



Reference of the Delivery of a Predictive Model Solution for Ensuring KeyBusiness Data Based on Machine Learning for Boehringer Ingelheim

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The pharmaceutical company BOEHRINGER INGELHEIM, in order to further and significantly improve the efficiency of its key business processes and future business plans, is now using the new solution enabling to process and evaluate data based on machine learning.

- ✔ **Boehringer Ingelheim then processes the data and evaluates it in the Microsoft Power BI solution (Business Intelligence).**
- ✔ **Complete solution for sales and production management process allows the client more accurate and more detailed understanding of behavior and expectations of the market in all business contexts.**

✔ Implementation Summary for Boehringer Ingelheim Client.

- ✔ The implementation by GEM System involved the prediction of sales of specific goods at individual stores. Each item is sold differently in each store and the Covid-19 pandemic wave has also significantly changed customer behavior and therefore the usability of historical data for prediction (Pre-pandemic data is unusable for forecasting in practice).
- ✔ We implemented an automated process for the client, that processes (cleans and prepares) the source historical data, finds the best parameterization of the prediction model, and based on that, create a new prediction for future period. There are more than 500 models counted in this way.
- ✔ The calculated values are then mapped to the bonus bands and calculated projected bonuses for each groups of outlets.
- ✔ The resulting data is then displayed in Microsoft PowerBI reports.



✔ Machine Learning

- ✔ Machine learning is a subfield of artificial intelligence, dealing with algorithms and techniques that enable computer a computer system to literally „learn“.
- ✔ By learning in a given context we mean such a change of the internal state of a system that makes the ability to adapt more effective to changes in the environment.
- ✔ Machine learning allows the entire solution to produce results at the time the data is being processed more and more accurate with direct positive impact on the client's entire business.

✔ Project Vision

- ✔ Given the situation where the current state of motion tracking of the customer's products and competition in the market was unsatisfactory, a project was set up to convert the existing processing into a modern solution using an application MS Power BI.
- ✔ The motive was to obtain a reporting system for predicting of the development of subscriptions in a given segment for managerial and detailed level.

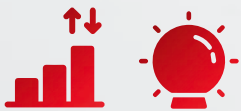
Technologies Used

- ✓ To calculate the predictive plan, an initial predictive algorithm was implemented by using libraries in the Python programming language.
- ✓ The algorithm is based on historical data and calculates a linear prediction of data for the coming months.
- ✓ Thanks to the support of Python scripts in the MS Power BI environment, a reporting tool was used as a presentation layer for visualization of the necessary data shared through the solution Microsoft SharePoint, which the client uses at the same time.

Use of Advanced Mathematical Methods for Development Prediction Data Step by Step



- ✓ In our Business Intelligence practice we often encounter with the term „predictive model“ used to compare predicted data trends with actual values. However, the predicted trends are prepared manually by staff of a given company, and machine prediction is out of the question.
- ✓ For our client we have implemented an automated prediction mechanism, which based on historical data creates a new prediction of future data trends every month. Based on this prediction, the client then adjusts its business models and is thus able to better address its business needs.



A bit of Theory – approaches to predictive methods. There are more or less two approaches to data prediction.

- 1 First approach based on known external conditions determines the predicted variable (it's nice, it's Friday, it's afternoon, i.e., the highway can be assumed to be clogged). This approach has the limitation that in order to make a functional prediction I have to know the input conditions in advance and I have to build a large amount of data to build the prediction model. A similar approach is often implemented by using neural networks.
- 2 The second approach, used by us, calculates on the basis of our own historical data (every day for the last two weeks I've driven to work 20-25 minutes, and therefore I assume that I'll drive no more than 25 minutes tomorrow). This is actually about finding the mathematical function that best correlates with the historical data and then simulate the future.

About Company Boehringer Ingelheim

The Boehringer Ingelheim pharmaceutical group was founded in 1885 and ranks among the most important biopharmaceutical companies in the world. It researches, develops, manufactures and markets innovative products of high therapeutic value for human and veterinary medicine. In order to be effective in this market, of course, it is important to keep track of the sales information of each product according to the defined terms and conditions.



Integration and Development



Business intelligence



Safety



Administration and Support