This is the sausage AI

"How many sausages do we need for the weekend?" Winweb is developing an AI-based sales forecast to support expert knowledge and gut instinct.

Developer expertise, customer industry knowledge and the persepective of researchers come together in the latest project from software company Winweb. Together, they developed a methodology based on artificial intelligence (AI) that understands the causes of certain sales figures and uses them to make future predictions. "How many sausages do we need for the weekend?" Every company in the meat industry is sure to ask itself this question. If too many are produced, some have to be disposed of; if too few are produced, the company loses out on profits. Many companies currently rely on the expertise and gut feeling of experienced employees when planning production. "But this dependency carries considerable risks," says Jan Schummen, Senior Software Engineer at Winweb: "The loss of an experienced production manager can jeopardize the financial stablility of the entire company." For this reason, forecasting sytems are becoming increasingly important in the industry and the need for automated and precise forecasting methods is growing.

Difficult sales forecasting

Andreas Mayer, who is responsible for IT at Michael Kleiber GmbH, a butcher's shop in Swabla with 8 own branches, also emphasizes: "There are many factors that influence sales volumes." These include seasonal fluctuations - Frankfurter sausages are more in demand in winter than in the summer months. But current offers also have an impact on sales: If sausages are advertised, more will be sold and more will have to be produced in advance.

Of course, the weather as well as weekdays and public holidays also determine sales. "From today's perspective, it is not possbile for us to use the dependencies between similar products, which correlate either positi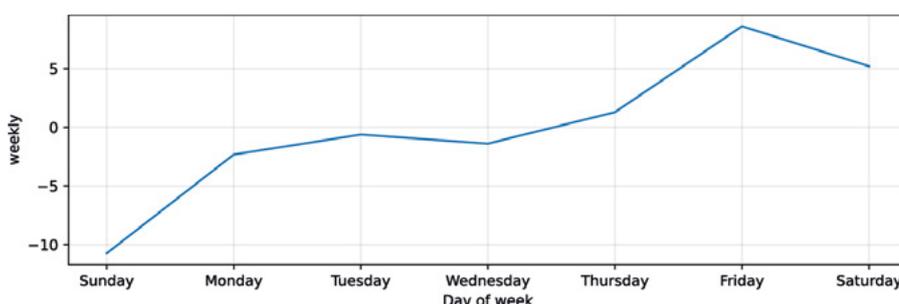vely or negatively with each other, the consumer behavior of customers and many other influencing factors for a sales forecast," says Mayer. In addition, only a smart amount of data can be analyzed manually.
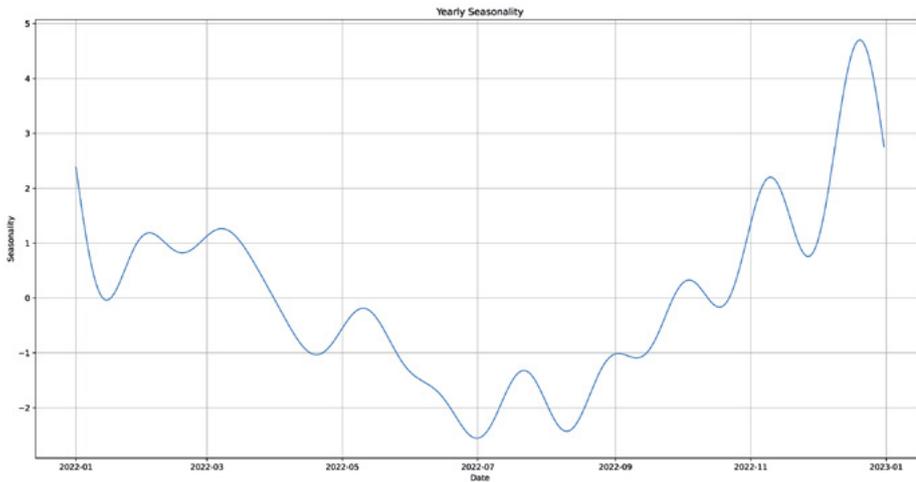
An ERP system that processes sales and operating data and is also used at Kleiber with winweb-food is already very important as a basis for forecasts. It enables precise price calculations, strategic sales and operational planning and offers special analyses for customers to control sales in their stores. Conventional time series, however, analyses for sales forecasting show weaknesses in prediction. Although they are useful for planning, they are not suffcient to explain the underlying causes of sales peaks or slumps and seasonal trends. Particularly relevant sales days for production planning and stores cannot be predicted adequately.

Even modern machine learning approaches do not yet deliver satisfactory results. "This is not due to data quality or a lack of historical data," says Schummers.

"Machine learning simply doesn't distin-

The sales of Franfurter sausages increase throughout the week, peaking on Friday and then falling slightly on Saturday.
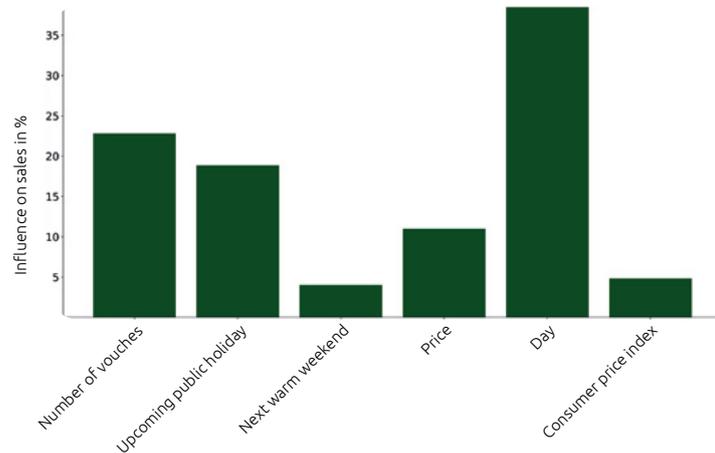
Yearly Seasonality

with data-supported decision-making options," says Schummers.

Three diagrams were used as a basis, which were developed together with Kleiber and show the causal relationships between the influecing factors for the AI. In practical terms, Causal AI will support Kleibers stores this year in estimating sales volumes and identifying the factors that influence sales in advance.

Initial results are very promising

The practical use of Causal AI to predict food sales figures has not yet been tested and is unique in this context, according to the university. "The initial results are very promising and surpass all previous attempts at sales forecasting," explains Schummers. By combining LLMs and specialist knowledge, more accurate and operationally relevant forecasts can be produced. "This has improved for a set of rules that can be a blueprint for implementing forecasts for our customers," emphasizes Schummers.

guish between correlation and causality." For example, the sale of barbecued meat is correlated with the incidence of sunburn. "However, this is only due to the common influencing factor - the sun - and has no other connection."

"The loss of an experienced production manager can jeopardize the financial stability of the entire company."

Jan Schummers, Senior Software Engineer Winweb

crucial data that enables us to create detailed forecasts for indivildual products and compare these predictions with real sales figures," explains Schummers. As Kleiber, he has implemented and tested his new process in a realistic environment.

The gap between theory and praxis

The specific question was whether causal AI and LLMs can be used effectively in practice to support and improve decision-making processes. "We want to close the gap between theory and practical applicatlon and provide our customers

Text und Pictures: Isabel Melahn

However, understanding possible connections and modeling them correctly is essential in order to create reliable sales forecasts for the future.

Partnership with Maastricht University
Schummers has therefore joined forces with Maastricht University and Michael Kleiber GmbH to investigate a new method. It is designed to explain sales figures and thus improve predictions. In a study, the software engineer used causal artificial intelligence, or causal AI for short, together with large language models (LLMs) to identify factors influencing sales and then train the AI model on them. "As an ERP provider for the entire flow of goods, Winweb has the

Distribution of deviations for Frankfurters. Overall, the day of the week has the strongest influence on daily sales.