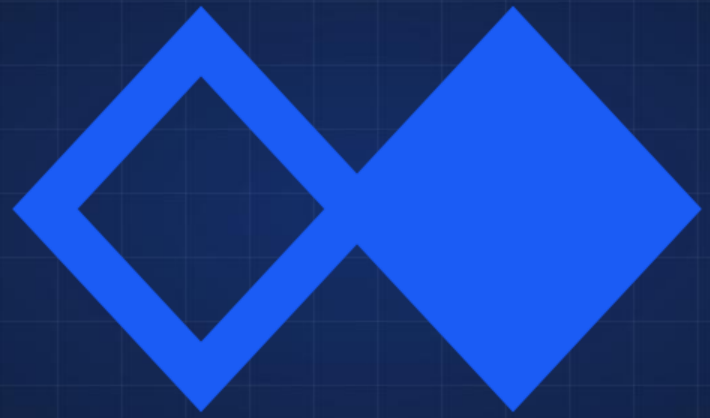
Bas Baccarne

The Design Engineer is dead. Long live the Design Engineer.

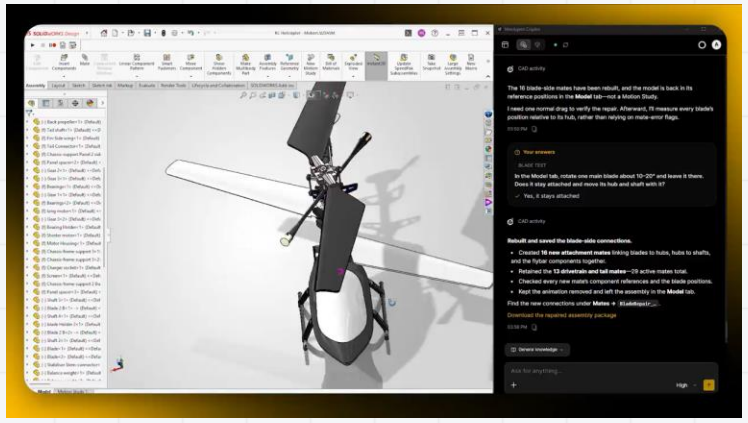


The machine picks up the pen

01 · SPEC → ASSEMBLY

An agent modelled a ~56-part RC helicopter, two subassemblies, unsupervised in under five hours.

MecAgent V2 on GPT-6 Astra · DEVELOP3D, Oct 2026



02 · PROMPT → HOUSING

Connected to Fusion via MCP, a model sourced a Pi 4 STEP file and built shell, cutouts, vents and snap-fits almost in one shot.

Claude Opus 5.5 · A. Steenken, LinkedIn 2026

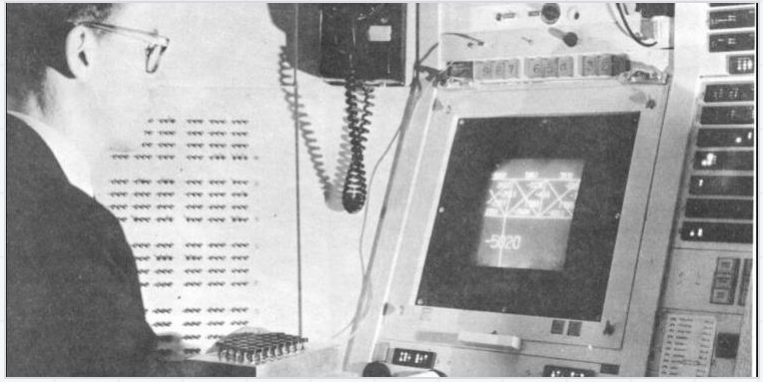
03 · DESIGN → FEA → REDESIGN

With FreeCAD, Gmsh and CalculiX as tools, a model slimmed a suspension rocker from 209 g to 85 g.

GPT-6 Astra + SolidMind · J. Cusack, LinkedIn 2026

WE HAVE ALWAYS BEEN OUR TOOLS. IS THE TOOL WHAT MAKES US HUMAN?

Humans & their tools



~1.7 Mya
Hand axe

~3000 BCE
Copper saws

1800s-
Drawing board

1963
Sketchpad

1980s-90s
Parametric 3D CAD

2010s
Generative design

2026
Agentic CAD

EXTENSION THEORY

The tool is part of us

Kapp, 1877

Organ projection

Tools *project our organs* outward: the hammer a fist, the telegraph a nervous system.

McLuhan, 1964

Extension and amputation

Every medium extends a faculty and *numbs* what it replaces.

Leroi-Gourhan, 1964 · Stiegler, 1994

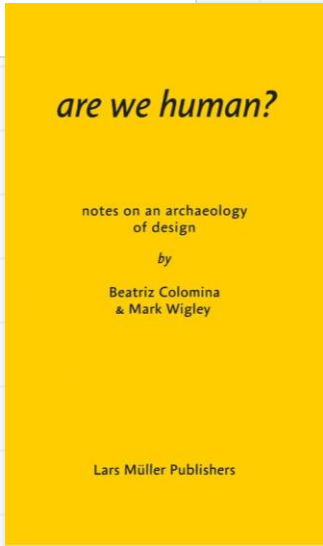
No pre-technical human

We became human by *exteriorising*: hand, tool, writing, machine. Technics is our third memory.

Clark & Chalmers, 1998 → Clark, 2025

The extended mind

GenAI is the newest resource in our *hybrid thinking*: the job is to design the extension well.



Learning to knap hand axes in modern times: toolmaking and minds co-evolved (Stout et al., 2015; Malafouris, 2013).

DONALD SCHÖN · THE REFLECTIVE PRACTITIONER · 1983

Designing is “a reflective conversation with the situation”.

What happens when the material starts talking back … in full sentences?

— IF THE TOOL MAKES US HUMAN, WHAT KIND OF HUMAN DOES AI MAKE?

AI lifts performance. Learning on the other hand …

−40% time

Professionals writing with ChatGPT: faster, about 18% better, and the *weakest gained most*.

Noy & Zhang, Science, 2023 (n=453)

+48% → −17%

Students with plain GPT-4 performed better, but scored worse once AI was removed (17% below control group).

Bastani et al., PNAS, 2025 (~1,000 students)

28% → 22%

Adenoma detection by endoscopists working without AI, after months of routine AI use.

Budzyń et al., Lancet Gastro Hep, 2025

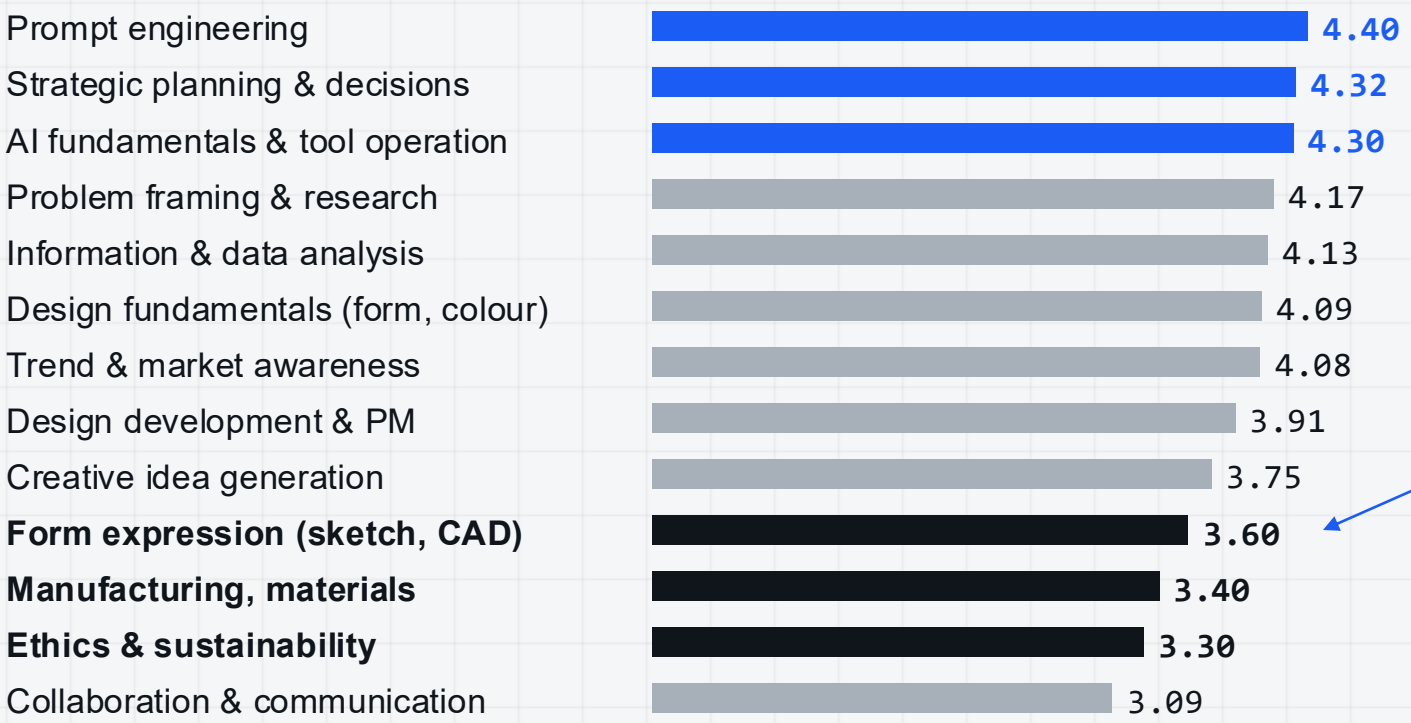
Performance *with* AI ≠ skill *without* it.

The more knowledge workers trust AI, the less critical thinking they report (Lee et al., CHI 2025). EEG studies hint at something like a ‘cognitive debt’ (Kosmyna et al., 2025, preprint).

Upskilling, reskilling or never-skilling?

	STARTING SKILL: NOVICE	STARTING SKILL: EXPERT
Aims to master ↑	**Upskilling** AI as tutor and sparring partner. Bastani et al. 2025; Schmidt et al. 2026	**Reskilling** Skill moves from making to framing, directing and verifying. Lee et al. 2025; Dell'Acqua et al. 2023
Aims to pass ↓ *'metacognitive laziness'*	**Never-skilling** The skill never forms; fluent output feels like competence ('*illusion of competence*'). Abdulnour et al. 2025; Prather et al. 2024	**Deskilling** Unpracticed skills erode Bainbridge 1983; Budzyń et al. 2025

Competences considered important in AI-powered Product Design



THE PI-HOUSING TEST

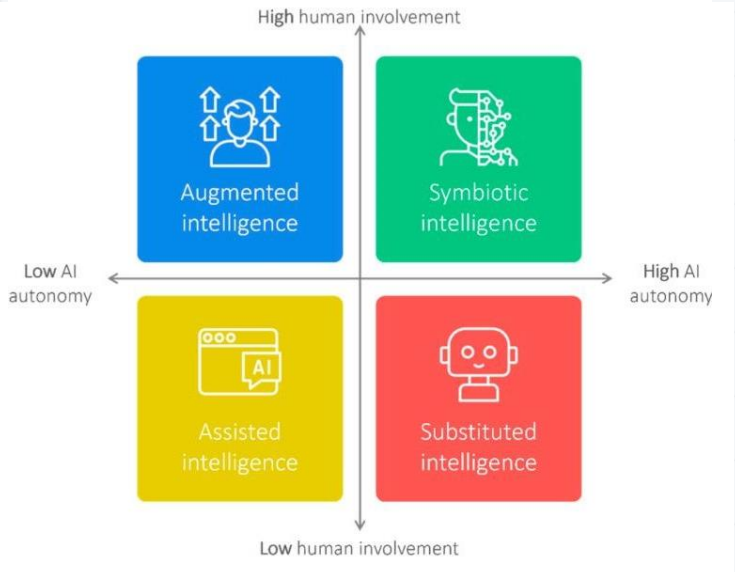
The agent's snap-fits would break when printed, and nothing had draft for moulding. Nobody told it the process.

"Knowing what to check is still my job."

A. Steenken, 2026

Lee & Choi, NordDesign 2026, Table 4: mean importance on a 5-point scale, N=70 Korean designers and educators.

Control vs. automation (~ not a slider)



Augmented · AI proposes, you decide
CAD copilot suggesting fillets, standard parts, materials.

Symbiotic · shared agency
Agent loops design → FEA → redesign; you set loads, constraints, acceptance.

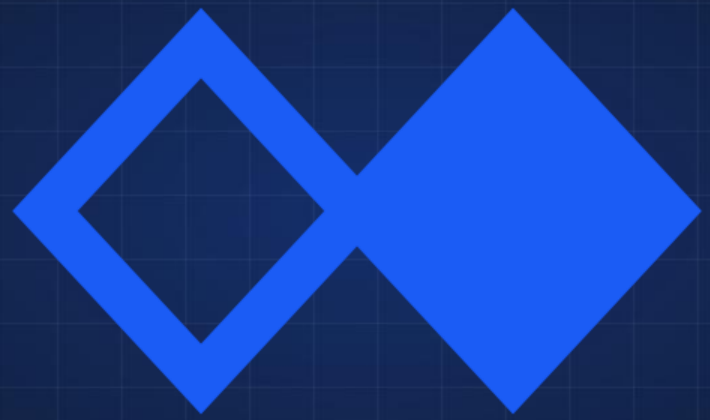
Assisted · narrow helper
Auto-dimensioning, BOM extraction, render clean-up.

Substituted · nobody watching
Unsupervised spec-to-CAD: fine for low-risk tasks, risky for the rest.

Gómez-Cruz et al., Technologies 2026, Fig. 4

Adopted from Shneiderman (2020): aim for high automation and high human control. The quadrants are choices per task, not maturity stages.
> Good talk by Ben Schneiderman

Changing markets



Flexible production & digital sovereignty.

Production goes flexible and personal

Mass customization · 1993
Reconfigurable manufacturing systems (Pine; Tseng et al.)

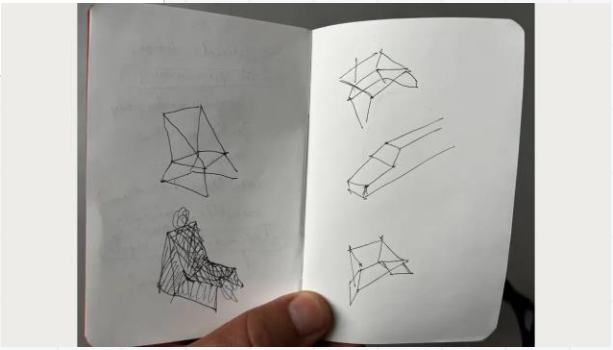
Reconfigurable manufacturing · 1999
Change capacity and function fast (Koren, Van Brussel et al.)

Mass personalization · 2017
The customer feeds the design itself (Wang et al.)

Industry 5.0 · 2021
Human-centric, resilient, sustainable (~European Commission)

THE DESIGN SPACE BECOMES THE PRODUCT

Cornelissen's AI-built configurator for planar-sheet chairs exports a STEP file per variant: bespoke, and cuttable by construction.



We increasingly design families, rules and configurators, no longer single parts.

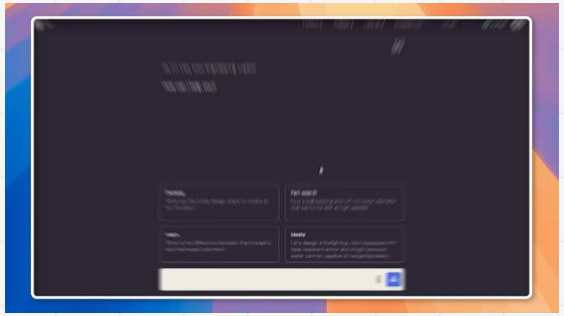
Whose stack are we designing on?

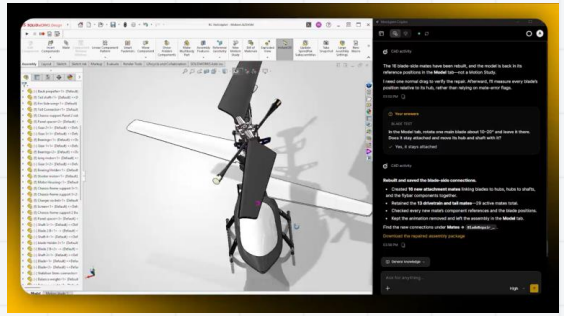
Who	Examples, 2025–2026
Incumbents adding AI	Autodesk Neural CAD & Assistant · Siemens NX Copilot & agents · PTC Onshape AI Advisor
AI-native challengers	Zoo Zookeeper · MecAgent V2 · Leo AI · Adam
Open & DIY	SolidMind (FreeCAD + CalculiX) · Fusion and Blender MCP with frontier models

>80%

of Europe's digital technology is imported (EuroStack, 2025).

- Open weights and self-hosting keep design IP in-house



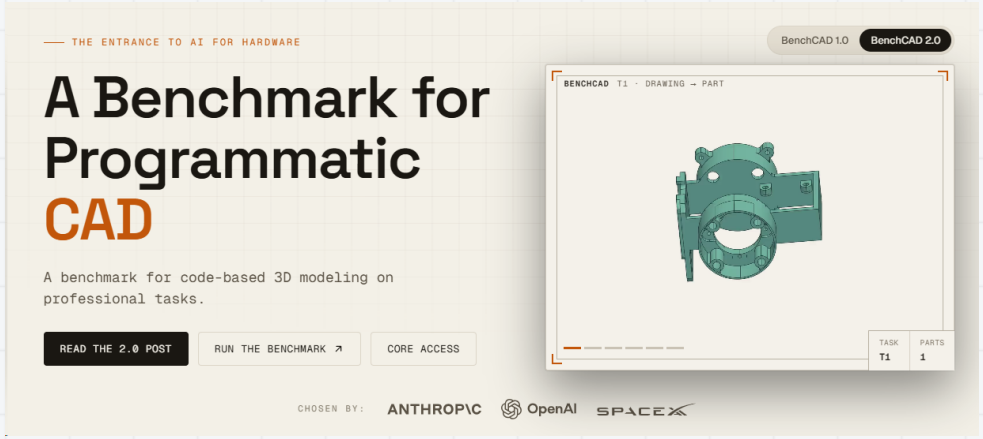


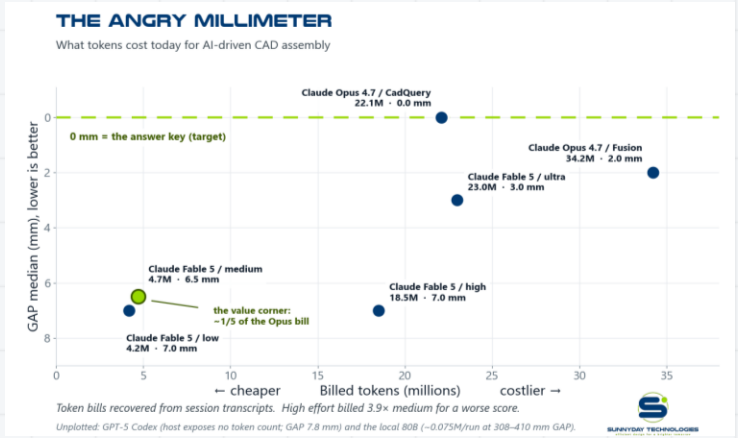
Videos: Zoo Zookeeper · Autodesk Bernini · Leo AI spec-to-CAD · MecAgent V2

Pick the tool by evidence, not by demo

Benchmark	Measures
BenchCAD v2 (2026)	Code-built industrial parts, executed and scored
MARB (2026)	Assemble ~100 STEP parts into a 2 m machine frame
3JSBench (2026)	100 three.js objects, judged by people and by checks
Text2CAD · CADPrompt	Text → parametric CAD sequences or code

MARB target: the M3-CRETE frame



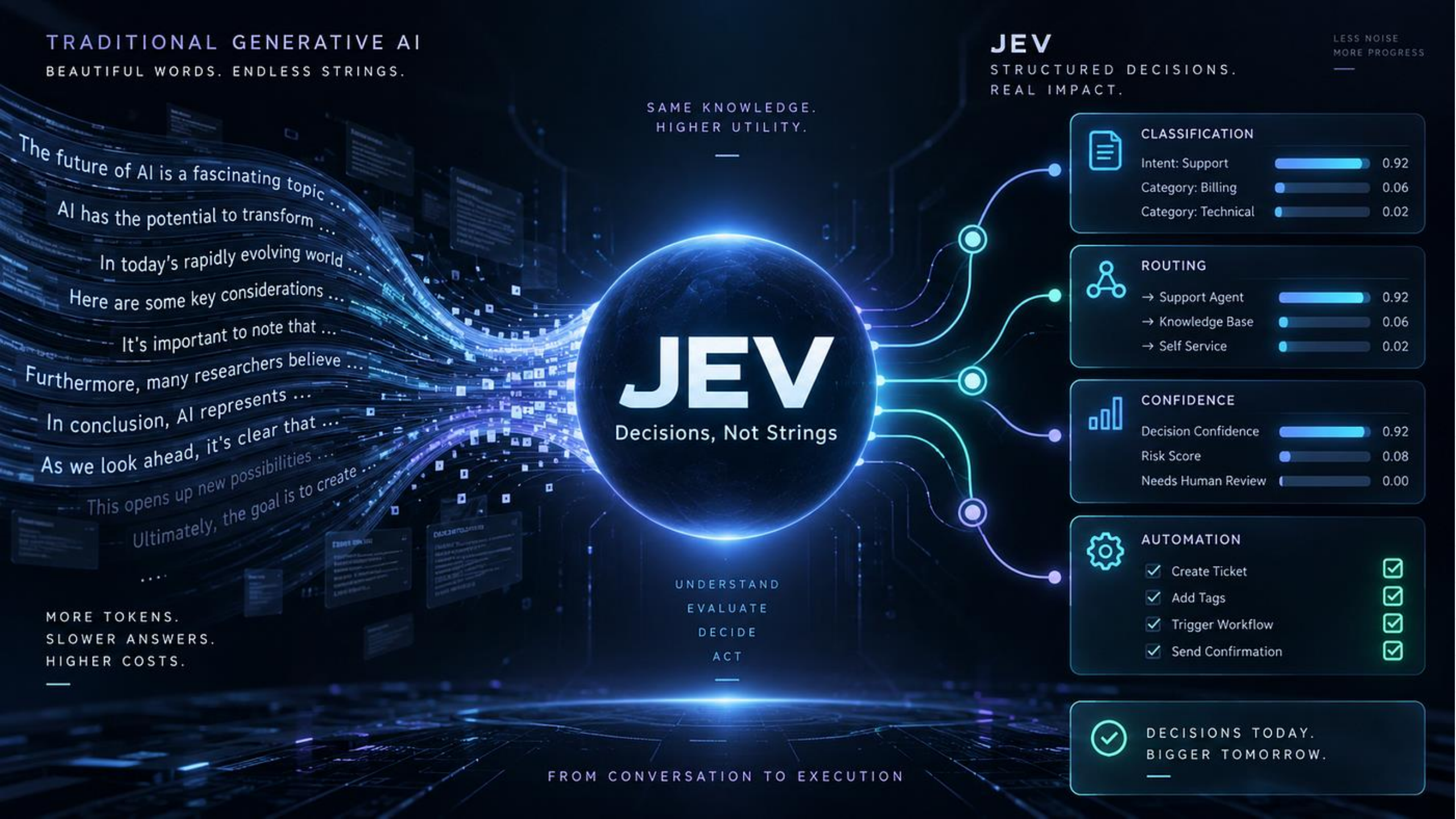


benchcad.com · marb.cadclaw.io · 3JSBench · imec AI Stack

The proving ground where *workloads* meet *hardware*.

Build your roadmap on actual data, not guesswork.

Insights ›


TRADITIONAL GENERATIVE AI
BEAUTIFUL WORDS. ENDLESS STRINGS.
The future of AI is a fascinating topic ...
AI has the potential to transform ...
In today's rapidly evolving world ...
Here are some key considerations ...
It's important to note that ...
Furthermore, many researchers believe ...
In conclusion, AI represents ...
As we look ahead, it's clear that ...
This opens up new possibilities ...
Ultimately, the goal is to create ...
...
MORE TOKENS.
SLOWER ANSWERS.
HIGHER COSTS.
SAME KNOWLEDGE.
HIGHER UTILITY.
JEV
Decisions, Not Strings
UNDERSTAND
EVALUATE
DECIDE
ACT
FROM CONVERSATION TO EXECUTION
JEV
STRUCTURED DECISIONS.
REAL IMPACT.
LESS NOISE
MORE PROGRESS
CLASSIFICATION
Intent: Support 0.92
Category: Billing 0.06
Category: Technical 0.02
ROUTING
→ Support Agent 0.92
→ Knowledge Base 0.06
→ Self Service 0.02
CONFIDENCE
Decision Confidence 0.92
Risk Score 0.08
Needs Human Review 0.00
AUTOMATION
Create Ticket
Add Tags
Trigger Workflow
Send Confirmation
DECISIONS TODAY.
BIGGER TOMORROW.

Long live the Design Engineer.

THE THRONE PASSES FROM…

drawing → framing

modelling → directing

producing → verifying

tool skill → judgement

output → accountability

THE LINE FROM IDEA TO PRODUCT GETS SHORTER AND STRAIGHTER.

The new king

→ needs foundations to check the machine,

→ stays meaningfully in the loop and answerable, and

→ chooses tools by evidence and with an eye on sovereignty.

I · Humans & tools

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Images: Acheulean hand axe, Portable Antiquities Scheme (CC BY) · Drawing office 1942, IWM (public domain) · Sketchpad, Sutherland 1963 (Wikimedia Commons) · Fig. 4, Gómez-Cruz et al. 2026 (CC BY 4.0) · M3-CRETE frame, MARB

II · Skills

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III · Human in the loop

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IV · Markets, tools & benchmarks

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Watch and read further

VIDEOS

Sketchpad (1963), with Alan Kay

MecAgent V2: spec-to-CAD

Zoo: Introducing Zookeeper

Autodesk Research: Project Bernini

Leo AI: from spec to CAD in one conversation

Shneiderman: Human-Centered AI (Microsoft Research)

Casari: The ironies of automation in the age of AI

PRACTICE, 2026

M. Cornelissen: AI as maker of design tools

A. Steenken via T. J. Lukka: the Pi-housing test

J. Cusack: SolidMind design–FEA loop

J. Hunt: Fusion MCP and laser-cut boxes

B. Guler: agentic modelling in AEC (Veras)

M. P. Reed: HumanShape and Wheelchair Fit

M. Vukelja: will AutoCAD stay king?

DEVELOP3D: MecAgent V2

CONTACT

Word deel van de AIPPD-community

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