Adexa AI and ML Technology

Adexa has been a pioneer in the use of AI techniques since the very beginning. This is partly due to the company founders who have had their roots in AI technology while attending graduate school and research projects conducted at various research labs. Obviously in addition to the above techniques there are also mathematical optimization techniques such as MILP, graph theory and queuing theory.

AI Search Techniques

Constraint Propagation – This is used in order to quickly arrive at a near-optimal solution. An example of this approach is the 8-Queen problem in chess.

Divide and Conquer – Using this approach the system sets up guidelines of constraints at various levels of detail in order to arrive at solutions that are feasible. Thus, the search space keeps getting smaller and closer to the final solution

Taboo search – This is a useful search technique where the system keeps learning from its previous attempt in order to shorten the length of the next search. In other words, it leaves markers behind to let the next search to know branches that would NOT have a feasible solution. (We refer to this as self-optimizing learning technique—see below)

Gradient Descent – This is a complex search process that is used in order to arrive at an optimal solution where the search space is exponentially large. This search is used in order to optimize inventory levels and safety stock at the right locations to ensure quick response and optimal delivery performance.

Expert Systems – Adexa's attribute-based planning (ABP) technique allows the creation of intelligent constraints using Boolean expressions that are parsed by the engine. The expressions are in the form of IF_THEN_ELSE so that one can allow user-defined business constraints as needed for ANY object in the supply chain.

As it can be seen this makes the application very flexible and adaptable to any environment and more importantly as the business changes, the application also changes with the business as needed.

Use of Machine Learning

Neural Nets – NNs are very effective machine learning tools that are applicable in many different areas of supply chain including demand planning and forecasting. At Adexa we use NNs for finding multi-variate causes of events and use that in order to have a more precise prediction of the outcome knowing the potential cause(s).
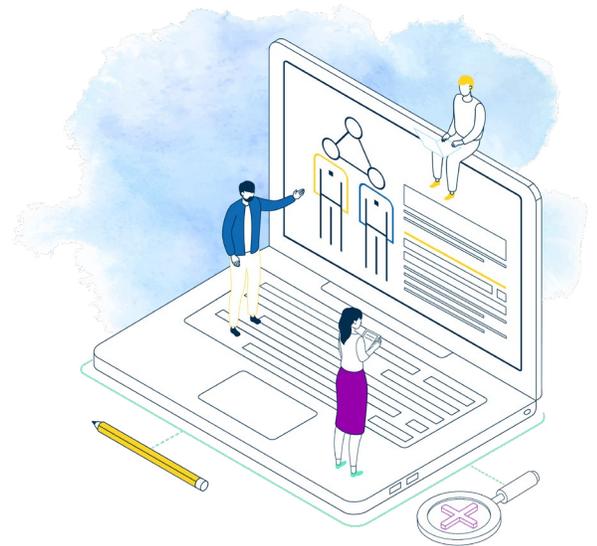
"Adexa Self-Correcting Technology keeps your supply chain operations digital twin constantly updated."

Self-Correcting Models – Supply chains are a living organism. They are changing all the time. A static model of the supply chain becomes irrelevant after a while because the real world has changed from its original assumptions that we made about availability of equipment, processing times, delivery leadtimes during different months of the year and so on. To this end Adexa uses learning techniques in order to constantly update the model of the supply chain to represent a true Digital Twin (what we call a Digital Mirror©)

Self-Improving Policies – As the supply chain changes and or business priorities and environment changes, one needs to adapt to the new way of doing business and optimize decisions. At Adexa, we use ML in order to make good decisions on inventory settings, customer prioritizations, best mix of products so that a much better delivery performance is obtained.

Self-Optimizing Algorithms – ML is used to improve the algorithms themselves. There are a variety of ways to speed up search techniques such the one mentioned earlier using Taboo search.

This approach allows the system to find short cuts to finding the right solution and develop plans much faster by exploiting the structure of the problem at hand.

RBP and Swarm technology
Adexa deploys Swarm technology in order to automate business processes in a scalable fashion. Supply chain planning and execution is essentially a distributed system.

To this end it does not make sense for one big centralized system to respond to changes in a timely manner. Furthermore, it does not make sense to do batch planning. Distributed agents (Adexa Genies©) can sense, act and learn from their experiences and respond in an event-driven (or continuous) fashion.

We believe this is the next generation of IBP platform to enable distributed and intelligent processes to collaborate with one another and grow to be more intelligent making the whole system more effective and adaptive.

For more detail on the above topics please refer to **www.adexa.com**

Let's make **accurate** plans together!
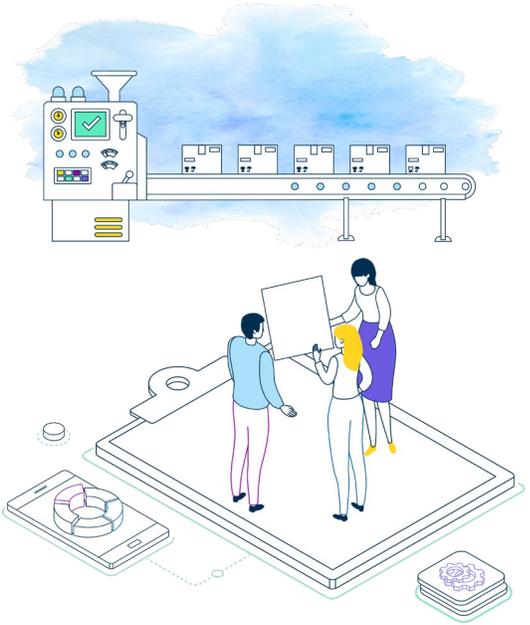
"Your supply chain behavior is changing constantly. Adexa's self-improving technology enables continuous improvement of policies and business rules."

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