FreeMoCap

Origin Story

Volume 0 of 3

The FreeMoCap Foundation

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Contents

Note

This document traces the origins of the FreeMoCap project, drawing from interviews, lectures, and public statements made between 2022 and 2026. Quotations are marked with source keys corresponding to transcripts in Volume 3.

S1: "This is FreeMoCap" video (2022) **S2**: BOOM podcast (2022) **S3**: VFX Futures podcast (2022)
S4: Dynamic Walking presentation (2022) **S5**: HMN2024 lecture (2024)
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1 The Academic Path

Jonathan Matthis came to motion capture research through a series of accidents. As an undergraduate, he studied philosophy of mind and philosophy of science. He applied to philosophy graduate programs and was rejected from all of them—an outcome he now describes as lucky.[S2]

After a year working at an autism research facility, where he discovered an interest in empirical data, he applied to cognitive science programs with the intention of studying language. The program that accepted him didn't have a language researcher. It did have a faculty member named Brett Fajin, who studied visual control of locomotion—how people use their eyes to guide their movement through the world. Matthis signed on.[S2]

That choice set the trajectory for the next fifteen years. His research focused on the intersection of neuroscience and biomechanics: how people navigate complex terrain, how the brain integrates visual input with motor commands. He completed a PhD and a postdoc at the University of Texas at Austin, where he studied people walking outdoors over rocks while wearing eye trackers and motion capture equipment. Along the way, he developed skills in computer vision, system design, and the kind of interdisciplinary problem-solving that comes from working at the boundaries of established fields.[S2]

By 2019, after roughly two decades of education and training, Matthis had landed a tenure-track faculty position at Northeastern University in Boston. His lab was built, his equipment was ordered, and his research program was ready to launch.[S6]

2 The Crisis

2.1 COVID and Its Revelations

The COVID-19 pandemic shut down Northeastern's campus in March 2020, along with nearly every other university in the country. For Matthis, a first-year professor whose research depended on lab access, the disruption was significant. But the pandemic itself was not what changed his relationship with the institution. What changed it was what happened in the faculty meetings.

From the professor side of the fence, the conversations looked different than they had from the student side. Matthis recalls a dean telling faculty that the university should encourage students to pursue master's degrees because master's students represented the best income ratio—"they pay full tuition but they don't require any resources."[S6]

Then came the push to resume in-person teaching, before vaccines were available. The reason, as Matthis saw it, was straightforward: the university's business model depended on the physical campus. Remote learning undermined the value proposition. Students needed to be on campus so the institution could justify what it charged them.[S6]

2.2 The Opt-Out Trap

The situation came to a head over a pair of letters. Matthis received notice that he was scheduled to teach in person, with a rider allowing him to opt out if he was uncomfortable. He opted out.

A second letter from his department chair followed. The policy had been revised: faculty who declined in-person teaching would be barred from campus entirely, including from their laboratories.[S6]

For a first-year research professor, this amounted to a career threat. "That's basically saying, if you don't come in and teach in person against your will, we're going to tank your career," Matthis has said.[S6]

His response was to begin building a home lab using consumer webcams.[S6]

2.3 The $3 Million Calculation

Matthis did eventually teach remotely. Sitting in his apartment, lecturing to a grid of faces on Zoom, he started doing arithmetic. He counted the students in the call, multiplied by tuition and room and board, and arrived at a number: roughly $3 million in annual student debt, channeled through a webcam.[S6]

The calculation led to a harder realization. Those students had taken on that debt in part because the university had recruited them with the promise of access to faculty like him. His presence at the institution—his credentials, his research—was part of the sales pitch. "The fact that I was there doing the thing that I did was part of the recruitment that they used to bring these kids in and to convince them that it's worth it, which it fundamentally isn't and cannot be," he has said.[S6]

He reached a conclusion: "I truly cannot stay here. I cannot continue to be in this position."[S6]

3 The Fallout

Matthis was thirty-five when this happened. He had just secured the faculty position he'd been working towards for most of his adult life, and he was now confronting the possibility that the institution he'd worked so hard to join was, in his view, fundamentally compromised.[S6]

He describes the experience using a clinical term: **moral harm**, a form of psychological distress that occurs when a person is made complicit in acts they find morally repugnant.[S5] "Realizing that actually what I was doing had been kind of harnessed and captured by this institution that I frankly despised and was morally repugnant to me—was really, really damaging, really hurtful," he has said. "Deeply traumatizing, I think."[S6]

The summer of 2020 compounded the personal crisis with a political one. The killing of George Floyd and the protests that followed prompted Matthis, like many people in positions of institutional authority, to ask whether he was "really adequately using our positions of power to do the most good for the most people."[S6]

Matthis did not resign. He had signed a multi-year contract with resources attached—salary, lab space, student researchers—and leaving in a huff, as he put it, would have meant walking away from all of it without anything to step into. Instead, he made a strategic decision: he would remain at Northeastern, decline to pursue tenure, and use the remaining time and resources to build an alternative.[S8]

He describes this as a "prefigurative approach"—building the institution you think should exist while still embedded in the one you're trying to leave.[S8]

4 The Pivot

4.1 Lift Where You Stand

Around this time, Matthis encountered a concept that would become central to his thinking: **lift where you stand**. The idea, as he describes it, is that when you're confronted with a systemic problem, you don't abandon your existing skills and expertise to start over in an unfamiliar domain. Instead, you look at what you know and what you can do, find a point of leverage, and apply force.[S6]

"I don't know shit about the climate," he has said. "I know about how to make laser skeletons."[S6]

Motion capture—the ability to precisely record and analyze human movement—typically requires equipment costing tens of thousands of dollars, institutional lab space, and specialized expertise. Matthis recognized that while inaccessible motion capture was relatively low on the list of global inequities, the broader problem it represented—the inaccessibility of science and technology to people outside well-funded institutions—was much higher.[S6]

4.2 The Garbage Camera Decision

Before the crisis, Matthis had been experimenting with markerless motion capture using GoPro cameras, a moderately priced option. The conventional approach would have been to work up from there toward higher-end research equipment.

He reversed direction. "What if instead of pushing it towards research grade stuff, I push it towards the most garbage cameras you can possibly get," he reasoned, "on the assumption that if it works for the cheap cameras, it will also work for the good cameras, but not necessarily the other way around."[S6]

The logic was both technical and political. Building for cheap hardware meant the resulting system would be accessible to anyone with a few webcams and a computer. The physics, Matthis noted, doesn't care how much the camera cost.

The result was a motion capture system with a hardware cost of approximately $30—three webcams at ten dollars each.[S4]

4.3 Reversing the Hierarchy

Matthis also describes a broader shift in how he thought about his work. For twenty years, he had been oriented upward in the academic hierarchy: producing work that would satisfy advisors, tenure committees, grant reviewers, and department chairs. The incentive structure pointed in one direction—serve the people above you to earn the right to remain.[S6]

He reversed this. "One of the big brain shifts that happened was deciding to just stop caring or considering what I was being asked to do by people above me in the hierarchy and start asking instead what I could do to support people who were at or below me in that same hierarchy."[S6]

The people above him wanted publications and metrics. The people below—students, independent researchers, creators without institutional access—wanted tools that worked.

5 The Open Source Discovery

The collapse of Matthis's faith in academia coincided with a growing interest in free and open source software, catalyzed by his encounter with Blender, the open-source 3D creation suite.

Blender competes directly with commercial software packages costing thousands of dollars per year. It is built by a distributed community of contributors, funded primarily through a development fund supported by individuals and corporations, and governed by a nonprofit foundation. The source code is public. Anyone can use, modify, or redistribute it.

Matthis had been aware of Blender before, but during the period of institutional disillusionment, he began to understand it as a model—not just a piece of software but a proof that a different way of organizing knowledge work was viable.[S6]

"In those moments of losing faith in the academic system, seeing something like Blender and starting to understand the business model and the community model—that galvanization happened together," he has said. "As I was losing faith in the one, I started to gain respect for the other."[S6]

The parallel between what open source communities actually do and what scientific institutions claim to do became a recurring theme in his public statements. "The open source community is what the scientific community pretends to be," he has said in multiple interviews—a line that appears in sources from 2022 through 2026.[S2][S3][S6]

The argument, in brief: science claims to be collaborative, transparent, and oriented toward shared benefit. In practice, publications are paywalled, data is hoarded for competitive advantage, and careers are built on outperforming peers rather than cooperating with them. Open source communities, by contrast, operate with public codebases, transparent development processes, and a norm of building on each other's contributions.[S3]

6 Building FreeMoCap

FreeMoCap—Free Markerless Motion Capture—launched publicly in January 2021 with its first post. In July of that year, a demo video went viral. An Epic Megagrant followed, providing significant funding. The FreeMoCap Foundation was established as a 501(c)(3) nonprofit.[S6]

The software uses MediaPipe for pose estimation, Anipose for 3D triangulation, and standard webcams as input. It produces three-dimensional skeletal tracking data from ordinary video—no markers, no suits, no specialized hardware. The intended user base spans biomechanics researchers, animators, game developers, educators, clinicians, and hobbyists. "We want indie game designers and animators to use the same tool to add motion capture assets to their zero budget art project that I am using for my federally funded scientific research program," Matthis said in his 2022 introductory video.[S1]

Version 1.0 was released in September 2023. By 2024, the project had approximately 5,000 users across 115 countries. By 2026, that number had roughly doubled, with about 10,000 users and 2,500 members on the project's Discord server.[S6]

A map on the FreeMoCap dashboard shows the geographic distribution of users as dots. Matthis has spoken about checking this map with evident feeling: "I see you there in the Faroe Islands. Thanks for not unchecking the box, guys. I like to see the dots. It really, truly, truly keeps me going."[S6]

7 The Transition

As of 2026, Matthis is in his final year at Northeastern. The question facing the project is whether a small team can sustain itself building free software without university backing or corporate sponsorship—and without charging subscription fees.[S8]

"How do you survive in the world when you're not going to be attached to a big research institution or a big corporation?" he has asked. "That's kind of the question we're trying to answer right now in the very small scale of just me and two or three other people in my lab."[S8]

Matthis frames the stakes at three levels. At the most immediate level, survival itself would constitute a win: demonstrating that the model is viable at all. Beyond that, a working model could serve as a case study for others—"a conduit and umbrella and support system for people who are trying to achieve their own sense of independence," as he has put it.[S8]

At the broadest level, he sees FreeMoCap as potentially catalytic. "If we can sort of solve that tiny inequity," he has said, referring to access to motion capture, "then it might serve as a model of how to solve bigger ones."[S8] The hope is that the tool, and the community around it, can serve as an entry point into technical literacy and open source participation more broadly—a starting point for a larger shift in who gets to build and control technology.

His thinking on this last point has grown more urgent as artificial intelligence has moved to the center of public debate. "We are entering into the AI era," he has said. "If enough people in the world gained the kind of technical competency necessary to really engage in the open source community, then we can literally seize back the means of production and free people of having to live their entire lives attached and managed by corporations. And now at this point in history, governments."[S8]

Whether FreeMoCap can deliver on that ambition remains an open question. The project has grown steadily but remains small relative to the systems it challenges. The transition away from institutional support is underway, and the outcome is uncertain.

What is not uncertain is the diagnosis that produced it. The institutions that control access to scientific tools and knowledge production have structural incentives that do not align with the interests of the people they claim to serve. FreeMoCap is one attempt to build around them.

8 Timeline

Date	Event
2017	Matthis sees OpenPose demo; realizes markerless motion capture is feasible
Summer 2019	Begins tenure-track position at Northeastern University
January 2020	Lab construction complete
March 2020	COVID-19 pandemic; campus closed
May–June 2020	George Floyd protests; series of institutional conflicts at Northeastern
Summer 2020	Pivots to cheap cameras; begins building FreeMoCap
2020	Discovers FOSS model through Blender
January 2021	First public FreeMoCap post
July 2021	Demo video goes viral
2021	Epic Megagrant awarded; FreeMoCap Foundation established as 501(c)(3)
June 2022	Dynamic Walking conference presentation; approx. 800 Discord members
September 2023	Version 1.0 released
2024	Approx. 5,000 users across 115 countries
2026	Approx. 10,000 users; approx. 2,500 Discord members; final year at Northeastern
2026+	Transition to independent operation of FreeMoCap Foundation