Bring AI to your computing tasks with new Lenovo laptops powered by Intel Core Ultra processors

How investing in Intel Core Ultra processor-powered Lenovo PCs with Windows 11 Pro can help your organization better handle today's and tomorrow's AI advancements

Windows 10 will reach the end of its support period in 2025, with the current version being the final one. After that, Windows 11 will take over.[1] Simultaneously, the artificial intelligence (AI) revolution is here to stay, with Microsoft reporting that searches about AI have outpaced searches for other software by more than three times.[2] Many people and organizations are considering how best to experiment with AI and discover what benefits it can bring them. In this rapidly changing environment, if you're still working on a PC from several years ago—or are responsible for purchasing and managing the laptops of a large team—you may be considering what you could gain by upgrading.

We compared the performance and capabilities of three new Lenovo® PCs, all featuring Intel® Core™ Ultra series processors, against those of their three-year-old counterparts. Among other advantages, we found that the new Lenovo PCs delivered AI performance that their predecessors couldn't match, with much stronger Procyon® AI Computer Vision benchmark scores and the ability to run specialized AI video-enhancing software. Read on to learn how these new laptops can enable you to take advantage of new technologies from Lenovo, Intel, and Microsoft while empowering you to dip your toes into the exciting waters of AI.

Boost AI inference performance

With up to 2.7x the performance on the Procyon AI Computer Vision benchmark

with a Lenovo ThinkBook 13x Gen 4 vs. a Lenovo ThinkBook 13x Gen 1

Take advantage of new AI video editing capabilities

in Topaz Video AI

Utilize AI-powered Windows 11 Pro features

for facial recognition, special effects, and more

Exploring Lenovo PCs with Intel Core Ultra processors

In three studies, we assessed the Lenovo ThinkBook 13x Gen 4, the Lenovo ThinkPad® X1 Carbon Gen 12, and the Lenovo ThinkPad T14s Gen 5 next to earlier-generation versions of the same systems:

ThinkPad X1 Carbon Gen 12 study: https://facts.pt/u6W6c5o.

ThinkPad T14s Gen 5 study: https://facts.pt/NI5FMjs.

ThinkBook 13x Gen 4 study: https://facts.pt/5J0cslV.

All three of the new systems featured Intel Core Ultra processors and ran Windows 11 Pro. Here, we review some of the features and enhancements these new systems bring to the table, including several powered by AI.

New Intel technologies to power AI workloads

The Intel Core Ultra processor-powered Lenovo laptops we tested offer new capabilities aimed at accelerating AI workloads, as well as valuable technologies, such as Intel vPro®, that you may have relied on in the past.

New Intel Core Ultra multi-processor (with integrated CPU, GPU, and NPU architectures)

All three of the new Lenovo devices we tested featured new Intel Core Ultra multi-processors. To form a powerful platform for AI and other workloads, these processors combine a CPU, GPU, and NPU.

The **CPU**, or central processing unit, combines multiple types of cores: Performance-cores, which are optimized for workloads with minimal multithreading requirements at higher clock speeds, such as linear calculations (spreadsheets) and gaming; Efficient-cores, ideal for "scaling highly threaded workloads;" and Low-power Efficient-cores, which Intel "designed for scalable multithreaded performance and offloading background tasks."[3] The Intel Thread Director acts as a traffic controller, allocating tasks to the core that can best handle them.

Which **GPU**, or graphics processing unit, the processor includes depends on the specific processor. The most powerful Intel GPU is the Intel Arc™ GPU, available in certain H-series Intel Core Ultra processor-powered systems.[4] While GPUs do have "graphics" in the name, they can also be powerful tools for running heavy AI workflows. Intel notes that the Intel Arc GPU can offer "the high performance needed for accelerated creation and immersive high-resolution gaming, even while on the go."[5]

Finally, the processor incorporates Intel AI Boost (also known as Intel NPU). **NPUs**, or neural processing units, are a type of processor specifically designed to speed up AI and machine learning tasks. Intel calls Intel AI Boost "an integrated AI engine for low-power AI acceleration and CPU/GPU offload" and notes that it can also "[free] up CPU resources for overall system performance and responsiveness."[6]

According to Intel, the architectural shift to include all three engines makes Intel Core Ultra processors "the most AI-capable and power-efficient client processor in Intel's history."[7] Intel recommends Intel Core Ultra processors for AI-enhanced video editing, among other tasks.[8]

Learn more about Intel Core Ultra processors at https://www.intel.com/content/www/us/en/products/docs/processors/core-ultra/core-ultra-series-1-product-brief.html.

Intel vPro

The Intel vPro platform brings advantages in security, manageability, and performance, according to Intel. It states, "Intel vPro PCs powered by Intel Core Ultra processors deliver a new holistic approach to performance that powers AI workloads and new experiences."[9] All three of the new systems we tested included Intel vPro processors.

Explore more about Intel vPro at https://www.intel.com/content/www/us/en/architecture-and-technology/vpro/overview.html.

Intel Evo

Intel Evo™ Edition laptops have met Intel standards for performance, charging, battery life, and more, and according to Intel are "built for AI."[10] Two of the three of the laptops we tested are Intel Evo Editions; while the Lenovo ThinkPad T14s Gen 5 we tested is not, some configurations of the ThinkPad T14s Gen 5 are Intel Evo certified.

Learn more about Intel Evo Editions at https://www.intel.com/content/www/us/en/products/systems-devices/laptops/evo.html.

Intel Unison

The Intel Unison™ app promises to be a game changer for the many millions of Windows PC users who rely on their smartphones.[11] While Apple® Continuity connects only devices in the Apple ecosystem,[12] Intel Unison "seamlessly connects your PC, phone, and tablet for a universal, easy-to-use experience," according to Intel.[13] For Intel Evo-certified Windows PCs and Android™ or iOS phones and tablets, Intel Unison can enable you to:

- Fully access iOS or Android mobile photo galleries from your PC
- Transfer files between your PC and iOS or Android phones and tablets
- Make and receive iOS or Android phone calls on your PC
- Send and receive iOS or Android text messages on your PC
- Manage, filter, and customize iOS or Android device notifications through your PC[14]

Built-in security enhancements

Security is an inevitable concern for anyone purchasing or managing a laptop, as bad actors come up with ever more sophisticated ways to insert malicious code or capture user data. Intel and Lenovo offer technologies that can help. Among these are Intel Transparent Supply Chain and Lenovo ThinkShield.

Intel Transparent Supply Chain

In today's complex cybersecurity landscape, security concerns begin even before your device reaches your hands. Supply chain attacks, in which bad actors compromise products during manufacturing or distribution, are a threat to take seriously. According to Lenovo, the manufacturer offers "one of the world's best supply chains as ranked by Gartner Group, backed by extensive and mature supply chain security programs that exceed industry norms and US Government standards."[15]

Lenovo supply chain security measures include Intel Transparent Supply Chain (Intel TSC). Intel TSC protects hardware components and software during every step of the supply chain process with "a set of tools, policies, and procedures implemented on the factory floor at PC and server manufacturers that help enable enterprises to verify the authenticity and firmware version of systems and their components."[16]

Learn more about Intel TSC at https://www.intel.com/content/www/us/en/products/docs/servers/transparent-supply-chain.html.

Lenovo ThinkShield

Lenovo ThinkShield provides full lifecycle security and protection, "allowing you to work from anywhere with extended detection and response against cyber-threats."[17] The Lenovo ThinkShield solutions guide calls it "a comprehensive portfolio of end-to-end security tools that encompasses hardware, software, services, and processes" and breaks down ThinkShield solutions as follows:[18]

- Built-in platform security, including Intel vPro and both software and hardware security features
- Device protection, including a fingerprint reader and IR camera
- Threat and data protection, including anti-virus measures and disk encryption
- Security management, including Lenovo Device as a Service and endpoint management solutions

Learn more about Lenovo ThinkShield at https://techtoday.lenovo.com/sites/default/files/2023-01/Lenovo-IDG-REL-PTN-Nurture-General-Security-ThinkShield-Solutions-Guide-177-Solution-Guide-MS-Intel-English-WW.pdf.

AI enhancements in Windows 11 Pro

Windows 11 Pro brings AI features and enhancements that did not exist in Windows 10. By choosing to upgrade to a new device with Windows 11 Pro, you can take advantage of these new opportunities.

Microsoft Copilot

Microsoft Copilot is a new AI assistant, available in Windows 11, that promises to "support your creative process" and "automate tasks to help you get things done faster."[19] According to Microsoft, Copilot can:

◆ Automate financial workflows and offer new insights to financial departments

◆ Ease the work of support staff and deliver better service experiences to customers

◆ Help salespeople make connections and save time

◆ Find new trends in your organization's data to help you answer tricky questions

◆ And much more[20]

Individuals can choose between the free version and Copilot Pro, while organizations can purchase Copilot for Microsoft 365 for integration into Microsoft 365 and Teams.[21] (Copilot is also available on certain Windows 10 devices, but functionality on those systems is limited.[22])

Personalized user experience: Windows 11 AI-powered features

The AI enhancements in Windows 11 start with Copilot, but they don't end there. Separate from Copilot, the following new AI-powered features are also available in Windows 11:

◆ AI enhancements to the snipping tool that let you copy text from images or redact text in them

◆ New AI tools and features in Paint and Photos

◆ AI assistance with editing video using Clipchamp

◆ AI-enhanced security via Smart App Control

◆ And more [23]

Note that we did not test these features because they were beyond the scope of this project.

Windows Studio Effects

Windows Studio Effects is a new feature set from Microsoft that "leverages AI models built by Microsoft and compiled/optimized for devices with a Neural Processing Unit (NPU) to deliver high-fidelity, battery-friendly AI effects."[24] The effects include background blurs, fun filters, background noise minimization, and adjustments to framing and lighting. To take advantage of Windows Studio Effects, a device must have a compatible NPU.

We enabled Windows Studio Effects on all three new Lenovo laptops and found that they ran as we anticipated. The older devices, however, lack NPUs and thus could not run Windows Studio Effects.

To learn more about these effects and how to enable them, visit https://support.microsoft.com/en-us/windows/windows-studio-effects-273c1fa8-2b3f-41b1-a587-7cc7a24b62d8.

Our AI performance testing results

To prove the benefits of upgrading to new Lenovo devices powered by Intel and running Windows 11 Pro, we compared three new Lenovo laptops featuring Intel Core Ultra processors to their three-year-old counterparts:

- Lenovo ThinkPad X1 Carbon Gen 12 with an Intel Core Ultra 7 processor 165U vs. Lenovo ThinkPad X1 Carbon Gen 9 with an Intel Core i7-1185G7 processor

- Lenovo ThinkPad T14s Gen 5 with an Intel Core Ultra 7 processor 155U vs. Lenovo ThinkPad T14s Gen 2 with an Intel Core i7-1165G7 processor

- Lenovo ThinkBook 13x Gen 4 with an Intel Core Ultra 9 processor 185H vs. Lenovo ThinkBook 13x Gen 1 with an Intel Core i7-1160G7 processor

To assess the devices' AI performance, we ran the Procyon AI Computer Vision Benchmark. This benchmark measures a system's performance on inference tasks using float- and integer-optimized versions of the following models:

- MobileNet V3 for visual recognition

- Inception V4 for image classification

- YOLO V3 for object detection

- DeepLab V3 for image segmentation

- Real-ESRGAN for image upscaling

- ResNet-50 for image classification

We ran the Procyon AI Computer Vision Benchmark using the open-source Intel OpenVINO™ toolkit and three different precision levels: float32, float16, and int8. Precision levels determine how precisely a model can complete its work. The precision level you choose depends on your goals. In some situations, you might be happy to have slightly less precise results at a faster pace, while in others, you need the most precise results possible and are willing to sacrifice speed.

We cover our results and what they mean in detail below, but spoiler: The new Intel Core Ultra processor-powered Lenovo laptops delivered dramatically higher performance on this AI benchmark. Of course, you're not likely to use your laptop to run inference or training operations on massive datasets, but you might wish to work on development tasks for an AI model, test an existing model's accuracy, or develop refinement parameters.

We also attempted to run the Topaz Video AI benchmark, which tests performance on the AI video-enhancing application Topaz Labs™ Video AI. The three new Lenovo devices featuring Intel Core Ultra processors all delivered strong performance on this benchmark. The older devices, however, could not run the benchmark at all. If you work with video and are considering how to best incorporate AI tools such as Topaz Labs Video AI into your workflow, the newer Intel Core Ultra processor-powered Lenovo devices offer you that option. The older ones don't.

Comparing the Lenovo ThinkPad X1 Carbon Gen 12 to the Lenovo ThinkPad X1 Carbon Gen 9

Our first comparison pitted a new Lenovo ThinkPad X1 Carbon Gen 12, featuring an Intel Core Ultra 7 processor 165U, against an older Lenovo ThinkPad X1 Carbon Gen 9 with an Intel Core i7-1185G7 processor. On all three precision levels we tested, the new ThinkBook 13x Gen 4 laptop performed better than the ThinkBook 13x Gen 1, delivering up to 57 percent better performance on the Procyon AI Computer Vision Benchmark.
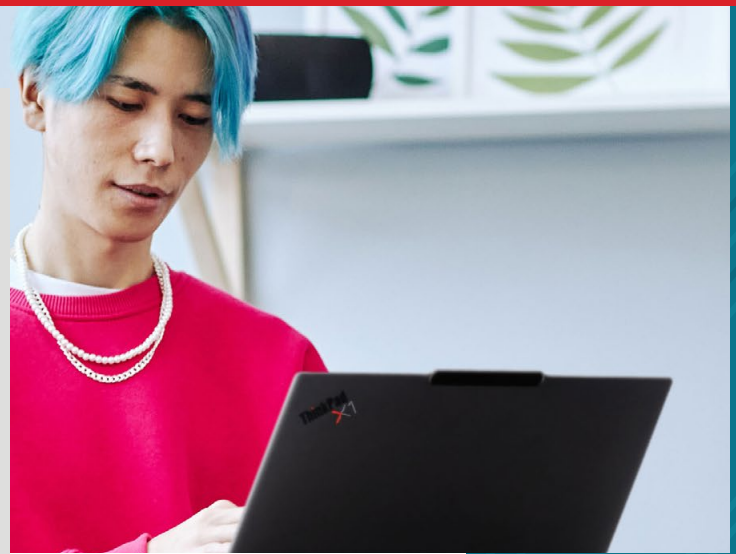
About the Intel Core Ultra 7 processor 165U

Part of the Intel Core Ultra series of processors, the Intel Core Ultra 7 processor 165U has 12 cores, 12MB Intel Smart Cache, a Max Turbo Frequency of 4.9 GHz, and support for the OpenVINO, WindowsML, and ONNX RT AI software frameworks.[26] Intel notes that, as an Intel Core Ultra 7 processor, it is well suited for gaming, multitasking, and adding AI effects to video calls.[27]

▶ To learn more about the Intel Core Ultra 7 processor 165U, visit https://www.intel.com/content/www/us/en/products/sku/237329/intel-core-ultra-7-processor-165u-12m-cache-up-to-4-90-ghz/specifications.html.

Procyon AI Computer Vision Benchmark Intel OpenVINO

Lenovo ThinkPad X1 Carbon ■ Gen 12 ■ Gen 9

Overall rating | Higher is better

float32
- 146
- 129

float16
- 327
- 210

int8
- 568
- 360

Figure 1: Procyon AI Computer Vision Benchmark Intel OpenVINO overall scores for the Lenovo ThinkPad X1 Carbon Gen 12 and the Lenovo ThinkPad X1 Carbon Gen 9. Higher is better. Source: Principled Technologies.

To see the rest of our test results for this comparison, including performance tests for graphics-intensive and everyday workloads, visit https://facts.pt/u6W6c5o.

About the Lenovo ThinkPad X1 Carbon Gen 12

The Lenovo ThinkPad X1 Carbon Gen 12 includes a redesigned keyboard, a larger trackpad, an optional 2.8K OLED display, and "razor-thin bevels."[28] As a sustainability bonus, its chassis includes recycled post-consumer content and its packaging is plastic-free, with some elements utilizing rapid-renewable materials.[29] In our testing, we found that it delivered over six and a half hours of battery life while running a heavy Zoom conference call workload.

▶ Learn more about the ThinkPad X1 Carbon Gen 12 at https://www.lenovo.com/us/en/p/laptops/thinkpad/thinkpadx1/thinkpad-x1-carbon-gen-12-(14-inch-intel)/len101t0083/.

Comparing the Lenovo ThinkPad T14s Gen 5 to the Lenovo ThinkPad T14s Gen 2

In our next comparison, we tested a new Lenovo ThinkPad T14s Gen 5 with an Intel Core Ultra 7 processor 155U and an older Lenovo ThinkPad T14s Gen 2 with an Intel Core i7-1165G7 processor. The Lenovo ThinkPad T14s Gen 5 offered higher overall scores than its older counterpart across the board, delivering up to 77 percent better Procyon AI Computer Vision benchmark performance when we tested with int8 precision.

Procyon AI Computer Vision Benchmark Intel OpenVINO
Overall rating | Higher is better

Lenovo ThinkPad T14s
■ Gen 5 ■ Gen 2

float32
136
114

float16
327
192

int8
565
318

Figure 2: Procyon AI Computer Vision Benchmark Intel OpenVINO overall scores for the Lenovo ThinkPad T14s Gen 5 and the Lenovo ThinkPad T14s Gen 2. Higher is better. Source: Principled Technologies.

Visit https://facts.pt/NI5FMjs to learn more about what we found in our testing on the Lenovo ThinkPad T14s Gen 5, including advantages in battery life, everyday performance, and more.

About the Intel Core Ultra 7 processor 155U

The Intel Core Ultra 7 processor 155U, part of the Intel Core Ultra series, boasts 12 cores with 12MB Intel Smart Cache and a Max Turbo Frequency of 4.8 GHz. Like the other processors in the Intel Core Ultra series, it incorporates a CPU, GPU, and NPU. It supports Intel Deep Learning Boost on GPU and the OpenVINO, WindowsML, DirectML, ONNX RT, and WebGPU AI software frameworks.[30]

▶ Learn more about the Intel Core Ultra 7 processor 155U at https://www.intel.com/content/www/us/en/products/sku/237327/intel-core-ultra-7-processor-155u-12m-cache-up-to-4-80-ghz/specifications.html.

About the Lenovo ThinkPad T14s Gen 5

This 14-inch ultrathin and lightweight laptop can enable "AI-powered productivity driven by [an] Intel Core Ultra processor."[31] With up to 2.8K OLED display options, an ENERGY STAR® 8.0 certification, and Lenovo ThinkShield security, Lenovo says the ThinkPad T14s Gen 5 "prudently adapts to your workload needs with an improved battery system."[32] Lenovo has also made changes to the latest ThinkPad T14s Gen 5 to enhance its repairability, adding more customer-replaceable parts, incorporating visual indicators for repairs, and building new repair guides.[33]

▶ Learn more about the Lenovo ThinkPad T14s Gen 5 at https://www.lenovo.com/us/en/p/laptops/thinkpad/thinkpadt/lenovo-thinkpad-t14s-gen-5-(14-inch-intel)/len101t0092.

Comparing the Lenovo ThinkBook 13x Gen 4 to the Lenovo ThinkBook 13x Gen 1

In our final comparison, we assessed the Procyon AI Computer Vision Benchmark performance of a new Lenovo ThinkBook 13x Gen 4, featuring an Intel Core Ultra 9 processor 185H, against an older-generation Lenovo ThinkBook 13x Gen 1 with an Intel Core i7-1160G7 processor. Again, the newer Intel Core Ultra processor-powered device offered consistently higher overall scores, with over double the performance on every precision model we tested.

Procyon AI Computer Vision Benchmark Intel OpenVINO

Overall rating | Higher is better

Lenovo ThinkBook 13x
Gen 4 ■ Gen 1

float32
- 203
- 75

float16
- 328
- 126

int8
- 569
- 219
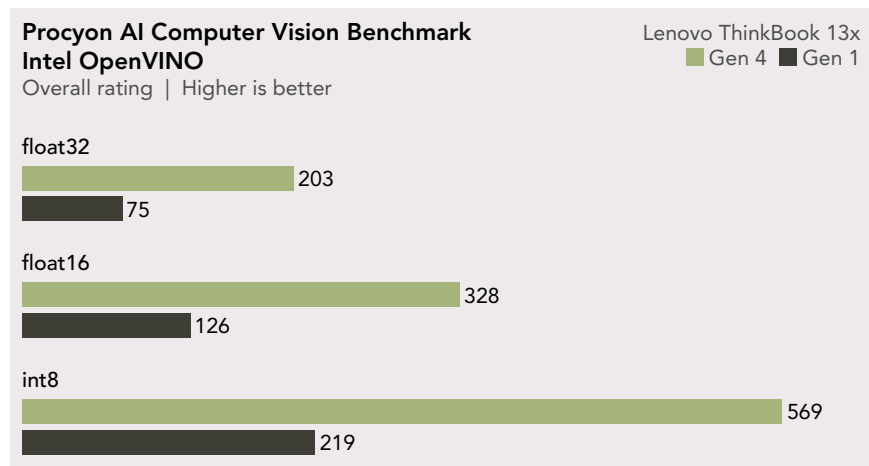
Figure 3: Procyon AI Computer Vision Benchmark Intel OpenVINO overall scores. Higher is better. Source: Principled Technologies.

To learn more about how you could benefit from an upgrade to the Lenovo ThinkBook 13x Gen 4—including test results on battery life, creative app performance, and more—visit https://facts.pt/5J0cslV.

About the Intel Core Ultra 9 processor 185H

The Intel Core Ultra 9 processor 185H is part of the Intel Core Ultra 9-series, the highest-bin Ultra processors. Of the Intel Core Ultra processors, Intel rates the 9-series the most effective for AI-enhanced video editing and multi-tasking with software accelerated by AI.[34] It offers 16 cores, a Max Turbo Frequency of 5.1 GHz, and 24MB Intel Smart Cache. For AI workloads, it supports the OpenVINO, WindowsML, and ONNX RT AI software frameworks.[35]

▶ Learn more about this processor by visiting https://www.intel.com/content/www/us/en/products/sku/236849/intel-core-ultra-9-processor-185h-24m-cache-up-to-5-10-ghz/specifications.html.

About the Lenovo ThinkBook 13x Gen 4

This 13-inch Intel vPro Intel Evo Edition ultrathin, ultralight laptop is powered by Intel Core Ultra processors and the Lenovo LA3 AI chip for "amazing AI experiences without lags or battery drain."[36] Its narrow bezels enable a larger-than-standard display size for a 13-inch laptop, with a 97 percent screen-to-body ratio, and it boasts "an ultralow-power display panel with attention- and presence-based brightness and refresh rate."[37]

▶ Learn more about the Lenovo ThinkBook 13x Gen 4 at https://www.lenovo.com/us/en/p/laptops/thinkbook/thinkbook-x/lenovo-thinkbook-13x-gen-4-(13-inch-intel)/len101b0036?orgRef.

Conclusion

The era of Windows 10 is coming to a close—but the era of AI is just beginning. Either you and your team are already discussing how you'll prepare, or you soon will. An upgrade to new AI-powered PCs may be part of the answer.

In our assessment of three new Lenovo PCs, we found significant AI performance advantages on the Procyon AI Computer Vision Benchmark compared to three-year-old versions of the same systems. The new systems, running Windows 11 Pro and featuring Intel Core Ultra series processors, also offered a host of new AI features and enhancements. Our research and test results indicate that investing in these Intel Core Ultra processor-powered Lenovo laptops today can help prepare your company for tomorrow's AI developments.

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Learn more about the comparisons in this report:

Comparing the Lenovo ThinkPad X1 Carbon Gen 12 to the Lenovo ThinkPad X1 Carbon Gen 9 ▶

Comparing the Lenovo ThinkPad T14s Gen 5 to the Lenovo ThinkPad T14s Gen 2 ▶

Comparing the Lenovo ThinkBook 13x Gen 4 to the Lenovo ThinkBook 13x Gen 1 ▶

This project was commissioned by Lenovo.

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