Opinion

The limits of LLMs

PhotoCraft, an early AI-built image editor, REA, a toolkit for reverse engineering, and a new retro-game port every week convinced many people that Adobe is dead and programmers are next. I read the code and the numbers.

Fabio Akita · ailair.akitaonrails.com/limits/

> *LLMs can replicate what's open, but they can't guess what's private.*
>
> *LLM consegue replicar o que é aberto, mas não adivinha o que é privado.*

1. What it's good at

Copying what's already public

Models learned from public code. When something similar was published, an agent rebuilds it fast and cheap.

81.5%

of GitHub contributions happen in private repositories (Octoverse 2025)

67.5 TB

of public code in The Stack v2, the kind of data models train on

1. What it's good at

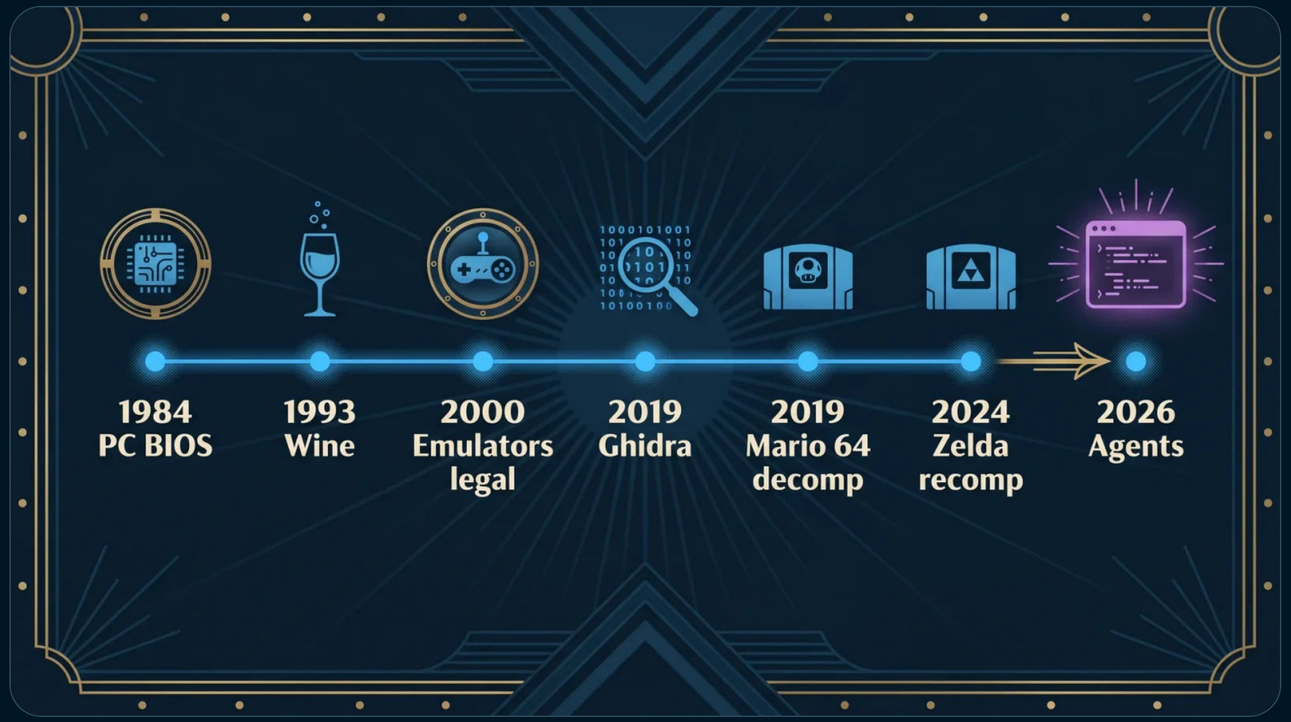
Copying what's already public

- That's why one person can now ship a native Spotify or WhatsApp client in Rust. The service, the libraries and the path already existed. Retracing a known path got cheap.
- Where nothing similar exists, the agent falls back on trial and error. It needs unpublished references, tests and an objective check, often called an oracle, that says whether the result is right.
- The code that pays salaries is mostly private. A general model was not trained on it by default. It can analyze code you provide through an approved tool, with the right context and access controls.

2. Reverse engineering

Taking binaries apart is 40 years old

Every emulator you ever used exists because someone took a binary apart. AI joined an assembly line that was already running.



2. Reverse engineering

Taking binaries apart is 40 years old

- US courts settled the basics in 1992 (Sega v. Accolade) and 2000 (Sony v. Connectix): disassembling code to learn how it works is fair use.
- LLM decompilers write more readable code than commercial ones, with 52% lower functional correctness (DecompileBench, 2025). The assistants in real use name variables on top of what Ghidra or IDA produced.
- The tools are mature, and many are free. The NSA released Ghidra in 2019, the same year the Super Mario 64 decompilation went public.
- REA, close to 200,000 stars on GitHub, hands those same tools to your agent. You need the binary, the tools installed and a lot of tokens: its own SQLite test took 42 tool calls and 300,000 input tokens. Its docs tell you never to say it clones a program.

3. Old games

Why old games fall first

A new retro port ships almost every day. Old games have every advantage a live product lacks.



◈ 3. Old games

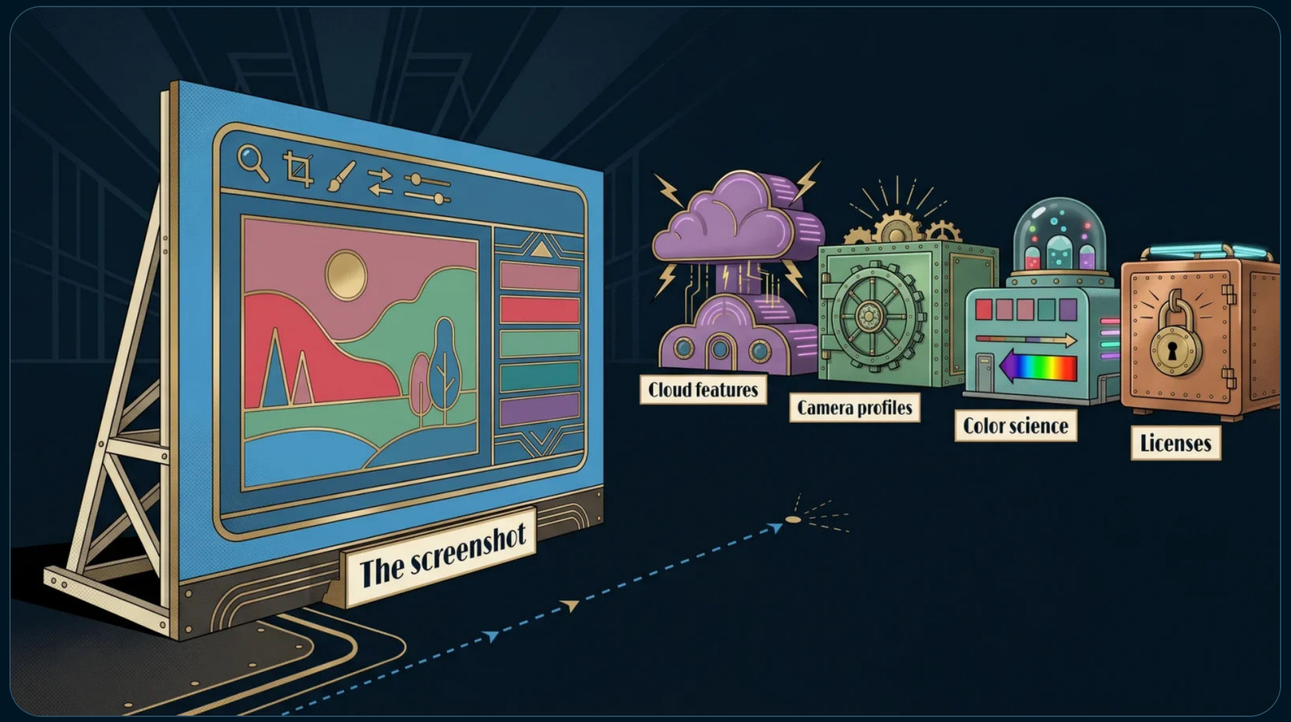
Why old games fall first

- The binary is tiny. Super Mario 64 is 8 MB. Baldur's Gate 3 is 150 GB.
- PS4, PS5, Xbox and Switch are PCs or phones in a different case. Your processor already runs their code, and Wine, DXVK and Proton solved most of the graphics translation years ago.
- The hardware has been mapped instruction by instruction for 25 years, and the target never changes. Nobody is updating 1998's Zelda.
- AI sped up the grunt work. The developers of the Zelda and Banjo recomps call the agent-made ports "slopcomps": untested, and patched in a way that makes them hard to maintain.

4. The Adobe clones

A screenshot of Photoshop

PhotoCraft looks like Photoshop in a screenshot. What people pay Adobe for lives somewhere else.



A screenshot of Photoshop

968

open issues on PhotoCraft, read October 13, 2026

- PhotoCraft was written in Rust with Claude. Its own README says early alpha. Images above 8,192 pixels fall back to the CPU, color management is basic, and about 100 open issues are about PSD files.
- Camera Raw carries 20 years of profiles for each camera and lens. A clone either has that data or it doesn't.
- Most software today runs as a service. The code behind Google Docs never leaves Google's servers, so there's no binary at all.

13

days after the repository was created

- Generative Fill and several Neural Filters run on Adobe's servers. That code never reaches your machine, so there's nothing to take apart.
- Print color is a field of its own. GIMP was born in 1995 and still has no CMYK editing in version 3.0. Pantone colors are licensed, and even Adobe lost them in 2022.

4. The Adobe clones

> *PhotoCraft today is that Ferrari replica built on top of a VW Beetle: the body has the right shape, you take a photo and most people say "wow, a Ferrari". Then you turn the key and out comes the Beetle engine.*
>
> *O PhotoCraft hoje é aquela réplica de Ferrari montada em cima de um Fusca: a carroceria tem a forma certa, você tira uma foto e a maioria das pessoas diz "uau, uma Ferrari". Aí você liga e sai o motor de Fusca.*

5. The real cost

What a big rewrite costs

The best public number comes from Bun, the JavaScript runtime, rewritten from Zig to Rust with agents in May 2026.



5. The real cost

What a big rewrite costs

$165K

at API prices

11

days, 535,000 lines of Zig

64

Claude agents at the peak

- It worked because of four things: Bun's own author at the controls, the full working source, about 60,000 tests per platform to check every change against, and Anthropic, which owns Bun, paying.
- A Photoshop clone has none of the four. There's no source to port, no test suite that says "matches Photoshop", and no author. And Photoshop is a 36-year-old product, far bigger than a runtime.
- Anthropic's C compiler, February 2026: 16 agents, under $20,000, and it builds Linux. It still borrows GCC's assembler and linker, and its code runs slower than GCC with every optimization turned off.

6. The price

"In two years it will be free"

The price of the best models barely moved since 2023. What fell fast is the price of a quality level that's already old.

$60

per million output tokens, GPT-4, March 2023

$50

per million output tokens, the best models, October 2026

6. The price

"In two years it will be free"

- The frontier got 1.2 to 3 times cheaper in three and a half years, depending on input or output tokens.
- Do the math on Bun: $165,000 divided by 100 is $1,650, for a port with the source, the tests and the author in hand. Cheap and trivial are different things.
- A fixed level of quality gets roughly 5 to 10 times cheaper every year, by Epoch AI's estimate, and they expect that to slow down.
- The models themselves converged, and the recent gains came from the agent tools around them. I explain that on the AGI page.

7. The job

Are programmers dead?

Every rewrite and every decomp that works has an engineer at the controls.

+15%

US software job postings since Claude Code launched in February 2025, while all postings fell 7% (Indeed, July 2026)

71%

of that growth came from senior roles

7. The job

Are programmers dead?

- Software postings are still about 27.5% below February 2020. Fewer people get hired to type. The people who can judge the output get hired.
- In my benchmark across 7 languages, giving the weaker models tests changed their results more than any language did.
- Rewriting Bun took Bun's author. The decomps that work have people who know the hardware driving the agent.
- Reverse engineering got cheaper and more accessible, as it did when Ghidra came out in 2019. It's still an engineer's job.

> *"It's over" headlines get clicks and don't compile.*
>
> *Manchete de "acabou" rende clique e não compila.*

The takeaways

1

AI copies what's public, fast. Most code that matters is private.

2

Reverse engineering is decades old. Agents sped up its grunt work.

3

Old games fall first: small, mapped for decades, and they never change.

4

A clone's screenshot is easy. The cloud services, the data and the licenses aren't in any binary.

5

Bun's rewrite took its author, its source, its tests and $165,000.

6

The best models barely got cheaper, and they converged.

7

The work that grew is judgment: tests, objective checks called oracles, and review.

> *"It's over" headlines get clicks and don't compile.*
>
> *Manchete de "acabou" rende clique e não compila.*

Read more: my posts and the sources

Copying what's already public

- The limits of LLMs: good at reproducing what exists, expensive for what doesn't
- GitHub Octoverse 2025: 81.5% private
- The Stack v2: the public code dataset

Taking binaries apart is 40 years old

- AI Reverse Engineering: Is Adobe Dead?
- Phoenix and the clean-room PC BIOS
- Sega v. Accolade (1992)
- Sony v. Connectix (2000)
- Ghidra, from the NSA
- DecompileBench: LLM vs commercial decompilers
- REA on GitHub
- REA: what one analysis costs

Why old games fall first

- AI Reverse Engineering: Is Adobe Dead?
- How DriveClub and shadPS4 almost defeated AI and me: how to learn
- Zelda 64: Recompiled
- shadPS4: a PS4 emulator
- Kotaku: the "slopcomps" fight

A screenshot of Photoshop

- AI Reverse Engineering: Is Adobe Dead?
- PhotoCraft on GitHub
- Adobe: Neural Filters need the cloud
- Adobe: Camera Raw lens profiles
- GIMP roadmap: CMYK still in progress
- PetaPixel: Pantone leaves Photoshop

Read more: my posts and the sources

What a big rewrite costs

- AI Reverse Engineering: Is Adobe Dead?
- Bun: the rewrite in Rust, with numbers
- Anthropic: a C compiler built by agents

"In two years it will be free"

- LLMs + Agents = competent enough
- AI Reverse Engineering: Is Adobe Dead?
- Anthropic: API pricing
- OpenAI: API pricing
- Epoch AI: inference price trends
- Epoch AI: how long the cost burden lasts

Are programmers dead?

- Are There Better Languages for Programming with LLMs?
- LLMs + Agents = competent enough
- AI Reverse Engineering: Is Adobe Dead?
- Indeed Hiring Lab: software postings, July 2026

Every point, with every link, on the web

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