

# **Saving Operational Costs with AI and Neural Networks**

The introduction of lean manufacturing models, Six Sigma, Heijunka, and digital transformation initiatives all have one thing in common - reducing operational costs to maximize productivity. To successfully implement these cost-reducing models requires the use of transformative technological solutions. Artificial Intelligence (AI) and its subset Neural Networks (NN) empower the industrial sector with the tools to enhance operational efficiency which leads to considerable cost savings.

In manufacturing, the need to provide individual customers with high quality, customized goods are changing the production landscape. For example, in Batch Size 1 production lines the manufacturer must consider complexities such as tooling changes, workstation sequences, and their effect on the entire process. Hence, conventional simulation models that evaluate capacity plans, resource usage, or predict maintenance timelines are likely to struggle with evaluating Batch Size 1 operations.

So, while the conventional model may successfully develop accurate predictive maintenance strategies for mass production cycles, a different approach is required for customized productions. The approach involves developing complex rules or logic to simulate the dynamic actions of Batch Size 1 workstations, equipment, and systems. Failure to integrate these complexities will lead to ineffective predictive maintenance strategies, downtime, and increased operational costs.

## **Simplifying the Development of Complex Logic in Simulation Models**

Neural Networks provide manufacturers with a streamlined approach to creating complex rule logic in simulation and digital twin models. The NN algorithm is capable of capturing the dynamic variables that define complex production requirements without the designer having to create rules for every variable.

Neural networks automate the logic creation process and its accuracy is dependent on the training and retraining it goes through to make better decisions. Automating the development of complex logic saves time and enhances decision-making which leads to quantifiable cost savings. Going back to the previous example, integrating NN into simulation models of Batch Size 1 production lines improves its evaluatory capabilities. For example, when developing a real-time scheduling plan for customization production

cycles, NN aids the prediction of tool changes, workstation rotations, and the assembly process to ensure high-quality customized items are produced. The optimized production process eliminates operational bottlenecks and reduces cost.

## **Automating Decision-making Processes**

Implementing data-driven optimization processes are crucial to achieving the benefits of Industry 4.0. The digital transformation of traditional manufacturing processes already solves the challenges with data capture and aggregation through the use of APIs. The use of simulation models, the digital twin, and other data analytics tools solves the challenges of gaining insight from captured data. All that's left to explore and optimize is the simplification of the data analytics process through automation.

Neural networks provide the industrial sector with a robust solution for automating decision-making at the source. For example, integrating NN algorithms in an analytical application empowers it to analyze operational complexities and provide evaluatory results without human intervention. If Industry 4.0, smart automation and reducing human intervention, is to be achieved, then the continuous integration of NN provides a pathway to achieving smart automation.

Successfully automating data analytics tasks provide two crucial benefits to industrial enterprises. First, it reduces the financial burden associated with hiring multiple technical tasks to handle data management and secondly, it democratizes data analytics and its insight to both technical and non-technical staff. One example is utilizing Simio software to analyze data from complex operational activities. Using Simio, non-developer can create neural networks to replace complex rules or logic without the need to have programming knowledge or experience.

Open-source AI platforms such as ONNX and its file format empower industrial enterprises with the tools to leverage existing NN algorithms to automate specific workflows. The smart automation capabilities of NN and the availability of open source resources reduces the time spent on repetitive tasks and improve operational efficiency – leading to reduced operational cost.

## Improving Smart Systems

The fourth industrial revolution is all about developing highly-functional cyber-physical spaces that limit human intervention. Despite the admirable milestones recorded with implementing transformative solutions, in many cases, final decisions are being made by men. For example, a digital twin which is a digital mirror of physical systems still sends notifications to the user prompting end-users to take action. But in the true sense of automation, full automation means the smart system or digital twin should be able to make crucial decisions without informing its handler.

It is important to note that the buffer a notification process puts in place is done to ensure safety and accountability on the shop floor. Fears that a system may interpret shop floor data wrongly means an overseer must be in place to take responsibility for its actions. The ability to consistently train neural networks to improve their situational evaluation accuracy levels may be the final link to alleviating these fears and achieving full automation.

Neural networks are trained using both historical and live data thus improving a system's capability to make accurate deductions in real-time. Hence, smart systems will benefit from an iterative analytical process and could be trusted to move from delivering notifications to taking action.