



Metalworking

How AI and the Industrial Internet Will Revolutionize Manufacturing

Kip Hanson | Mar 26, 2024

As machine shops and sheet metal fabricators know all too well, accurate scheduling in a high-mix, low-volume environment can prove exceedingly difficult.

That's especially true for shops that still rely on job data that's input manually, i.e., paper timecards, which might contain errors or have missing information.

Some also find it difficult to ensure accurate production standards, at least until the shop has run a new job a few times.

Then there's the matter of updating the company's enterprise resource planning software to reflect actual cycle times, a time-consuming task that tends to fall by the wayside when the manufacturing engineers are busy with more important activities (like trying to deliver jobs on time).

Wouldn't it be great, then, if smart machine tools could communicate with equally smart software systems and deliver accurate, up-to-date production schedules in real time? No human intervention, no surprises and no more manual data entry—just clean information that people can depend on to more effectively manage their operations.

That's no longer an idle fantasy. **Artificial intelligence (AI)** is poised to take over the data analysis (another onerous task) that comes after shops have begun capturing data from their CNC machine tools via the **Industrial Internet of Things (IIoT)**. Meet the Artificial Intelligence of Things, or AIoT.

People-Oriented IoT

The term has been floating around since at least 2017, when a **press release** from Sharp Corp. mentioned "a network of IoT devices that constantly monitor and learn about our lifestyles and preferences, leveraging leading-edge AI to offer optimal services and solutions for any situation."

The electronics giant was talking about artificial intelligence's potential use in making televisions and home appliances smarter and "more people-oriented." And while we'd all love a big-screen TV that would learn our preferences and automatically record our favorite shows, the technology also has a

vast array of potential industrial uses.

One example is placing sensors in CNC machine tools and other production machinery, then either sending harvested data to the manufacturing equivalent of ChatGPT for automated analysis, or by embedding similar AI capabilities into the sensors (and possibly the machine tool itself).

Doing so would not only enable more accurate production scheduling, but also provide more comprehensive views of the manufacturing floor overall.

For instance, AI could analyze Internet of Things data from all of the factory's machinery and even its people (via smart nametags, perhaps) and spot unfavorable trends, look for continuous improvement opportunities and alert maintenance staff of impending breakdowns.

Making CNC machinery "smarter" through artificial intelligence might one day open the door to autonomous process optimization, leading to longer tool life, better parts quality and increased machine utilization, i.e., overall equipment effectiveness.

AI could also help manufacturers refine their products.

Smarter Planes, Trains and Automobiles

Consider the automobile. Using Internet of Things sensors in cars, automakers might gather usage and performance information and, like *Tesla*, use it to "improve and enhance development."

Considering that Tesla has already sold more than 5 million vehicles, that's a humongous amount of data, information that only automated algorithms could process.

By feeding life cycle analyses into a product's *digital twin*, designers could then easily identify areas ripe for optimization, reducing costs and enhancing the user experience on subsequent versions.

Mimicking Human Learning Capabilities

As you read this, you might be wondering how artificial intelligence differs from machine learning, especially since the terms are sometimes used interchangeably.

In a nutshell, machine learning uses large sets of data and computer algorithms to "make a prediction or classification."

That's according to IBM, a pioneer in the field, which goes into *great technical detail* about the nuances of machine learning vs. deep learning vs. neural networks.

Here's a simple example. In 2012, a group of bored Google scientists constructed a "*neural net*" with thousands of computer processors and told it to spend its days surfing the internet. The result? It soon learned to spot cats on YouTube.

More than a decade later, robot and automation providers are using a similar machine-learning capability to perform tasks like picking random parts from bins and assembling complex products, tasks that depended entirely on humans up until a few years ago.

Artificial intelligence takes that a step further.

While it often employs machine learning and large language models like those used to teach ChatGPT, artificial intelligence is capable of more human-like behavior: taking what it has learned and going beyond, making deductions, predicting results, identifying patterns and solving problems. It learns on

its own.

As for the Industrial Internet of Things, think of it as a heavy-duty version of the Internet of Things that makes your home thermostat smart, automates your lights and locks and slams on your vehicle's brakes before you barrel into the car ahead of you.

When these related and extremely powerful technologies are combined as described earlier, manufacturers will have the ability to significantly improve overall equipment effectiveness and part quality.

Already, machine tool builder ***Okuma America*** advertises numerous intelligent technologies, while DMG MORI talks about the "***Machining Transformation***," and cutting tool provider Sandvik Coromant has a host of ***Digital Machining*** products.

Other industrial suppliers provide similar offerings, with more becoming available each day.

The message is clear. AIoT may not have made its way onto the production floor in a meaningful sense yet but it's coming. Companies that embrace the Industrial Internet of Things and other cutting-edge technologies today will be in the best position to leverage AI tomorrow.

It's time to get smart.

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