Interview: Dr. Rudolf Felix Talks About AI in Industrial Business Processes

Qualitative Labeling with Deep Qualicision AI

For PSI, Industrial Intelligence means using AI in industrial business processes. What distinguishes the use of AI methods in business processes?

The advantage of using AI methods is that you can enhance systems and solutions with capabilities that are usually attributed to people. In this way, you can solve problems in business processes that you would not always have entrusted to software systems. For example, suitable AI algorithms can detect patterns in large amounts of data very effectively if labeled data is available for these patterns. This can be a major advantage if large amounts of data need to be analyzed in business processes in a very short time.

In many cases, balancing target conflicts, such as utilization against throughput, is not an easy task when optimizing production. Systems based on extended fuzzy logic or neural networks that use qualitative labels can do this very effectively. They are also better able to explain the calculated decisions. Hybrid AI systems can complement each other and lead to even better solutions. Depending on the issue in question, there are many other AI methods that can offer advantages.

Can you give examples of some important AI methods?

Beside the extended fuzzy logic and neural networks and their variants, which I already mentioned, there are other important methods like support-vector machines and random forest approaches. Beyond this, methods of conventional operation research and many statistical methods should also be included. Depending on the issue in question, hybrid systems combine different AI methods to form suitable overall systems that also combine conventional analytical methods from advanced engineering with AI methods.

What is particularly important when using AI in industrial applications?

In addition to in-depth knowledge of all AI methods, the problem-solving expertise of the developers of AI-based solutions is important. That's why PSI talks about Industrial Intelligence, which combines AI method knowledge with industrial process knowledge. If you have both, the advantages of AI solutions are far-reaching. But another important aspect is the availability of labeled data. This is a prerequisite that has remained largely ignored in the public perception of AI. Nevertheless, it is of crucial importance in most cases of industrial AI applications.

What is labeled data and why is it so important?

Labeled data is prepared data that has already been assigned meaning before the AI learning process takes place. Thus it can be used by a suitable AI learning method for creating a model of that data in order to automatically detect similar data patterns in future data. You might say labeled data is the bridge between data patterns and their real meaning in the real world, such as the meaning of a business process. In conventional AI applications like image classification or speech recognition, the labeling of data is usually pre-classified empirically and often even carried out manually. This is only possible because the data patterns labeled in these applications do not change substantially over time and the labeled data material has long-term applicability. For example, an AI-based speech recognition program can assume that

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the meaning of speech and word patterns in a language will basically remain unchanged once they have been trained. The spoken word will endure for months or even years. But dynamic business process data is very different.

So does this mean you have to keep re-processing the data relating to business processes in order to keep the AI application "up to date"?

Exactly. With business process data, the continuous emergence of data patterns means automated labeling of data is essential once AI applications are operating in the area of optimization of business processes and real-time decision support. In production processes with a higher number of variants, customer ordering behavior and the resource situation in the production process will change on a daily basis. An AI-compatible data preparation process needs to automatically detect and visualize patterns in the process data in the form of self-calculated classes of data patterns based on historical and current data so that it can automatically label the raw data. Only in this way can raw business process data be used for self-adapting and learning AI algorithms.

And how are you meeting this challenge?

We have developed algorithms for "qualitative labeling" in conjunction with Deep Qualicision AI. Simply put, qualitative labeling makes use of the measurement data that is already collected in the business processes. I'm referring to micro and macro KPIs, which the customer classifies as key figures with regard to satisfaction from its own perspective or from the perspective of the process. Based on this minimum amount of quality-oriented information, we can derive data time series and calculate the qualitative labels for the relevant business process without any further input knowledge. The qualitative labels are derived automatically from the quality requirements of the business process and their inherent reality, and the business process data is processed automatically in a way that is AI-compliant. Qualitative labeling forms an essential component of the Industrial Intelligence in PSI systems.

So the use of AI at PSI should already include qualitative labeling. Is that the case?

First of all, at PSI, we claim that our systems are really industrially intelligent. Neural networks have been in use in systems at PSI customers for more than ten years. Systems based on extended fuzzy logic are used to control processes at well-known automotive manufacturers and suppliers worldwide on more than 180 production lines. PSI customers in the metal industry are also optimizing their processes worldwide with AI scheduling algorithms. PSI AI systems are ensuring that processes are harmonized in bus depots. Maintenance management systems are optimizing maintenance schedules in power grids. In total, PSI has supplied and is currently supporting over 50 different AI processes.

And what about qualitative labeling?

Qualitative labeling is already in use in a number of these applications. Some important reference applications include AI autopilots for optional automatic control of production processes or for self-learning of system settings in the automotive industry and in energy management processes. We should also mention the forecasting methods that were recently presented for the first time at the Hanover Trade Fair in conjunction with the management of energy loads in "micro grids", or in the self-diagnostics of complex machinery for predictive maintenance.

What specific experiences have PSI and customers had with the use of AI?

A range of positive experiences, in particular, that PSI Industrial Intelligence really works. In some applications, qualitative labeling works quietly, efficiently and inconspicuously. Since the solution is the main focus and not the method, this topic is only now being discussed in greater depth. However, as the topic of automatic data processing of business process data is becoming increasingly important, qualitative labeling is also coming under the spotlight.

What is your vision for the future when it comes to using AI in PSI solutions?

There is undoubtedly great future potential in the networking of existing solutions to form comprehensive solution scenarios. If the individual solutions from the automotive industry, depot management, traffic flow optimization, and maintenance and control of power grids are combined into networked scenarios, this instantly creates global solution scenarios, for example in concepts for modern mobility, e-mobility or in the networking

of production and transport logistics, with immediately tangible benefits. Here, I believe PSI strikes with its unique potential, as I stated in a similar interview in 2017. As we also integrate qualitative labeling into all PSI tools as part of the PSI platform strategy, we have several USPs that put us in an excellent position for the AI future.

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