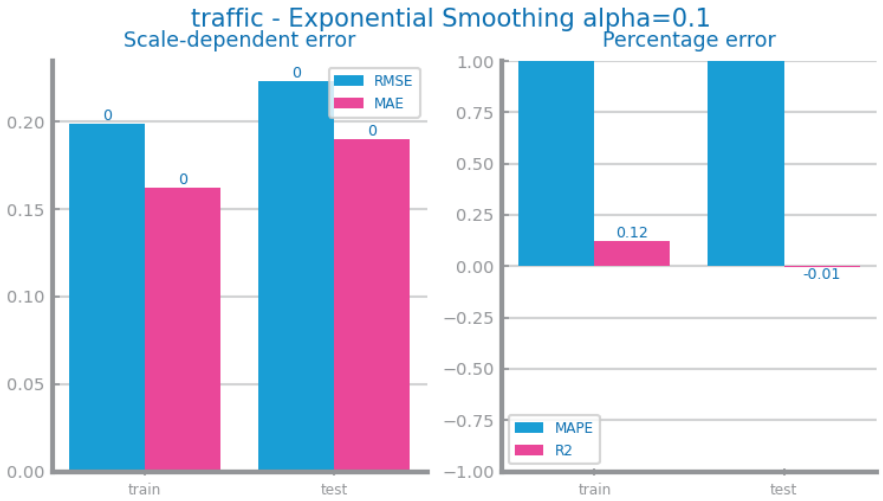

Figure 2: Best model's performance metrics (RMSE, MAE, MAPE, R^2)

1.3 Best model's predictions over the testing dataset after transformation

Figure 3: Predictions (red) vs actual test data (pink) for best Exponential Smoothing model

2 Multi-layer Perceptrons

2.1 Hyperparameters study over data

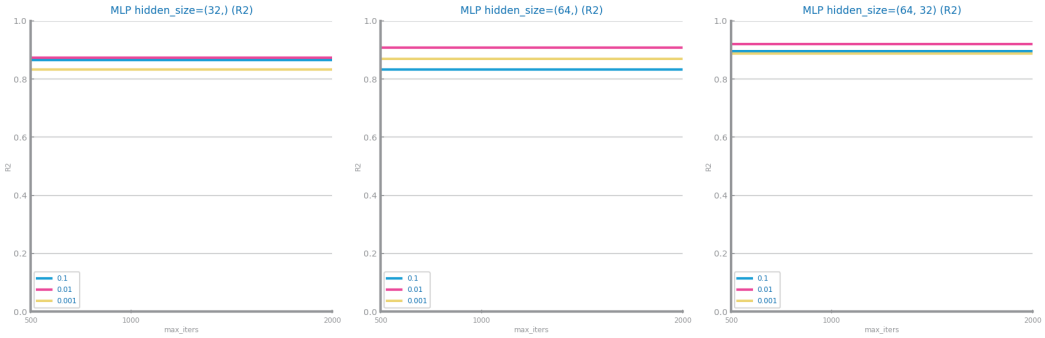

Figure 4: R^2 convergence for different MLP hidden layer configurations

2.2 Best model's performance

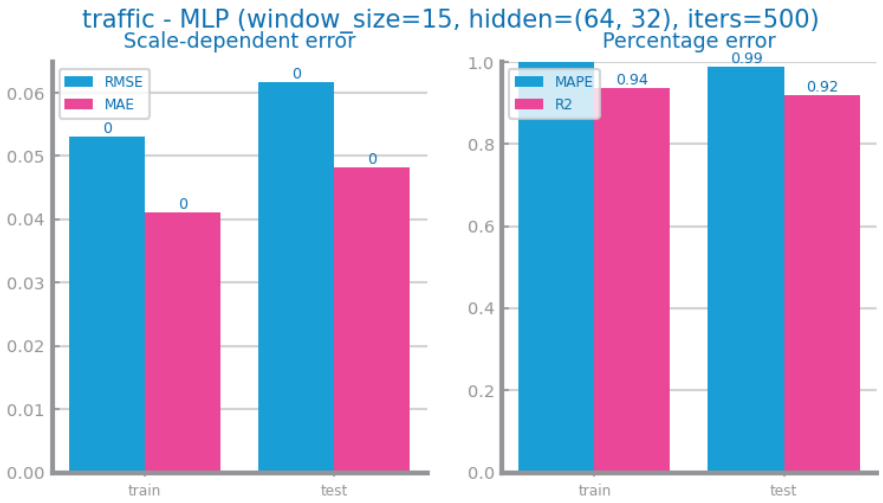

Figure 5: Best model's performance metrics (RMSE, MAE, MAPE, R^2)

2.3 Best model's predictions over the testing dataset after transformation

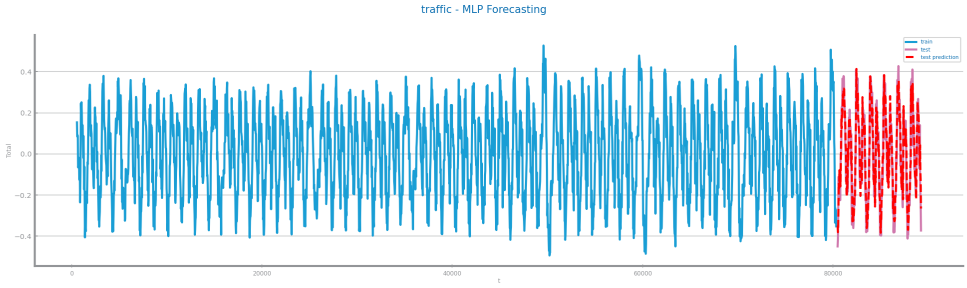

Figure 6: Predictions (red) vs actual test data (pink) for best MLP model

3 ARIMA

3.1 Hyperparameters study over data

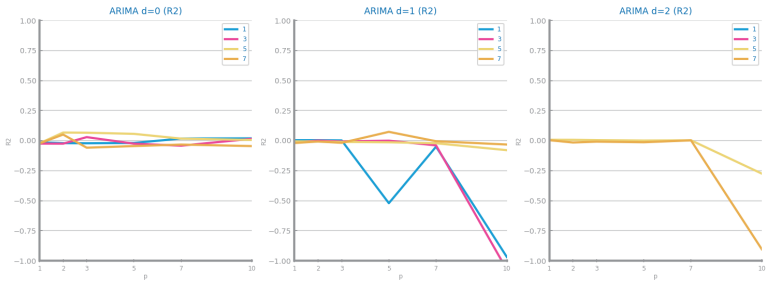

Figure 7: ARIMA hyperparameters study: best configuration (p=5, d=1, q=7)

3.2 Best model's performance

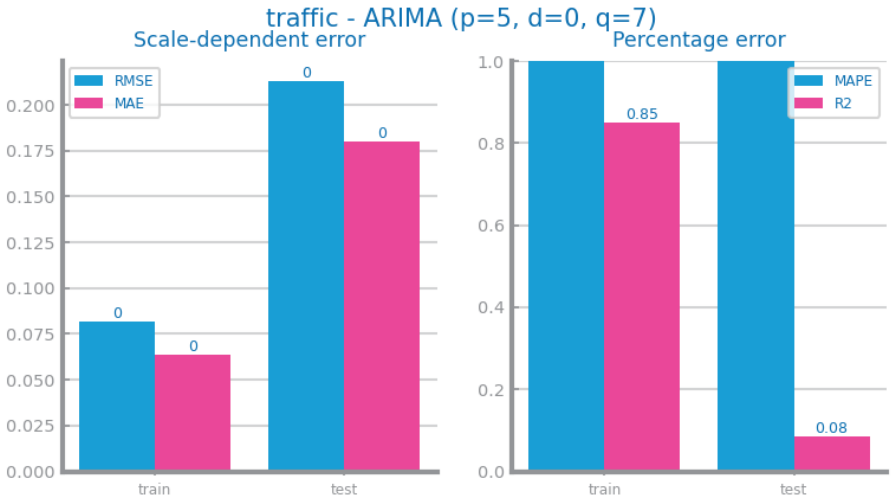

Figure 8: Best model's performance metrics (RMSE, MAE, MAPE, R^2)

3.3 Best model's predictions over the testing dataset after transformation

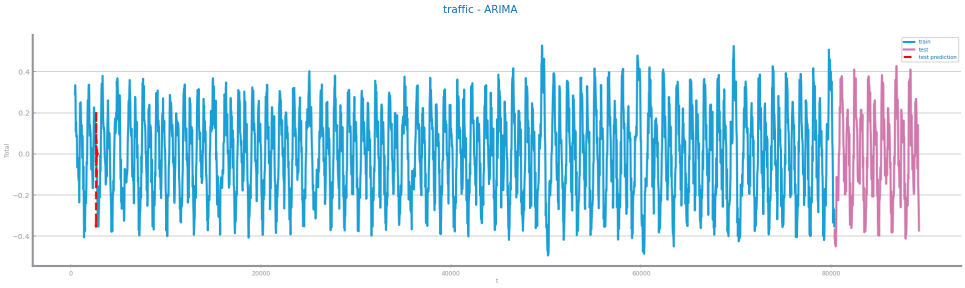

Figure 9: Predictions (red) vs actual test data (pink) for best ARIMA model

4 LSTMs

4.1 Hyperparameters study over data

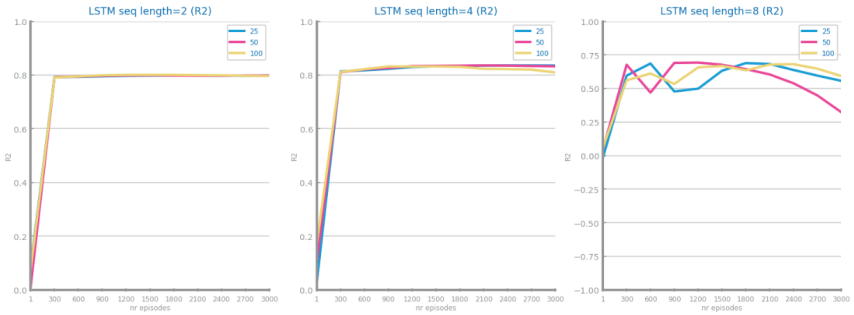

Figure 10: LSTM hyperparameters study: best configuration found (sequence length=4, hidden=25, epochs=2100)

4.2 Best model's performance

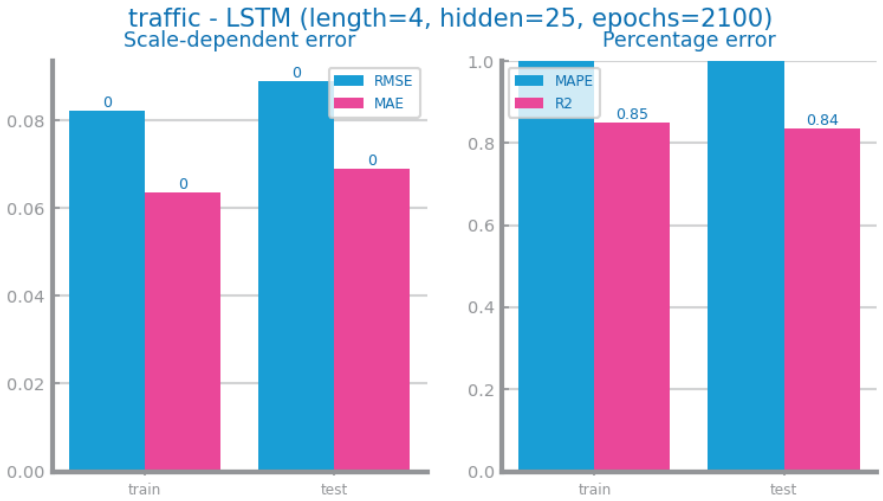

Figure 11: Best model's performance metrics (RMSE, MAE, MAPE, R^2)

4.3 Best model's predictions over the testing dataset after transformation

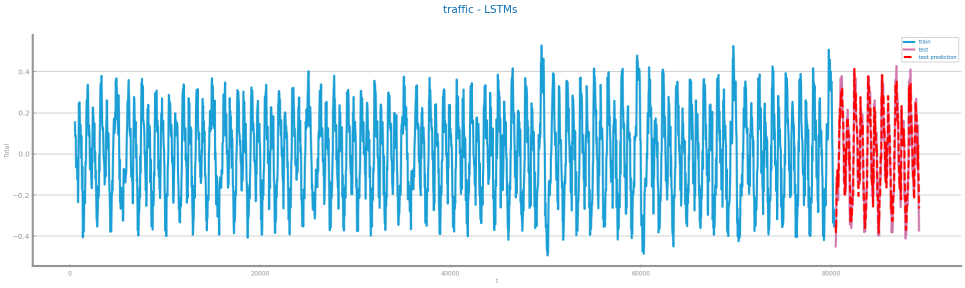

Figure 12: Predictions (red) vs actual test data (pink) for best LSTM model