3DS DELMIA

AI-POWERED MACHINING: OPTIMIZE, AUTOMATE, EXCEL

Artificial intelligence (AI) is redefining CNC machining, making programming and toolpath optimization more innovative and efficient. With platforms like DELMIA and the **3D**EXPERIENCE platform, manufacturers can quickly capitalize on knowledge and automate complex machining tasks. AI-powered solutions function like a GPS for machining—analyzing challenges, suggesting optimized toolpaths, and unlocking new possibilities in mill-turn and mold machining.

3DS DASSAULT SYSTEMES

QUICK OVERVIEW AND ANALYSIS

Automated Toolpath Optimization
AI-driven software predicts the most efficient toolpaths, reducing waste and enhancing cutting precision.

Adaptive Machining
AI adjusts parameters in real time based on sensor data, optimizing cutting speeds and tool wear.

Knowledge Retention
AI preserves machining expertise, enabling rapid onboarding of new operators and reducing dependency on seasoned professionals.

These are just a few examples, but applications of AI in machining are not limited to the preceding uses and extend to predictive maintenance, computer vision-based operations, and much more.

MARKET INSIGHTS & ADOPTION TRENDS

1 The global AI in manufacturing market is projected to reach **$16.3 billion by 2027**, driven by advancements in automation and Industry 4.0 initiatives (BusinessWire, 2022).

2 Over **75% of CNC manufacturers** are investing in AI-based process automation to improve quality control and production efficiency (McKinsey & Company, 2023).

3 AI-powered systems can reduce machining cycle times by **up to 30%** and increase tool life by **20-40%**, leading to significant cost savings (Boston Consulting Group, 2023).
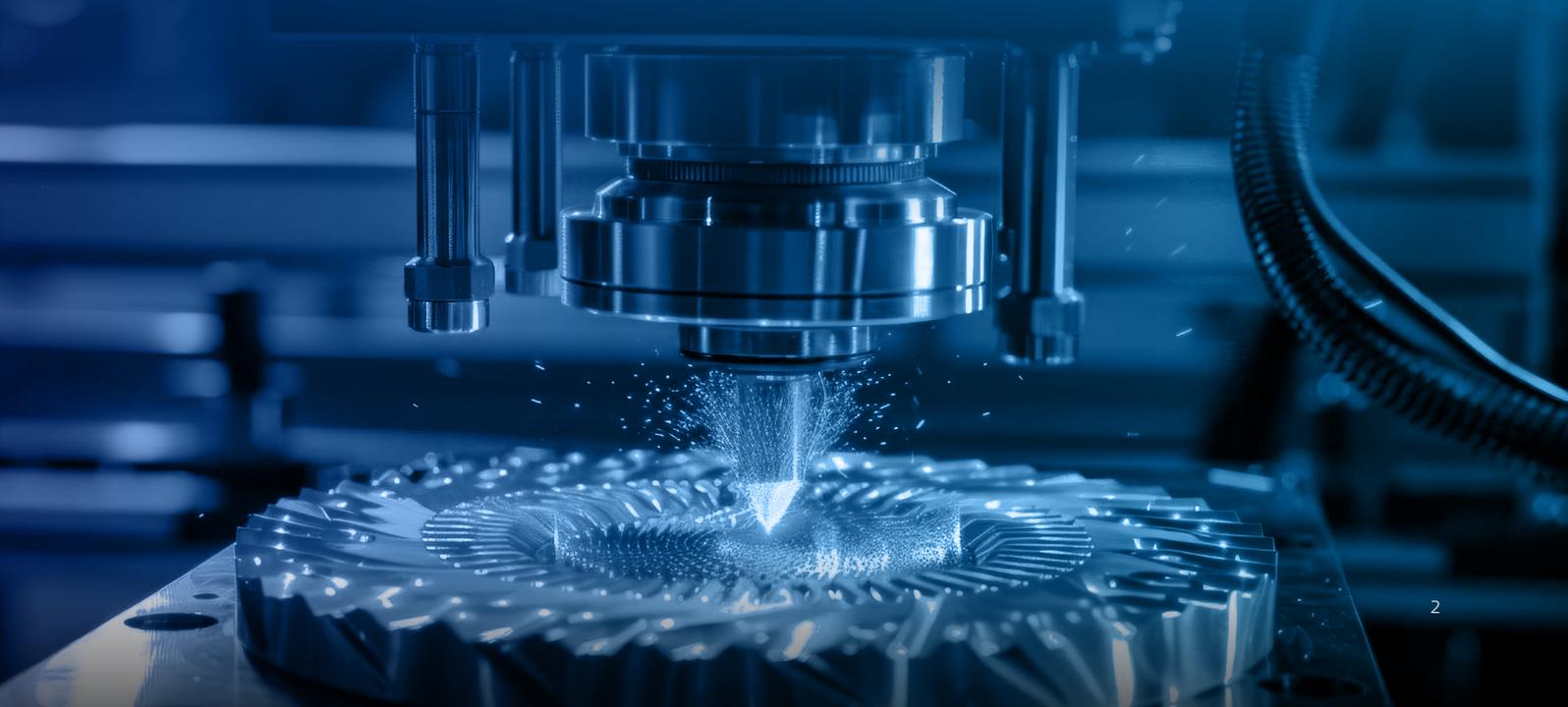
IS CAM EXPERTISE AT RISK?

Trends for CAM users

For years, CAM operations have relied on seasoned experts with deep knowledge of machining processes. However, many of these professionals are now retiring or shifting to different roles, leaving a gap in expertise. This generational shift introduces both challenges and opportunities for manufacturers.

The incoming CAM users are technologically savvy and accustomed to modern digital experiences. Unlike their predecessors, they prefer:

1

User-friendly, mobile-like solutions
They expect software to be intuitive and easy to navigate, similar to the apps they use daily.

2

Smarter, more intelligent software
Rather than manually adjusting every detail, they want AI-driven assistance that simplifies decision-making.

3

Higher levels of automation
They are less interested in repetitive, low-value operations and seek software that automates routine tasks, allowing them to focus on more strategic activities.

With these shifts, companies must ask: **Is CAM expertise at risk?**

Risks for companies

As seasoned CAM professionals retire, critical machining knowledge may be lost, often undocumented. Without centralized know-how, companies risk inefficiencies, slower programming, and costly trial-and-error processes. Since productivity relies on experience, losing this expertise can severely impact operations.

At the same time, attracting young talent to machining is challenging. The field demands technical precision, yet modern workers expect intuitive, automated solutions. Without adapting software and processes to meet these expectations, businesses may struggle to fill the skill gap.

To stay competitive, companies must capture and centralize expertise while adopting AI and automation to support new users—ensuring seamless knowledge transfer and sustained productivity.

## Endless opportunities for CAM systems

By integrating AI into machining software, vendors can accelerate new user ramp-up. This provides real-time assistance and intelligent automation to simplify complex tasks, ensuring that even less experienced users can achieve high efficiency and precision from the start.

Another key opportunity lies in knowledge capitalization. Vendors can develop tools that store, centralize and streamline expert know-how, ensuring seamless access and reuse for future machining programs. By preserving machining intelligence within the software, companies can maintain performance levels despite workforce transitions, reducing reliance on individual expertise.

By embracing AI and knowledge management, CAM vendors can future-proof their solutions, making them more intuitive, efficient and attractive to the next generation of machinists.

HOW CAN AI GUIDE NUMERICAL CONTROL (NC) MACHINE PROGRAMMERS?

> **" AI is not replacing machinists— it's augmenting their expertise. "**
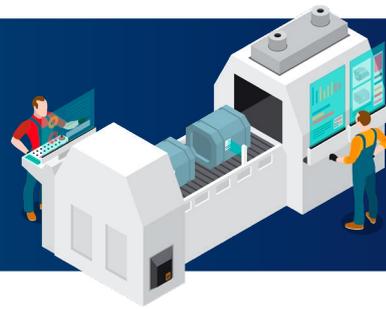
The artificial intelligence (AI) in DELMIA Machining is designed to assist users, not replace them. Rather than functioning as an independent decision-maker, it acts much like a GPS, offering alternative options for machining processes. Just as a GPS suggests different routes when faced with obstacles, the AI in DELMIA Machining proposes machining strategies that may not have been considered, potentially uncovering new alternatives.
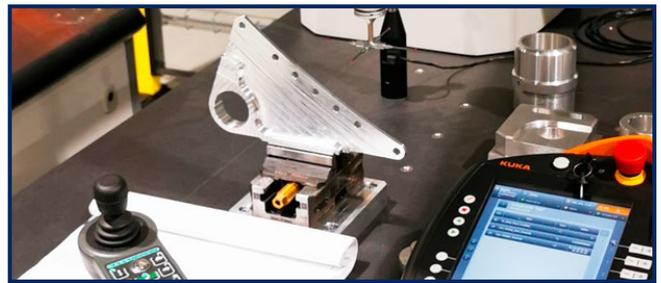
The purpose of this AI is not to replace individuals but to improve efficiency, allowing users to focus on tasks that add more value. This approach aligns with our broader company vision: **to *enhance* human capabilities through technology rather than *replace* them.**

The AI in DELMIA Machining is not a "black box." It does not operate in isolation but offers alternative suggestions based on experience and data. This allows users to explore different approaches and strategies, ultimately helping them make informed decisions.

With continued development, AI aims to capitalize on accumulated knowledge from years of programming and machine operations, providing valuable insights to users. The goal is to create a system where AI supports decision-making, guiding users toward better outcomes without replacing their roles.

Use AI to support new user ramp-up

AI can play a crucial role in helping new users quickly become proficient in machining processes. One key functionality in DELMIA Machining is the automated proposal of toolpath types based on geometry selection. This feature empowers less experienced users by offering guidance in selecting machining cycles appropriate for specific parts, allowing them to make informed decisions throughout the machining process.

A primary goal of this AI functionality is to assist novice users in ramping up their skills. When new programmers are tasked with programming a part, they often need help determining the appropriate operations required for machining it.

While many tools in the market offer a wide range of capabilities, the purpose here is to simplify the decision-making process for users. The AI suggests relevant toolpaths based on the geometry selected, helping users identify the most appropriate option. However, the user is still in control and has the final say in selecting the toolpath.

Powered by AI: Alternate parameters and strategy proposals
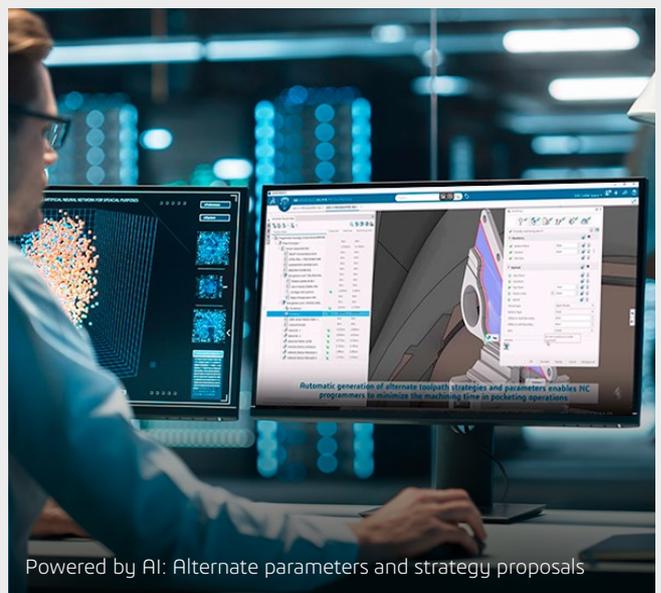
For instance, if the user selects a simple hole, the system will propose the operations specifically suited for machining a hole. Similarly, if the user selects a pocket, the system will suggest the relevant operations for pocket machining. This functionality streamlines the process and helps new users build confidence and ramp up their skills more efficiently.

AI technology in DELMIA Machining offers powerful support for NC programmers by automatically generating alternate toolpath strategies and parameters. This functionality is especially beneficial in pocketing operations, where it helps optimize cutting tool life and minimize machining time by proposing various options for toolpath strategies.

Once a user creates a toolpath and selects initial parameters based on their experience, the AI can suggest additional toolpath types and modify parameters based on trained data. This feature enables the system to present multiple alternatives, allowing users to explore different strategies that could improve performance. Just as a GPS suggests alternate routes for more efficient travel, the AI proposes alternate strategies and parameters to enhance machining efficiency.

To support users in making informed decisions, the system displays key performance indicators (KPIs) for each alternate toolpath. These KPIs provide valuable insights, allowing users to compare options and select the most suitable strategy for their machining needs.

Overall, this AI-powered capability simplifies the user interface and assists in identifying optimal parameters, giving users the flexibility to explore various alternatives and improve their machining outcomes.
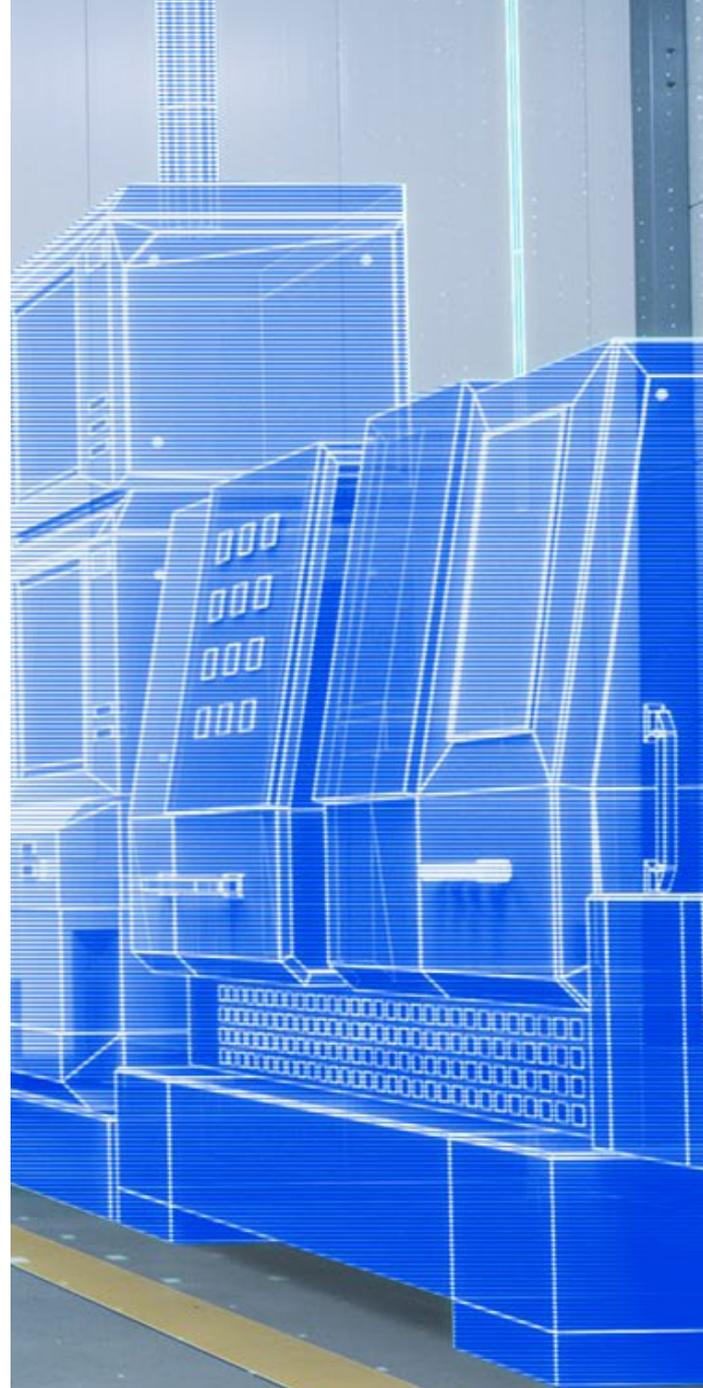
KNOWLEDGE CAPITALIZATION TO MAINTAIN FUTURE MACHINING PERFORMANCE

> " **The future of machining is knowledge-driven: AI helps retain and transfer expertise.** "
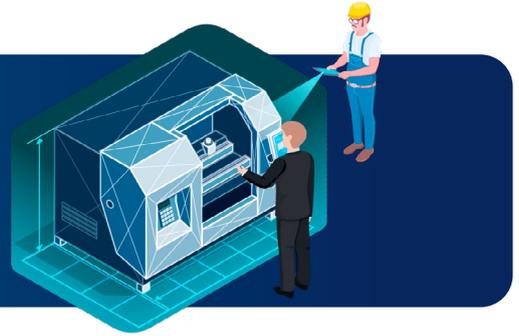
Knowledge capitalization is a crucial aspect of the DELMIA machining system to maintain high machining performance and ensure continuous improvement. By saving the company's know-how in the **3D**EXPERIENCE Platform, beginner programmers can benefit from the collective expertise accumulated over time. This approach not only preserves the company's machining knowledge but also supports the development of future machinists by providing them with tools and resources to build on previous experiences.

A key feature of this knowledge capitalization is the ability to create template programs with know-how linked to specific geometries, sequences and resources. These templates allow for the quick generation of NC programs that adhere to company standards, significantly reducing programming time and minimizing errors. The system's feature recognition capability helps retrieve features to be machined, including custom user-defined features, further streamlining the process and reducing the potential for mistakes.

New programmers can ramp up their skills more effectively by reusing these templates and recognizing both standard and user-defined features. They can leverage best practices and expert insights embedded into the know-how stored, which helps them avoid common errors and align their programming with the company's established standards.

The user interface can also be customized to reflect the company's specific know-how, ensuring that best practices and knowledge are easily accessible. This facilitates a seamless learning curve for new users while maintaining consistency and high performance in machining operations.

Ultimately, knowledge capitalization helps preserve valuable expertise, allowing the company to maintain and enhance its machining capabilities over time.
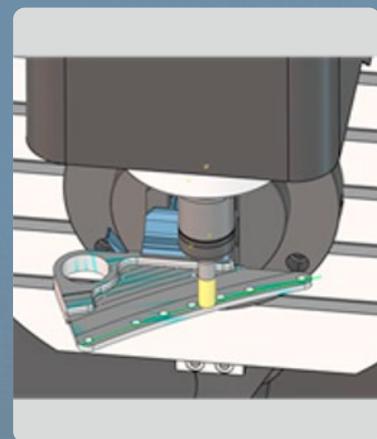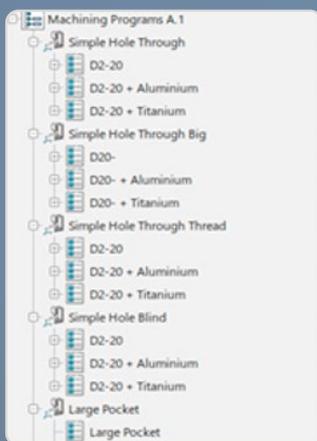
SAVE CAM KNOWLEDGEWARE: workplan and operations, cutting tools, cutting paramaters for simple shapes or complex user designed features

> Shape recognition and automatic creation of operations and programs aligned with company programming rules

DELMIA MACHINING ADDED VALUES

Use AI to support new user ramp-up

DELMIA Machining offers an immersive experience for CAM programming within a virtual workshop. With best-in-class machining capabilities, users can program their machines in a virtual environment that closely mirrors the real-world shop floor. This integration provides an intuitive and efficient way to interact with machining processes, making users feel as though they are programming directly in front of the machine.

The system is embedded within a native collaborative environment, facilitating seamless communication and teamwork. Whether working individually or as part of a team, users can access a complete set of programming tools and capabilities, all within the context of the virtual shop floor. This approach enhances the programming experience and helps reduce the gap between digital design and physical execution.

By offering this virtual workshop, DELMIA Machining enables users to experience and fine-tune their programming strategies in a controlled environment, ensuring they are fully prepared for real-world machining operations.

One Solution for All Your Processes

DELMIA Machining offers a comprehensive solution for managing all machining processes, aligning with our customers' corporate strategies. By providing a single tool for various processes, we help businesses reduce overall license costs, maintain skills across a unified solution and preserve best practices throughout their operations.

Our solution covers many machining processes, including milling, turning, mill-turn, complex machines, wire EDM, laser cutting and water jet cutting. Additionally, DELMIA Machining supports knowledge management and the ability to design resources such as machines, cutting tools and clamping tools. This broad scope ensures businesses can manage all aspects of their machining processes with one unified platform.

Integrating CAD and CAM programming into a single system allows DELMIA Machining to provide seamless continuity between design and manufacturing, allowing businesses to stay agile and efficient. Whether managing complex multi-process operations or maintaining consistent quality across production stages, DELMIA Machining ensures that all aspects of the shop floor are connected to the product design environment, fostering a streamlined and effective workflow.
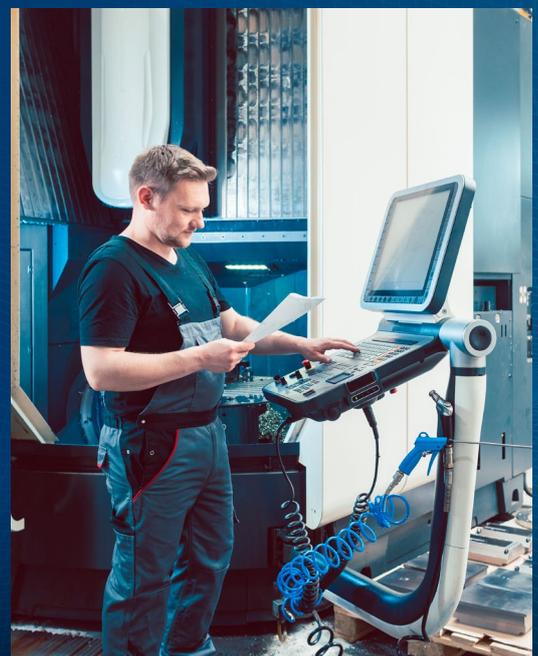
KEY TAKEAWAYS

Embrace AI the Right Way

AI is not magic but it can guide new users

It should be combined with company knowledgeware to best support NC programmers

It can optimize the machining time and efficiency

1 AI as a Guide, Not Magic
The purpose of AI in DELMIA Machining is not to replace users but to guide them, especially new users, and use the company's expertise to optimize machining processes.

2 Knowledge-Driven Optimization
While complete generative machining programs may not be immediate, relying on the company's experience and knowledge ensures that AI recommendations effectively optimize machining time and floor efficiency.

**3 Optimizing Machining Time and Efficiency**
By combining AI-driven suggestions with the company's knowledge, the system can help maximize machining time and improve overall efficiency on the shop floor, leading to more effective operations.

The goal is to empower users, especially those new to the system, by providing them with the tools to make informed decisions and streamline their workflows with the support of AI-guided suggestions.

WHY DELMIA MACHINING IS FOR YOU

- Bring a virtual workshop with cutting tools, machines and accessories to the desk of NC programmers
- Collaborative environment available on **3D**EXPERIENCE platform on the cloud but also on-premise
- Machine simulation is available in all programming roles
- Best in class Adaptive Concentric Milling for HSM and hard material machining
- Support Mill-Turn, SWISS machines and milling with robots
- Support WireEDM and Laser cutting machines
- Automation and Knowledge: store machining know-how while experts are retiring
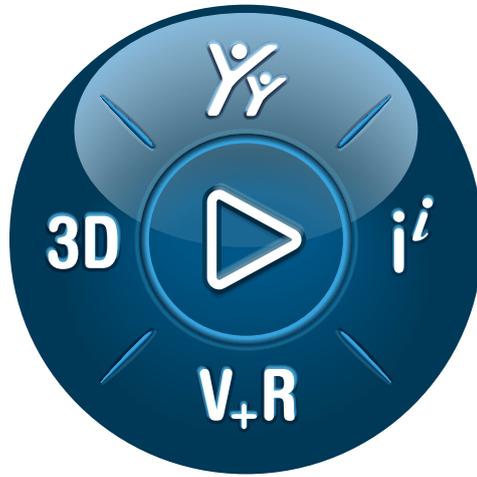
3DEXPERIENCE®

Dassault Systèmes is a catalyst for human progress. Since 1981, the company has pioneered virtual worlds to improve real life for consumers, patients and citizens.

With Dassault Systèmes' **3D**EXPERIENCE platform, 370 000 customers of all sizes, in all industries, can collaborate, imagine and create sustainable innovations that drive meaningful impact.

For more information, visit: **www.3ds.com**

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Virtual Worlds
for Real Life

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