

**Know-Center / Know-Center GmbH – Research Center for Data-Driven Business & Big Data Analytics**  
**Programme: COMET – Competence Centers for Excellent Technologies**  
**Programme line: K1-Centres**  
**COMET subproject, duration and type of project: [Porsche Automotive Forecast], multi-firm**

## “Gone in 30 Days!” Predictions for Car Import Planning

A big challenge in the automobile industry, but especially for car importers and dealerships, is to adjust to the rapidly changing market demands. Therefore, involved stakeholder are in need of an on-demand forecasting model to base their decisions on. Together with Porsche Austria, we analysed data related to market performances of new car models in the past to create predictions for each brand and models. With these insights, stock and logistics costs can be reduced by better targeting the market needs and increasing the customer satisfaction by fulfilling their demand in time.

### Car Importing and its problems

Porsche Holding Salzburg is the largest and most successful automotive distributor in Europe. The Salzburg-based company was founded in 1947 and operates today in 22 countries in Western and South-Eastern Europe as well as in China, Colombia, and Chile. Its subsidiary Porsche Austria GmbH is importing and distributing cars to dealers and customers across Austria.

The automotive industry, one of the largest private investors in research and development, has been facing an unstable and changing market demand. Especially as the competition between car manufacturers increases, it has become increasingly challenging to anticipate customers' demand. On the one hand, customers ask for more individualized vehicles and a larger product variety. On the other hand, policy measures for reducing emission levels or increasing tax revenue also impact the vehicle choice. To cover high production expenses while still satisfying local demands, many automobile manufacturers assemble vehicles at scale economies and offload them to automobile importers and car dealers. The

problem with this approach is that this limits importers' and car dealerships' ability to respond to dynamic market demands.

Together with the Know-Center, Porsche Austria started a project to analyse anonymized data related to market introductions and market performances of new car models in the past. The project should also provide information for the development of a forecast model to predict performances of upcoming introductions of new car models.

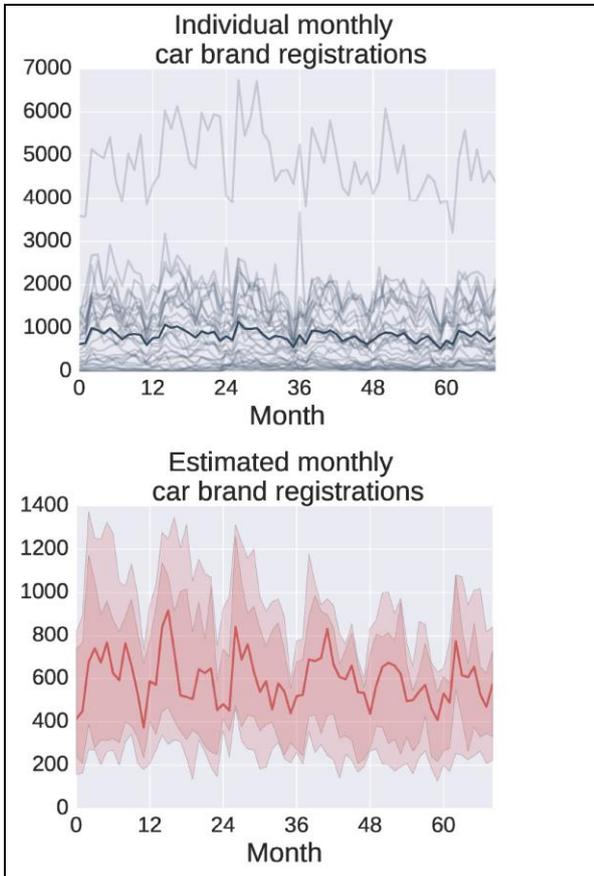
### Data Analysis

In order to create suitable prediction models, several data sources have been analysed: New, used and tactical vehicle licenses; buyer studies; sales data; additional market data. In order to evaluate the performance of the forecasting and prediction multiple algorithms and methods were applied. Direct comparison of Gaussian Regression, Linear Regression, Multilayer Perceptron Regressor and a Support Vector Machine ap-

proach for Regression was conducted on standard error metrics as MAE, RMSE, MAPE, and MASE introducing a simple baseline for comparison. Further a neuronal network approach was implemented based on a feed forward and later a recurrent network utilizing the deeplearning4j framework.

model being the Seasonal Autoregressive Integrated Moving Average (SARIMA) and a non-linear model being the Long Short-Term Memory (LSTM) recurrent neural network as well as a hybrid combination of those two. The prototype also considers two different scenarios, predicting the number of cars to import for the next month and for the entire following year. The results of this predictions are visualized in a Dashboard where multiple data variations and single brands can be observed in detail. Our experimental results reveal that in most settings, the SARIMA approach showed the best performance.

Results are going to be published together with Porsche Austria. These findings open up future research possibilities in the area of the interaction of dashboard and forecasting algorithms to better answer market questions such as the comparison of the performance of different brands. Further, we will research on an intelligent hybrid combination of the most promising algorithms in one prediction.

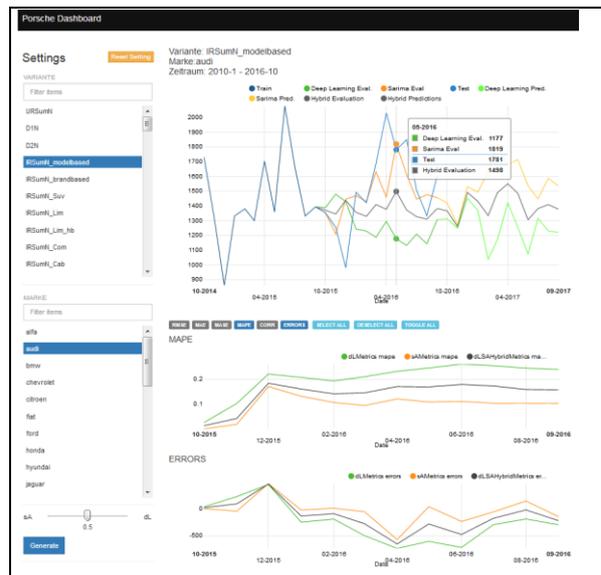


**Fig. 1:** Car registration data of 6 years. Upper plot shows the individual registration and illustrates the difference in magnitude. Lower plot shows an estimate over all brands and already reveals some kind of seasonality.



### Impact and effects

In the last stage of the project two predictive models were implemented. Specifically, a linear



**Fig. 2:** The results of this predictions are visualized in a Dashboard where multiple data variations and single brands can be observed in detail.

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