

WORKFORCE DEVELOPMENT

In the job market, artificial intelligence will create opportunities and obsolescence. Are manufacturers ready?



HAL for Hire

Kip Hanson
Contributing Editor

Science fiction is quickly becoming fact. Arthur C. Clarke's 1968 novel 2001: A Space Odyssey describes HAL, a heuristical-ly programmed algorithmic computer responsible for managing the Discovery One spaceship on its journey to Jupiter.

We won't give away the ending except to say it didn't turn out well for the crew. For Baby Boomers, this was perhaps their first example of artificial intelligence (AI), foreshadowing a time when intelligent systems will augment and, in many cases, replace humans.

Given the exponentially increasing intelligence of AI and large-language models (LLM), advanced platforms such as ChatGPT, IBM Watson, Google DeepMind and GitHub Copilot have become mainstream over the last couple of years. These technologies already are transforming the way we drive our cars and buy groceries, write term papers and diagnose mysterious ailments; just imagine what they'll be capable of in a decade.

Same Pain, Different Century

We've been here before. The advent of mechanical textile mills in the early 19th century led many workers—self-proclaimed Luddites—to destroy machinery in protest. A century later, automated switching stations began putting countless telephone operators out of work, followed by computerized machine tools, the printing industry's shift to digital typesetting, and the gutting of retail sales jobs following the birth of e-commerce.

In the face of these and other technological ad-



While AI and automation help enable efficiency for the human workforce, training on new tech tools is needed to help achieve smart manufacturing success.



CAM Assist was initially developed by CloudNC for use in its own machine shop.
(Provided by CloudNC)

vances, workers have responded by adapting to changing employment opportunities, upgrading their skills and, in some cases, taking entirely new career paths. The question then becomes: What will we do for a living when AI gains human-like decision-making capabilities (what computer scientists refer to as artificial general intelligence) and, together with machinery that's become equally intelligent, makes human workers unnecessary?

It's not going to happen. That's the word from Roger Atkins, president of the Cleveland-based National Tooling & Machining Association (NTMA), who's been in the industry since the days when tape-operated milling machines and cam-driven screw machines were considered state of the art. Since then, he's watched manufacturing undergo vast technological shifts; but he isn't concerned about AI or any other technology eliminating the roughly 13 million manufacturing jobs in this country, let alone filling the estimated 2 million open positions expected by 2030.

"Everyone is wringing their hands right now about AI taking their jobs when the reality is that it will do just the opposite, creating all kinds of new opportunities," Atkins says. "Yes, there's no doubt that it will reduce the need for less-skilled jobs like those in the call center

and food service industries, but in the manufacturing world, AI and other forms of automation allow you to redeploy your people more effectively and increase production with less effort. Further, it's opening the door to young people who, without this kind of high tech to entice them, would never have even considered going into the manufacturing field."

Saving Time

Note the added clause "and other forms of automation." It's an important point. Like it or not, typing the command "Write a five-page essay on the American Civil War" into your favorite chatbot is—conceptually, at least—no different than installing a pallet changer on a CNC machining center. Both technologies reduce the time and effort needed to complete certain tasks, and as Atkins pointed out, allow companies to redeploy workers more effectively.

"Just like sticking a robot on a lathe frees the operator to inspect parts or prepare tools for the next job, so will AI give them the ability to perform tasks they're either not very good at, or mundane tasks that consume a lot of time," Atkins says. "For example, we have men and women working in manufacturing businesses all across America who can make the most precision parts imaginable, but maybe their communication skills aren't the greatest. Thanks to AI, they can now type and even recite their thoughts into a computer or smartphone; and, within moments, ChatGPT will generate very succinct, intelligent text for sharing in an email, pasting into a work instruction or using as the starting point for an ISO certification document. It's an invaluable tool for many people."

The trick is for manufacturers to educate themselves about the different forms of automation—AI and otherwise—in order to select the right one and use it properly. Just as a machine shop owner considering investing in that robot must answer questions about payload, integration and safety, so should the AI-curious aiming to streamline their business processes know the often subtle differences between an LLM, such as GPT-4, and multimodal AI models like DALL-E (used to generate images based on textual descriptions).

Jobs, Jobs, Jobs

But this article isn't meant as a primer on AI; it's

WORKFORCE DEVELOPMENT

about the jobs that AI will create (and is already creating). So what are they, and what skills will people need in order to land one? A quick search for “artificial intelligence” on a well-known recruiting site lists more than 1,000 open positions nationwide. Job titles include the obvious artificial intelligence engineer, as well as machine learning engineer, AI math specialist, senior data scientist and solutions architect (AI/ML).

Most appear to offer good compensation but require

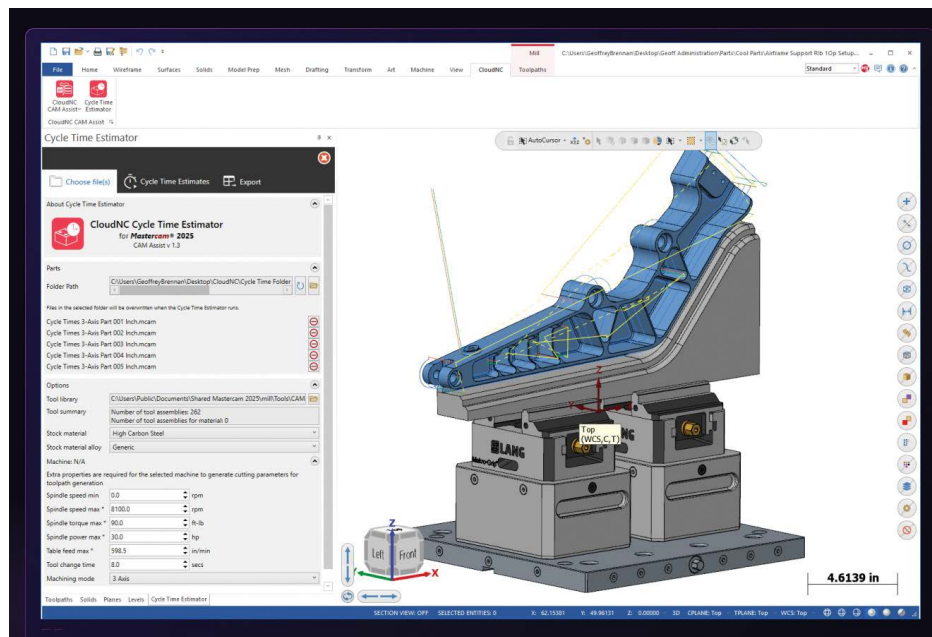
many of us spend each day on the “language tasks” (a skill that AI is especially good at) will now be available for more meaningful, productive work. Making these workers successful, however, will require companies to “ensure their staff are developing the new skills that will be required in the age of AI,” Accenture notes.

For those who wish to continue wearing a blue collar, a better question might be: How will AI impact my current job, and what should I and my

coworkers learn in order to leverage it? Unfortunately, it might be too soon to provide an answer.

My AI Instructor

“We’re at the same place today with AI as we were roughly twenty years ago with automation, when people began to worry about the impact robots would have on manufacturing jobs,” says Chad Schron, senior director at Tooling U-SME. “And while some of the very manual, tedious positions were lost to automation, you now see many opportunities for robot programmers, maintenance technicians and the like. It’s going to be interesting to see



Estimating a job? An AI-powered CAM system can eliminate the guesswork and drudgery while greatly reducing quote times. (Provided by CloudNC)

a college education and have little to do with manufacturing, centering instead around healthcare, banking, insurance, legal services and software development (i.e., making AI even smarter).

Not surprisingly, many of these are industries that the World Economic Forum’s Future of Jobs Report 2023 predicted would be most impacted by AI. The report cites several statistics from professional services company Accenture, which describes the arrival of ChatGPT-4 and similar models as “a significant turning point and milestone in artificial intelligence,” estimating that 40% of all working hours could be impacted by these LLMs.

But as NTMA’s Atkins indicated, this does not necessarily mean 40% fewer workers—instead, the time

where it all goes.”

Schroen’s advice in these uncharted waters is for people to learn all they can about smart manufacturing, of which AI is both a subset and an enabler. To this end, Tooling U-SME offers more than 100 training classes in this category alone, and, more importantly, partners with businesses, vocational colleges and universities to provide accredited curricula and apprenticeship opportunities to people of all ages and skill levels.

Ironically, some of these schools have begun using AI to improve student outcomes, and later, to assist them and their new employers with the onboarding process. “SME partners with Mainstay, a Boston-based educational technology company that recently

released its GenAI-powered [generative AI] Student Assistant,” Schron says. “Think of it as a very smart chatbot that acts as both a student companion and a guide while they’re in school. It’s intended to help them understand key concepts and create a more personalized learning experience, ultimately reducing dropout rates through higher student engagement.”

Hey, Moe!

SME’s new “Ready to Hire” program, meanwhile, aims to build sustainable talent pipelines by providing manufacturers with access to qualified pre-screened, pre-trained, pre-market talent. “It is our responsibility as one of the industry’s leading workforce organizations for over 90 years to create and invest in innovative programs like Ready to Hire, which will strengthen the manufacturing supply chain with technically skilled, productive individuals,” SME Executive Director and CEO Jeannine Kunz explained in an August press release. “Through our collaboration with Cengage, we are able to address not only the skills gap but also the gap in applicants, ultimately, positioning manufacturers and individuals to be better prepared for the future.”

Similarly, AI is helping companies retain new hires longer and make them more productive in less time. One example comes from Grede LLC, a 100-year-old casting company based in Southfield, Mich., with foundries and machining facilities throughout the Midwest and Eastern United States.

Like many manufacturers, Grede struggled to find employees in the first place, then retain them once on board. “It’s a very progressive company that’s made a strong push into automation and smart manufacturing; but, at the end of the day, foundry work is hard,” Schron says. “Because of this, they had a high turnover rate, and some people would leave after a few weeks, or not even show up at all.”

Grede turned to SME, which introduced the manufacturer to Mainstay. As with its GenAI-powered Student Assistant, the company has also developed an AI-enabled chatbot able to assist employees throughout the onboarding process. Says Schron, “Grede’s human resources team found themselves repeatedly answering rudimentary questions, like ‘When do I get my first paycheck? What’s the bereavement policy? Who do I call if

I’m going to be late or need a day off?’ Since the chatbot (dubbed Moe) was able to address more than 62% of these basic common questions, and even do things like send reminders to people on where to go their first day and who to ask for, the HR people had more time for one-on-one engagement with their workforce. Their retainment rate has increased so much they are now rolling the program out to all ten plants.”

Achieving Level III

Another area where AI is making inroads is CNC toolpath generation. Andy Cheadle, chief technology officer with London-based CloudNC, uses the analogy of self-driving cars to describe the company’s technology, where Level 0 provides no driving assistance and Level 5 is a fully autonomous vehicle. If CAM software were an automobile, he estimates that CloudNC’s CAM Assist would be somewhere around Level 3.

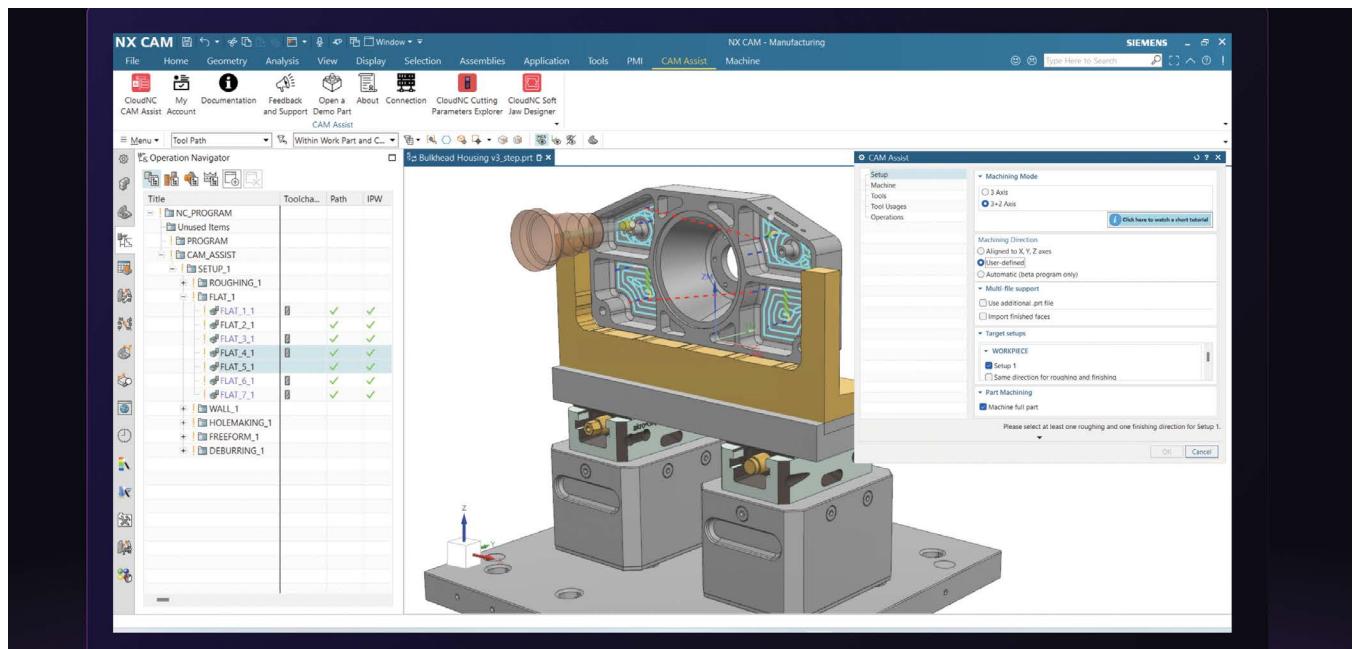
Yet Cheadle is quick to make two clarifications. The first is that CAM Assist is just that—an assistant—one that integrates closely with Autodesk Fusion 360, Mastercam and Siemens NX (for now). The second point is this: fully autonomous programming systems—like self-driving cars—remain the stuff of science fiction. But, as with novelist Clarke’s 1968 dreams of HAL, both are probably closer than many suspect.

“Our mission is to deliver a single-click programming solution, where you can upload a file and the software will deliver clean, efficient code all on its own,” Cheadle says. “Of course, we’re a long way from that capability—perhaps decades—and our primary focus right now is on the skills gap and associated hiring challenges that shops face when trying to secure machine tool programmers.”

As others have already pointed out, AI and automation aren’t about replacing humans, but rather freeing them from mundane tasks so they can A) be more efficient and B) do more challenging things with their time. “By automating the CAM process, our software will get you 50% to 80% of the way to a complete program on medium-complexity parts, maybe more for simpler ones,” adds CloudNC Principal Engineer Will Hoults. “This gives programmers more time to work on the very difficult stuff that AI can’t yet do.”

Beyond the Features

When asked what separates CAM Assist from the



CAM Assist is currently available for Siemens NX (shown here) as well as Mastercam and Autodesk Fusion 360. (Provided by CloudNC)

feature-based machining (FBM) and feature recognition capabilities available in most CAM systems today, Hoult was quick to note that these tools—though useful—are essentially nothing more than powerful macros, able to generate toolpaths for relatively simple features like slots and hole patterns, but easily stumped on more complex geometries. And, even when the system recognizes a certain feature, FBM still requires human assistance for tool selection and areas that don't fit neatly into the programming template.

"Parts of medium complexity have disjointed features," he says. "They tend to occlude one another, they tend to interlock, they tend to overlap. At that point, feature-based recognition breaks down and the user has to go in and clean it up. Further, where these legacy forms of programming automation look only at machining certain part features, AI is enabling complete process automation, machining the part from billet all the way through to the finishing operations. It's a holistic programming solution otherwise unavailable without artificial intelligence."

Cheadle raises another important point: just as tools like ChatGPT can make those with limited writing skills sound more like Clarke or Ernest Hemingway, so can

AI help newbies shorten the learning curve—users can watch the steps that CAM Assist takes when generating toolpaths and emulate them, allowing them to gradually piece together the knowledge that separates experienced programmers from those who are just starting out. Given the corporate offshoring over the past three decades and the resulting shortage of these and other metalworking professionals, AI could very well be the path forward as the U.S. attempts to rebuild its manufacturing base.

"As anyone who's done it knows, machining is a very complex process," notes Norval Scott, head of PR and communications at CloudNC. "Success depends not only on accurate toolpaths but also on the workholding, cutting tools, machine power and rigidity, workpiece material and much more.

"As excited as we are about AI's potential, humans are still very much in the loop," he continues. "They need to verify what the system has done, fix it where necessary, and quite possibly optimize the process. Because of that, we see AI and automation in all its many forms primarily as efficiency enablers for the human workforce; but given the chronic labor shortage and increasing global competition, these technologies are sorely needed." 📶

TRANSFORM YOUR
WORKFORCE

TOOLINGU | sme

info@toolingu.com or 866.706.8665