Artificial intelligence for complex problems

Artificial intelligence can optimise processes characterised by a large number of variables and possible solutions in a very short time - increasingly also in rail freight transport.

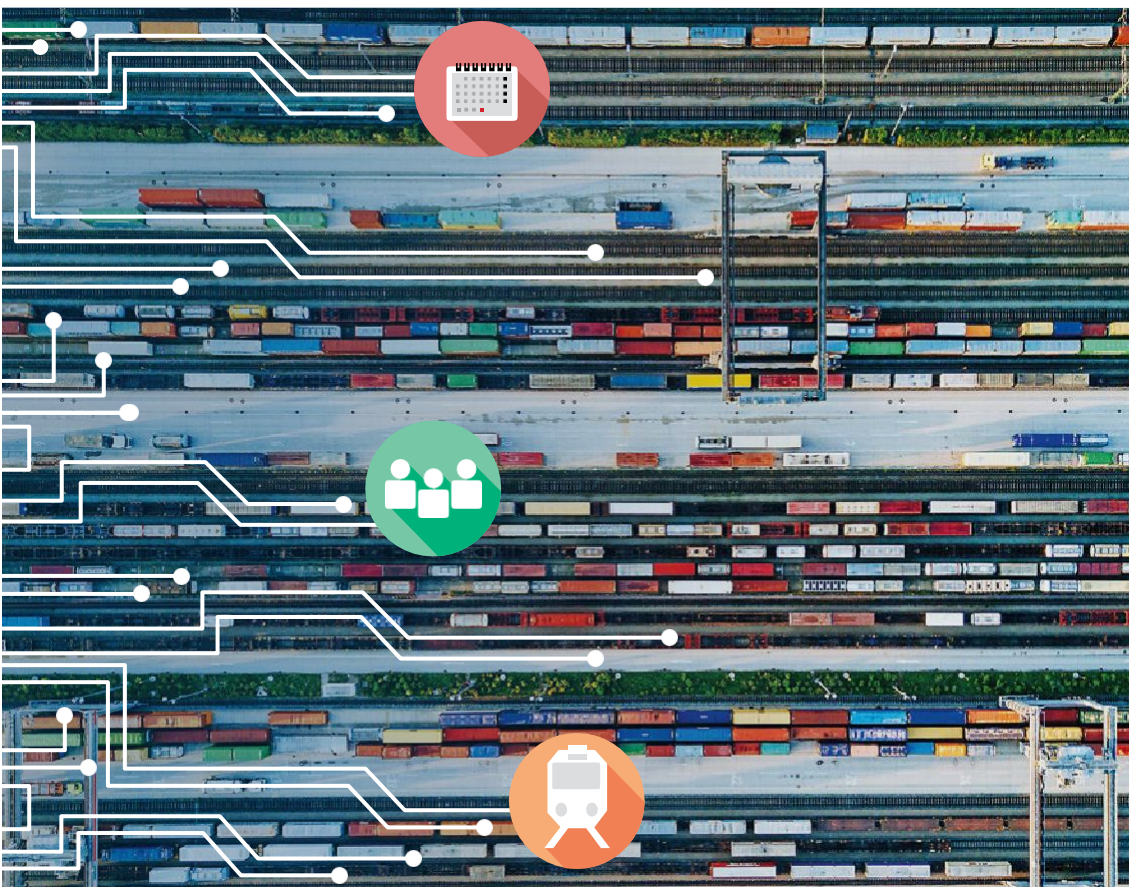DAGMAR REES, EDITOR RAIL BUSINESS

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Logistics processes are complex. A multitude of resources must be optimally coordinated to achieve the best possible result (optimisation). Due to the large number of variables and possible solutions, logistics has always been a challenge, also mathematically. The challenge begins in the planning stage and intensifies in the implementation. Because logistics does not take place in an empty space, but in the "real world": An employee falls ill, trains are delayed because of an accident somewhere in the network, a freight wagon has to be taken to the workshop unexpectedly. In these cases, new optimisations and decisions must be made quickly. New algorithms, combined with constantly increasing computing power, are also increasingly being used in rail freight transport to optimise individual processes or management as a whole.

Staff scheduling

New calculation methods based on artificial intelligence are used in the software solutions from ZEDAS, Senftenberg. With the standard plug-in Opti Planner, staff scheduling can be created at the push of a button - based on previously defined rules. A so-called rule-based, artificial intelligence (AI)-supported solver is used, which, among other things, automatically evaluates the suitability and qualifications of the personnel resources and creates a conflict-free plan in a matter of seconds. According to Christoph Baum, Head of Business Unit Rail Logistics at ZEDAS GmbH, and Chris Richter, Head of Sales, Opti Planner achieves better results than human planners and does so in the shortest possible time. Optimisation on this software basis is also conceivable for other resources, for example for the planning of locomotive rotations.

Overall optimisation

The SNCF logistics subsidiary Forwardis is introducing a total solution. It is converting its IT to a cloud-based logistics system (Ramco), which has so far mainly been used in aviation and for road transport. The core of the Ramco system is an optimisation software that accesses all data available in the company in real time and uses artificial intelligence/machine learning to optimise route planning and resource utilisation and to manage capacities. In the first step, Forwardis will use the Transport Management System (TMS), the hub, fleet and asset management system as well as the module for quotation and invoicing. The new IT should significantly reduce operating costs.

The introduction was planned for November 2020 - due to the coronavirus crisis, the development will be postponed slightly into 2021. According to Phillipe Golder, responsible for the introduction at Forwardis, further applications are planned in the second step. For example, the rail freight forwarder wants to use the AI-supported software in its alternative single wagon system ForwardNet to plan the capacity utilisation of trains in advance based on the experience values stored in the system and later also with the help of additional data from outside. The software will also help to make better use of free capacity on block trains. It is also planned to optimise pricing. One criticism of the rail market in the conventional sector is often the lack of reactivity, says Golder. Forwardis wants to use the data in the system to analyse the historical prices according to different criteria and thus get an estimate of the prices to be expected on the supplier side. In this way, a good indication of the costs to be expected can be given to customers quickly when enquiries are made.

AI - Artificial Intelligence

Artificial intelligence (AI) is a branch of computer science that deals with how computers can perform tasks that humans have been better at up to now: Recognising language and images, understanding texts, interpreting emotions and making decisions even in ambiguous situations. The core of artificial intelligence is that machines can learn through training and special computing models such as neural networks.

A neural network is a computational model that is analogous to the way a human brain works. It consists of many layers through which the input information travels and is reweighted in each layer by calculation. By training a neural network, these weightings are adjusted in such a way that in the end a computational model is created that can make statements with a high degree of reliability.

The structure and function of a neural network can be playfully tested using the "Evolution" app.