Executive Summary

Core Positioning

Nouxel combines a world-class robotics research team with an industry-leading hardware team to tackle a single, ambitious goal: **build America's first commercially-viable, mass-market humanoid robot**. Like almost every emerging product category throughout history, we expect humanoid robots will follow a trajectory from developers and early adopters into a mass-market product, and we have observed strong signs that the market today is hungry for a great, developer-focused humanoid product which combines hardware, software and foundation models into a seamless, mass-produced, easy-to-integrate robotics platform.

We view humanoids as a rapidly-commoditizing product category with early traction in developer, entertainment, and education markets, exhibiting parallels to the self-balancing scooter (colloquially known as the "hoverboard") market a decade ago. This represents an exciting opportunity for a world-class robotics research and engineering team to adopt an ODM-focused production strategy and gain significant market with minimal capital expenditure. Our strategy to capitalize on this opportunity leverages four main pillars:

- **Build an engaged community around our product**: Our primary aim is to build a world-class hardware and software platform, built on the back of a top-tier research and engineering team. However, rather than focusing on building a moat in either hardware, where competition is already driving commoditization, or software, where AI approaches are still evolving, our goal is to become the best robot for the rapidly-growing general-purpose robotics developer and early adopter communities and cement our brand and product ecosystem as the industry standard.
- **Monetize foundation model subscriptions**: Rather than building "one brain for every robot" or a single model that can do everything out-of-the-box, we position our robotics foundation model as analogous to Cursor - a developer-focused Software 3.0 product, built for our own bespoke robot hardware, capable of vastly accelerating robotics R&D and integration for our customers while generating high-margin subscription revenue.
- **Identify opportunities for developer-led enterprise adoption**: Our existing customer base and developer community consists of highly-technical developers, startup founders and VPs in leading robotics, biotech and AI organizations. As our product and technology offerings mature we will translate this exposure into focused enterprise revenue streams via developer-led adoption.
- **Leverage open hardware to accelerate ODM adoption**: By publishing a complete reference design, we can accelerate supply-side scale, lower BOM and operational expenses, and maintain second-source coverage to avoid supply chain risk, while focusing on foundation model development, UX, developer experience, and distribution with significantly reduced capital requirements compared to competitors.

Business Model and Strategy

ODM-Based Manufacturing

- 2-3 qualified ODMs with interchangeable subassemblies and second-source coverage (motors, reducers, IMUs, compute).
- **Quality assurance**: burn-in test, robots must walk continuously for 4 hours without failure; target 2% defect rate and 98% yield.
- **Assembly time**: 0.3 units per day per line ($\sim$110 units per line per year); target volume: 1,000 to 10,000 units annually. Scaling plan: 9-10 lines for 1k units/year; 30-40 lines for 3-4k units/year; 90-95 lines for 10k units/year across 2-3 ODMs.
- **Lifecycle**: two-year EOL cadence for major hardware generations; interim revisions (e.g., v3.0) represent mid-cycle improvements rather than new generations.

Cost Structure and Pricing

Generation	BOM	Landed COGS	MSRP	Gross Margin
Gen 1	$7,130	$9,850	$16,000	38.4%
Gen 2	$3,830	$5,473	$8,000	31.6%

Our aggressive BOM optimization and ODM co-design provide us with the ability to maintain cost leadership and avoid pricing pressure from vertically-integrated manufacturers. The listed MSRP is chosen to maximize distribution and market share over value capture, although we expect to wield significant pricing power in the near term among American firms and our pricing strategy may evolve as the market matures. Listed margins apply to base hardware only, not aftermarket and software components (Tables 1, 2, 6).

Aftermarket Hardware

Upgrade	MSRP	COGS	Margin	Est. Adoption
Spare Arm	$4,000	$1,500	62.5%	25%
5-Finger Hand	$5,000	$2,000	60%	50%
Compute Upgrade	$2,000	$1,200	40%	80%

Among our existing customer cohort, we observe early evidence of strong demand for aftermarket upgrades, such as bespoke end effectors, and replacement parts that can drive significant revenue and push blended corporate margins into software-like territory while still giving us the ability to maintain pricing power and cost leadership among American firms (Tables 7, 8).

Software and AI

Our software product positioning aligns with our strategy of reinvesting software revenue into AI R&D. We view our software product and foundation model as analogous to Cursor - a developer-focused Software 3.0 product capable of vastly accelerating robotics R&D and integration for our customers.

- **Target price**: $200 per month.
- **Take rate**: $\approx$71.7% among buyers at $4,000 one-time payment (Table 17), indicating strong willingness to pay.
- **Gross margin**: $\approx$94%, with profits reinvested into GPU infrastructure, data acquisition, and RFM R&D.

By 2029, projected revenue from our software product and foundation model reaches $267M annually (Table 9).

Market Context

We highlight Unitree's 2023-2025 price collapse (H1 $90k $\rightarrow$ G1 $16k $\rightarrow$ R1 $5.9k) as evidence that the humanoid product category and addressable market is rapidly evolving, entering a hyper-commoditization curve reminiscent of the hoverboard market a decade ago. Nouxel's approach aims to ride that curve, not defend against it, using community-led developer adoption to capture early market share before slower vertically integrated players can adjust. For more background and context, see Appendix A.

Financial Model and Funding

Capital Requirements

- **Raise**: $25M equity.
- **Purpose**: Payroll, regulatory certification, pilot production, ML infrastructure, R&D, and collateralizing tooling and inventory financing (Table 14).
- **Outcome**: Provides two-year runway and a clear path to break-even under current margin structure (Table 11).

Revenue Outlook (Hardware only)

Year	Units	Revenue	Gross Profit	Gross Margin
2026	200	$1.6M	$0.5M	31.6%
2027	5k	$40M	$12.6M	31.6%
2028	25k	$200M	$63M	31.6%
2029	125k	$1B	$315M	31.6%

Aftermarket and software lines sit atop this base, pushing blended corporate margins materially higher (Table 5 and related sections). We highlight these revenue projections based on conservative estimates of market penetration and adoption to show a clear path to significant revenue growth as the humanoid robot market expands.

Revenue Outlook (Total)

Combining hardware, aftermarket, and software revenue streams produces the following total business outlook:

Year	Revenue	Gross Profit	Gross Margin
2026	$3.0M	$1.4M	46.6%
2027	$74.4M	$34.8M	46.8%
2028	$379.5M	$181.0M	47.7%
2029	$1.90B	$911.3M	47.8%

The blended gross margin of 47-48% reflects the combination of hardware (31.6% margin), high-margin aftermarket upgrades (54.2% margin), and very high-margin software subscriptions (94% margin), demonstrating the strong unit economics of our integrated platform approach.

Traction

- **Best-selling American humanoid robot**: 130+ pre-orders representing $2M in booked order value (deposits collected: varies by order, see Appendix D), with no marketing spend.
- **Product readiness and material revenue**: 5 robots in customer hands (October 2025), first American humanoid robot used in a boxing match.
- **Developers behind Isaac Lab**: Industry-standard simulation framework for robotics R&D with massive community and adoption.
- **Bespoke academic relationships**: Georgia Tech and University of Toronto providing a differentiated talent pipeline and academic sales channel.
- **Customer cohort**: Pre-orders from senior engineers and founders at DeepMind, Nvidia, Amazon Robotics, Boston Dynamics, academia and startups (Appendix D).

Roadmap and Milestones

Our anticipated development timeline for our Gen 2 product has our full launch scheduled for mid-2026, targetting the release of our first enterprise-grade hardware and foundation model in mid-2027 (Table 11).

Risk Management

Appendix B lists identified risks. Key mitigations:

- **Technical risk**: hardware-software co-design, world-class robotics team, developer go-to-market strategy, strong academic and ecosystem relationships.
- **Market timing**: maintain capital discipline; fund AI R&D investments with revenue.
- **Quality drift**: golden samples + dual sourcing.
- **Supply chain**: 100% second-source coverage; open-source design and partnerships.
- **Regulatory delay**: parallel pre-compliance testing and certified components.

K-Bot: An Open-Source Humanoid Robot

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Abstract

Prima facie, humanoid robots appear to be the ultimate "hard tech" product, bolstered by decades of science fiction and Hollywood portrayals. However, as dozens of startups and established companies prototype and release their own humanoid robots, it is becoming clear that the humanoid robot ecosystem of the future will more closely resemble the self-balancing scooter, colloquially known as the "hoverboard" [1], than the drone, smartphone, electric car, or other deep tech product. In particular, while hoverboards have become ubiquitous and experienced explosive initial growth, the origins of the product were value-destructive to their inventor as copy-cats quickly released subpar versions, presenting a challenge to the viability of entrants who intend to bring similar products to market. Additionally, while the product was positioned as a micro-mobility device, most users bought it as a fun, fashionable toy, driven by viral growth and influencer endorsements. There are compelling reasons to believe that the same dynamics underpinning the hoverboard market are likely to underpin the humanoid robot market as well. These market dynamics make such a product category a compelling target for the open-source community, combined with a Tesla-style approach to driving high gross margins for commodity hardware through aftermarket sales, and represent a unique opportunity - the potential for a small, highly leveraged investment to direct the trajectory of a key piece of consumer electronics technology.

1 Introduction

It is an underappreciated fact that the humble self-balancing scooter, colloquially known as the "hoverboard", experienced one of the all-time steepest cold-start adoption curves in the history of consumer electronics, dwarfing the smartphone, VR headset, or electric car by sales since its initial launch. While the product itself was hampered by the fact that they sometimes caught fire while people were riding them, the rapidity of adoption was remarkable, driven by widespread celebrity and influencer endorsement and a glut of copycat manufacturers.

The emergence of humanoid robotics as a viable consumer electronics category represents one of the most significant technological transitions of the 21st century. Humanoid robots occupy a space in the popular imagination that no other device does, cemented by decades of Hollywood portrayals and, increasingly, an unprecedented influx of capital. However, while many in the space have compared humanoid robots to the next smartphone or electric car, it is becoming clear that the most apt consumer electronics product category through which to understand the humanoid robot landscape today is that of the hoverboard.

The hoverboard phenomenon provides a particularly compelling case study for several reasons. First, like humanoid robots, hoverboards represent a fundamentally new consumer electronics product category that required consumers to adopt entirely new interaction paradigms, often drawing skepticism and derision from much of the general public. Second, the rapid commoditization and value destruction experienced by the original inventor, Shane Chen of Inventist, offers critical insights into the challenges facing innovators in the humanoid robot hardware space today. Third, given the striking similarities between the two products, the hoverboard market dynamics - characterized by rapid copycat proliferation, quality control issues, and eventual market stabilization - provide a template for understanding humanoid robot hardware as well.

The central thesis of this work is that humanoid robot hardware is more similar to the hoverboard than the smartphone or electric vehicle, with consumer drones representing an intermediate case that offers additional insights into potential market trajectories. Humanoid robots are likely to experience rapid commoditization, vast networks of manufacturers and copycats, and value destruction for original IP holders. Faced with this landscape, we believe this presents compelling territory for an open-source hardware platform to harness the same dynamics that drove the initial explosive growth in the hoverboard market. While the component supply chain for hoverboards and humanoid robots bear strong similarities, this supply chain is significantly more mature today than it was in 2013. Put differently, if the hoverboard were to be brought to market in 2025, it would be unlikely to experience the quality control issues that plagued the product in its infancy.

It is important that readers do not misinterpret this analysis as a prediction of how the humanoid robot hardware landscape is likely to evolve *absent the influence of a strong community-driven effort*, but rather, as a prescription for how **an open-source humanoid robot platform represents a highly leveraged investment opportunity** that is likely to be capable of fundamentally disrupting the direction of a key piece of consumer electronics technology. The purpose of writing this whitepaper is to make a contrarian case for why this is possible with a relatively limited investment, by observing the current hardware-software product landscape and ecosystem and in the context of historical trends, paired with unique insights from K-Scale Labs' market data (as the only American humanoid company with access to such first-party data). The implication is dramatic: **a focused actor with a leveraged investment can set the course for the dominant consumer electronics product category of the AI era**.

2 Background

2.1 The Hoverboard: A Case Study in Rapid Commoditization

The hoverboard phenomenon represents one of the most instructive case studies in consumer electronics history - not for its technological innovation, but for the speed and completeness with which it demonstrated how rapidly commoditization can destroy value for original innovators. The story begins with Shane Chen, founder of Inventist, who filed U.S. Patent 8,738,278 in February 2013 for a "two-wheel, self-balancing vehicle with independently movable foot placement sections" [2]. Chen's "Hovertrax" device, launched via Kickstarter in May 2013 with a $100,000 funding goal, would inadvertently create the blueprint for one of the most rapid commoditization cycles in consumer electronics history [3].

What makes the hoverboard story particularly relevant to humanoid robotics is not the technology itself - relatively simple gyroscopic sensors and accelerometers controlling dual BLDC motors - but the market dynamics that emerged. Within months of Chen's patent filing, Chinese manufacturers began producing functionally identical devices, often with inferior components and manufacturing processes [4]. The value destruction for Chen was immediate and substantial: despite holding the foundational patent, his company struggled to maintain market share against competitors who could produce similar devices at dramatically lower costs.

The rapid commoditization was accelerated by two factors that bear striking similarities to current humanoid robot market conditions: celebrity endorsements creating viral demand, and the concentration of manufacturing capabilities in regions with limited patent enforcement. Justin Bieber, Kendall Jenner, and other high-profile figures created massive social media exposure that far exceeded any single manufacturer's capacity, creating opportunities for numerous copycat operations to enter the market simultaneously [1].

The safety crisis that followed - with over 500,000 units recalled in the United States alone by 2016 due to battery fires - highlighted a fundamental challenge in rapidly commoditizing hardware markets: maintaining quality control when production scales rapidly across numerous manufacturers with varying standards [4]. The US Consumer Product Safety Commission's intervention effectively halted unregulated growth, forcing market stabilization and consolidation.

Today, the hoverboard market has stabilized into a mature industry with annual sales of 7-8 million units globally, dominated by established brands offering UL 2272 certified products at $50-200 price points. The key insight is not that hoverboards failed, but that they succeeded in becoming ubiquitous (after some ups and downs) while destroying value for the original innovator - a dynamic that provides crucial insights for the humanoid robot hardware market.

This pattern of rapid commoditization should be recognizable to anyone who has followed the evolution of humanoid robots. The actuator design which underpins the entire humanoid hardware industry is based on the open-source MIT Cheetah actuator design [5]. Unitree, the leading humanoid robot company today, got their start by reverse-engineering the Boston Dynamics Spot. The humanoid industry today is built on a foundation of reverse-engineering and copying which was absent from either the smartphone or electric vehicle industries. Companies which are advocating for forming moats around their humanoid intellectual property are fighting against the tide, just as Shane Chen did.

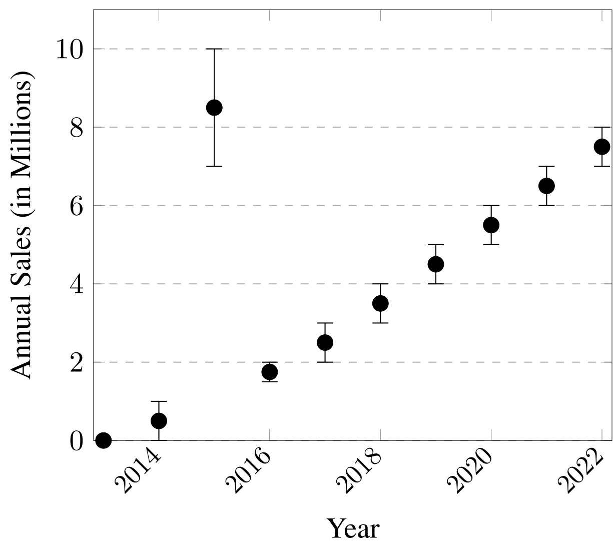

Figure 1: Hoverboard adoption curve, using data from [6, 7, 8]. Hockeystick growth in 2015 was brought to a halt in February 2016 by the US CPSC recall of 500,000 hoverboards.

2.2 Consumer Drones: A Middle Ground Case Study

Consumer drones represent a particularly instructive case study for humanoid robotics because they occupy a middle ground between the complete value destruction of hoverboards and the sustained innovation of smartphones and electric vehicles. The drone industry's evolution from 2010 to 2025 provides crucial insights into how humanoid robot markets might develop, particularly regarding the balance between commoditization and sustained competitive advantage.

The consumer drone market began with Parrot's AR Drone in 2010, which sold approximately 180,000 units by 2013 [9]. However, Parrot's early success was short-lived as the market rapidly evolved toward more sophisticated and user-friendly designs. The key lesson from Parrot's experience is that being first to market in consumer electronics does not guarantee long-term success when the underlying technology becomes commoditized.

DJI's entry with the Phantom series in 2013 fundamentally altered the industry landscape. The Phantom's user-friendly design, integrated camera system, and reliable flight controls made aerial photography accessible to a mass market. By 2014, DJI had sold over 500,000 Phantom units, establishing the company as the dominant player in consumer drones [9].

DJI's success was built on vertical integration - the company designed and manufactured most components in-house, enabling rapid innovation and cost reduction. This strategy allowed DJI to maintain technological leadership while driving down prices, creating a virtuous cycle that competitors found difficult to match. By 2015, DJI held approximately 50% of the U.S. consumer drone market, selling 900,000 Phantom models and capturing 75% of the global consumer drone market [10].

The most compelling case study comes from the battle between DJI and 3D Robotics (3DR), an American company co-founded by Chris Anderson and Jordi Muñoz in 2009. 3DR's Solo drone, launched in 2015, was designed to compete directly with DJI's offerings, featuring advanced autonomous capabilities and an open-source software platform. However, 3DR's ambitious plans were undermined by two critical failures that highlight key risks for humanoid robot companies.

First, 3DR struggled with engineering execution and product quality. The Solo drone faced critical issues including GPS system connection problems and production delays that prevented the company from capitalizing on early market interest. This emphasizes the need for a team with top-down engineering excellence, led by a highly technical CEO who can ensure rapid iteration and quality control - exactly what DJI achieved through their vertical integration model.

Second, and more critically, 3DR raised significant capital to build their own manufacturing and fulfillment infrastructure. When they experienced a high return rate and the product demand slope failed to meet their aggressive predictions, they were left with massive inventory on hand that burned through their entire runway. This inventory risk is precisely what the hoverboard-style go-to-market strategy addresses: by leveraging existing manufacturing ecosystems and Amazon FBA fulfillment, companies can avoid the capital-intensive inventory risks that killed 3DR.

The results were stark: 3DR sold only approximately 22,000 Solo units in its first year, while DJI continued to expand its market share. By 2016, 3DR had shifted focus from hardware to software solutions, effectively conceding the consumer drone market to DJI [11]. The consumer drone market has experienced significant consolidation since 2015, with DJI emerging as the clear winner. By 2023, DJI controlled approximately 70% of the global consumer drone market, with annual revenues estimated at $2 billion [12]. The company's market share increased to 80% by 2024, selling an estimated 1.8 million drones annually [9].

This sustained dominance contrasts sharply with the hoverboard experience, where no single company maintained long-term market leadership. Unlike hoverboards, where commoditization led to value destruction for all players, drones achieved a stable market structure with a dominant player maintaining healthy margins. The consumer drone experience offers one key strategic insight for humanoid players: companies must be built around a highly technical, DJI-style culture of rapid iteration and execution, quickly adopting the latest and greatest ideas and components from across the industry to avoid falling behind.

2.3 Why Not Smartphones, Electric Vehicles, or Consumer Drones?

The current trend in humanoid robotics has been to draw parallels with either smartphones or electric vehicles - both transformative technologies that created massive markets while preserving value for their innovators. However, this comparison fundamentally misunderstands the unique dynamics that have shaped the evolution of the humanoid robot as a product category. Consumer drones, while providing a middle ground case study, also differ in crucial ways that limit their applicability as a direct comparison.

2.3.1 Electric Vehicles

The idea for Tesla to build humanoids has humorous origins (as it was relayed to K-Scale's CEO). Elon would periodically ask Tesla's Director of AI, Andrej Karpathy, what Tesla should work on once they solved self-driving (which, for almost a decade, was about six months from happening). At one point, Andrej, being a fan of the movie "I, Robot", suggested building humanoids - he liked the idea of Tesla becoming a real-life U.S. Robotics. The motivation makes sense - Tesla has significant manufacturing capacity, a deep talent pool of actuator, battery and control systems experts, as well as a world-class AI team. Tesla initially looked into acquiring Agility Robotics, but ultimately decided to partner with Apptronik to kick off a home-grown humanoid robot before entirely bringing the effort in-house.

In retrospect, this original framing likely misunderstood the nature of the humanoid robot as a product category. The fundamental advantage that Tesla has in the self-driving race is that people like to drive Teslas without the self-driving functionality, enabling the progression from a high-end product in the Tesla Roadster down to a mass-market product in the Tesla Model 3. However, humanoid robots do not have this luxury - a humanoid without great software is essentially useless. While the form factor captures the inspirational qualities that Elon is known for, the first humanoid robots will likely be clumsy, slow, and not particularly useful, and it will be hard for them to command a Roadster-like premium.

Humanoid robots also sit within a fundamentally different manufacturing ecosystem than EVs. EVs required massive infrastructure investment - charging networks, grid upgrades, regulatory frameworks - that created natural barriers to rapid commoditization [13]. The complexity and capital requirements of EV manufacturing (particularly in Tesla's early days), combined with regulatory compliance demands, limited the number of potential competitors and supported sustained innovation by established players. Humanoid robots, however, are standalone products that require no external infrastructure. They operate in existing environments using standard power sources, eliminating the infrastructure dependencies that protected EV manufacturers from rapid commoditization. The manufacturing complexity, while significant, is not fundamentally different from other consumer electronics products that have experienced rapid commoditization.

2.3.2 Smartphones

As a consumer electronics product, smartphones are likely a better reference product for humanoids than electric vehicles, but also suffer from being an imperfect analogy. Apple's iPhone succeeded not because of superior hardware - indeed, Android manufacturers quickly matched and often exceeded Apple's hardware specifications - but because of the iOS ecosystem, App Store, and network effects that created platform lock-in [14]. Users became dependent on specific ecosystems due to app availability and data portability, creating sustainable competitive advantages that prevented rapid value destruction. Apple was able to rapidly capture the vast majority of the smartphone market and leverage their market share to maintain this competitive advantage.

It is possible that a humanoid company today could establish a runaway lead in the market and similarly cement their position to build a similar ecosystem. However, there are important qualities of the product that make this unlikely. Critically, the transition from Software 1.0 and Software 2.0 to Software 3.0 has made the application layer much more portable, as many LLM companies are now experiencing. In this paradigm, while it is certainly the case that the robotics ecosystem will advance rapidly thanks to significant investment, methodological differentiators are unlikely to represent a moat for the "hyperscalers" of the robotics industry. In the case of the iPhone, application and data portability created a strong lock-in - but this lock-in is unlikely to materialize in a Software 3.0 world.

The one crucial commonality which smartphones share with humanoids that hoverboards do not is a high price point. Hoverboards were quickly competed down to \$50-200, while consumers habitually pay upwards of \$1000 for a new smartphone, which comes with much greater functionality. If the settling price for humanoids is somewhere closer to \$4000, it is likely that users will still expect smartphone-like utility if it is really going to transition to a mass-market product. There are important lessons to be drawn from the successful players in the smartphone space:

- Hardware-software co-design becomes extremely valuable as a core competency of the company, as it allows the company to optimize the integration between physical and computational systems, even if the manufacturing itself is outsourced.
- Building a developer community that creates network effects around the platform is extremely valuable, as it allows the company to attract and retain developers who can create applications, tools, and extensions.
- Building a strong brand and reputation for quality and ease-of-use, which attracts both developers and end users, is extremely important for maintaining large gross margins.

2.3.3 Consumer Drones

Consumer drones provide valuable insights into market dynamics, particularly regarding the importance of hardware-software integration and the dangers of iterating too slowly. However, they differ from humanoid robots in ways that actually make humanoids more accessible to commoditization.

Consumer drones succeeded because they provided a clear, focused value proposition: aerial photography and videography. This single use case was sufficient to drive mass adoption, and the technology required to deliver this functionality was relatively straightforward - stable flight control, camera integration, and user-friendly interfaces. The success of drones was built primarily on doing one thing exceptionally well, and doing that thing well did not require particularly sophisticated software as much as it required a focus on simplicity and ease-of-use (indeed, drones were well within the domain of hobbiests prior to commercialization).

The key lesson from the drone market is not about manufacturing complexity, but about the critical importance of hardware-software integration. DJI's success came from their ability to tightly couple hardware design with software capabilities, creating seamless user experiences that competitors found difficult to match. The failure of 3D Robotics was not just due to manufacturing and product quality issues, but because of inventory risks that destroyed their runway when product demand and return rates failed to meet expectations.

However, humanoid robots differ from early drones in three crucial ways that make them more accessible to commoditization:

1. From a hardware assembly perspective, humanoid robots are actually simpler than consumer drones were during their inception. Modern humanoids can leverage a mature consumer electronics ecosystem with standardized components, established supply chains, and proven manufacturing processes. The technical barriers to assembly are significantly lower than they were for early drone manufacturers.

2. Contemporary reinforcement learning methods are far better at dealing with noisy and imperfect hardware than the control systems available during the drone revolution. This means humanoid robots can achieve reliable performance even with commoditized, lower-cost components that would have been insufficient for early drone applications.

3. Unlike early drones, humanoids can leverage existing consumer electronics infrastructure, standardized components, and established manufacturing processes. This ecosystem maturity means that the path to commoditization is not just possible, but likely to occur more rapidly than the drone experience.

The real competitive advantage lies not in manufacturing complexity, but in hardware-software co-design and seamless integration. Companies that can effectively couple their hardware design with software capabilities, like DJI did with drones, will maintain competitive advantages even as hardware commoditizes.

The key insight is that while drones provide a useful reference for understanding the importance of integration and the dangers of vertical integration gone wrong, humanoids are positioned to commoditize more rapidly due to their simpler assembly requirements and the maturity of the underlying ecosystem. The companies that succeed will be those that focus on hardware-software integration rather than attempting to build everything in-house.

There are important lessons to be drawn from the successful players in the drone space:

- Hardware-software co-design becomes extremely valuable as a core competency, allowing the company to optimize the integration between physical and computational systems, even if the manufacturing itself is outsourced.

- Building a developer community that creates network effects around the platform is extremely valuable, as it allows the company to attract and retain developers who can create applications, tools, and extensions.

- Building a strong brand and reputation for quality and ease-of-use, which attracts both developers and end users, is extremely important for maintaining large gross margins.

- Leveraging existing manufacturing ecosystems rather than attempting to build everything in-house can provide significant competitive advantages in rapidly commoditizing markets, avoiding a 3D Robotics-style inventory trap.

Note that many of these lessons parallel the lessons from the smartphone space. Since the hoverboard industry never achieved a "premium" brand feel because of the limited utility, humanoid companies should be mindful of lessons learned from higher-end products while being aware of the dynamics among hoverboard manufacturers.

2.4 Technical Foundation

The most compelling evidence for the hoverboard trajectory lies in the fundamental hardware similarities between the two technologies. Both rely on identical core components: brushless DC (BLDC) motors, inertial measurement units (IMUs), and control systems. This shared technological foundation creates conditions for rapid knowledge transfer and component commoditization that simply do not exist in smartphones or electric vehicles.

2.4.1 Actuators

Hoverboards utilize dual BLDC motors integrated directly into wheel hubs, typically rated between 250W to 350W with torque outputs of around 12 Nm [15]. The cost structure demonstrates the rapid commoditization effect: while early models commanded $100-150 per motor, mass production in China reduced costs to $20-50 per unit by 2016 [16].

Humanoid robots employ fundamentally identical BLDC motor technology but achieve higher precision and power efficiency through reducers, typically planetary reducers with 6:1 to 8:1 reduction ratios [17]. The core motors have similar power ratings (100-500W) and base torque output around 10-100 Nm, which is comparable to hoverboard motors with the additional mechanical advantage provided by the reducer.

This is the crucial insight: current high prices for humanoid robot motors ($200-800 per unit) reflect low production volumes and limited supplier competition, not inherent technological complexity. Indeed, while K-Scale buys a substantial number of actuators from our own supplier, the majority of their volume from selling the same actuators to electrical motor bike and industrial equipment companies. However, the same motor manufacturers that enabled hoverboard commoditization could theoretically support humanoid robot production at scale. As production scales and supplier competition increases, motor costs could follow the hoverboard trajectory, potentially reducing to $50-100 per unit through commoditization of both BLDC motors and planetary gearboxes.

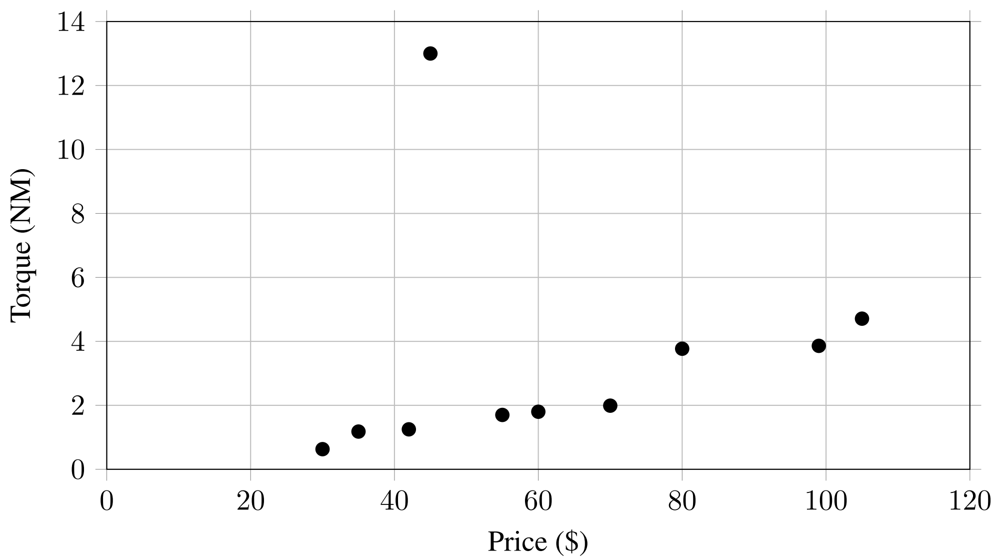

Figure 2: Peak torque as a function of motor price for a selection of commonly available off-the-shelf direct drive BLDC motors. Note that the major outlier in the above graph is the hoverboard motor.

2.4.2 Sensors

Both hoverboards and humanoid robots rely on low-cost IMUs for balancing. Hoverboards incorporate 6-axis IMUs combining gyroscopes and accelerometers, typically providing ±0.1-degree accuracy at sampling rates of 100 Hz [15]. These sensors, sourced from manufacturers like STMicroelectronics and InvenSense, cost $5-15 per unit in volume production. Humanoids incorporate additional sensors and compute systems to support video and audio, as well as running more sophisticated machine learning models.

However, in the humanoid space, we are similarly seeing convergence toward standardized, low-cost components that mirror the hoverboard commoditization model. Leading humanoid robot manufacturers are increasingly adopting off-the-shelf sensors and compute platforms, moving away from custom, high-cost solutions:

- **IMU Standardization**: Companies are converging on standardized 6-axis IMUs like the BNO055 and BNO085 from Bosch, which provide ±0.01-degree accuracy at consumer electronics price points.
- **Vision System Commoditization**: The transition from GMSL to MIPI camera interfaces eliminates expensive custom GMSL serdes components, replacing them with cheap, standardized MIPI camera ICs. Off-the-shelf camera modules like the IMX 219 are sufficient

for dexterous manipulation. Unitree and others have also explored incorporating integrated depth sensors like the Intel RealSense.

- **Compute Platform Standardization**: Single-board computers like the RP2040, RC3588, and A311D2 are becoming standard SOCs for commodity humanoids, providing sufficient onboard compute to run reinforcement learning policies while maintaining the product's consumer electronics price point.

This represents a fundamental shift from the traditional humanoid robot model of custom, high-cost components to the hoverboard model of standardized, commoditized hardware. The elimination of expensive tactile sensors in favor of vision-based interaction further reduces costs from $2,000-5,000 to $100-300 per robot [15].

2.4.3 Manufacturing Infrastructure

The hoverboard manufacturing ecosystem provides the template for understanding how humanoid robot hardware will likely evolve. The hoverboard supply chain emerged rapidly through existing consumer electronics manufacturing infrastructure in China, leveraging established suppliers of motors, sensors, and control systems [16]. This infrastructure enabled rapid scaling from thousands to millions of units within 18 months.

Key hoverboard suppliers included:

- **Motor Manufacturers**: Shenzhen-based companies producing BLDC motors at $8-15 per unit
- **Sensor Suppliers**: STMicroelectronics, InvenSense, and Bosch providing IMUs at $3-8 per unit
- **Control Systems**: Specialized manufacturers like TaoTao producing control boards at $10-25 per unit
- **Battery Systems**: Lithium-ion battery packs at $15-30 per unit

The total BOM for hoverboards is $40-80 per unit, with retail prices ranging from $80-200 - representing slim gross margins of 20-40% that enabled rapid market penetration and created conditions for copycat manufacturers to enter with minimal capital requirements [16].

The question is not whether humanoid robot hardware can be commoditized - the manufacturing infrastructure already exists - but whether it will follow the hoverboard trajectory of rapid commoditization or maintain the current high-cost, low-volume model. The evidence strongly suggests the former.

2.4.4 Case Study: Tao Motors

Perhaps the most compelling evidence for the hoverboard-humanoid robot connection comes from K-Scale Labs' direct experience with Tao Motors (also known as TaoTao), a major manufacturer in the hoverboard supply chain. After K-Scale published their open-source humanoid robot reference design, Tao reached out to the company, recognizing that their existing supply chain and manufacturing capabilities were remarkably similar to what would be required for humanoid robot production.

The results were striking: Tao was able to build K-Scale's humanoid robot by following the open-source reference design and deliver them through their US-based subsidary, Denago, with minimal assistance from K-Scale's engineering team, in less than three weeks from initial engagement. Critically, they accomplished this without needing any machine learning scientists on staff - demonstrating that the technical barriers to humanoid robot manufacturing are far lower than commonly assumed when leveraging existing consumer electronics manufacturing infrastructure. When K-Scale's partnership with Tao was made public, *Tao's stock price rose over 30%*, demonstrating the strong financial incentive for manufacturers to pursue this path even pre-revenue.

This case study provides compelling evidence for four key points:

- The manufacturing infrastructure for humanoid robots already exists in the hoverboard supply chain
- The technical complexity of humanoid robot assembly is manageable for existing consumer electronics manufacturers
- The path to commoditization is not simply theoretical, but already demonstrated in practice
- There are strong financial incentives for these manufacturers to transition into humanoids even absent substantial revenue in the sector

Indeed, the commoditization process may be even more rapid than the hoverboard experience itself, given the relative maturity of such manufacturers today.

2.5 Adoption Patterns

The adoption patterns of hoverboards and humanoid robots reveal the fundamental market dynamics that will likely characterize the humanoid robotics trajectory.

2.5.1 The Viral Growth Model

Hoverboard adoption followed a classic viral growth pattern driven by celebrity endorsements and social media exposure. Early adopters included celebrities like Justin Bieber and Kendall Jenner, tech enthusiasts, urban commuters, and the entertainment industry [1]. The adoption curve was extraordinarily steep: from a virtually anonymous initial market introduction in 2014 to peak quarterly sales of 2.5 million units in the United States alone by 2016 [15].

This rapid adoption created massive demand that exceeded the capacity of any single manufacturer, enabling numerous copycat companies to enter the market simultaneously. The demand-supply imbalance was a key factor in the rapid commoditization and value destruction experienced by original innovators.

2.5.2 Humanoid Robot Adoption

Humanoid robot adoption has undergone a dramatic transformation in 2024-2025, driven by unprecedented BOM cost reductions that are fundamentally altering market dynamics. The most compelling evidence comes from Unitree Robotics' dramatic price reductions:

- **Unitree H1 (2023)**: $90,000 - High-end research and industrial applications
- **Unitree G1 (2024)**: $16,000 - 82% cost reduction in one year
- **Unitree R1 (2025)**: $5,900 - 93% cost reduction from H1, 63% reduction from G1

The R1 model, weighing 25 kg with 26 degrees of freedom, demonstrates that sophisticated humanoid capabilities can be achieved at consumer electronics price points. This 93% cost reduction over two years represents one of the most rapid price reduction cycles in robotics history, directly paralleling the hoverboard experience [18]. The Unitree price reductions are not isolated incidents but represent a broader industry trend toward commoditization - a $4,000 market price point by Q3 2026 is imminent.

This rapid cost reduction creates conditions identical to those that enabled hoverboard commoditization: existing manufacturing infrastructure can support mass production, component suppliers are already established, and viral demand potential exists for consumer applications. The key difference is that humanoid robots have the potential to offer significantly more utility than hoverboards, suggesting a higher cap on total sales.

This transition creates a critical strategic imperative: **competing on the low end of the market through capital efficiency**. Just as hoverboard manufacturers succeeded by focusing on cost reduction and mass market penetration rather than premium features, successful humanoid robot companies will need to prioritize capital efficiency and market accessibility over technological sophistication, particularly in the early days of the product lifecycle. The companies that can deliver functional humanoid robots at an aggressively low price point will capture the largest early market share, while those focused on premium features and high margins at the expense of market accessibility, iteration speed or capital efficiency will be extremely vulnerable to being undercut by rivals.

2.6 Robotics Foundation Models

The recent emergence of robotics foundation models has been broadly split into two camps, one leveraging large amounts of supervised data, and another leveraging representation learning approaches on unstructured vision data.

2.6.1 Supervised Learning from Expert Teachers

The RT-X project represents the current dominant paradigm in robotics foundation models, emphasizing supervised learning from large-scale, curated datasets. By aggregating data from 34 research labs encompassing 22 different robot types and hundreds of skills across diverse environments, RT-X demonstrates the power of cross-embodiment learning [19]. The resulting models consistently outperform specialized approaches, achieving 50% improvement on average over domain-specific models [19]. Additional approaches have similarly shown the promise of cross-embodiment transfer from in-domain datasets [20, 21, 22, 23, 24].

In the context of a venture-backed business, this approach creates defensibility through data ownership and curation expertise. The extensive data collection process - requiring synchronized sensor inputs, motor commands, and human demonstrations - creates significant barriers to entry. Each data point necessitates physical robots, controlled environments, and often human operation, making data collection both expensive and time-consuming. Companies that can amass and curate the largest, highest-quality datasets gain a substantial competitive advantage that is difficult for competitors to replicate.

The RT-X approach is particularly well-suited for companies with significant resources and established robotics research programs. The defensibility comes from the ability to collect, process, and leverage proprietary datasets that competitors cannot easily access or replicate. This creates a classic data moat where the company with the most comprehensive dataset wins.

2.6.2 Continuous Modality Representation Learning

However, an alternative paradigm is emerging that fundamentally challenges the data-centric approach: learning from unstructured video data using self-supervised methods. Approaches like Video Joint Embedding Predictive Architecture (V-JEPA) and similar video foundation models demonstrate that robots can learn to understand and interact with the physical world by observing how humans and other agents manipulate objects and navigate environments [25, 26, 27, 28, 29, 30].

This approach is based on a relatively simple philosophical underpinning, which is that the physics of the world are universal, and understanding how actors interact with these physics to perform useful tasks can be learned from any video data, not just specialized robotics datasets. While less methodologically mature because of the relative difficulty of learning great latent representations compared to just modeling supervised data directly, such approaches align much better with the Bitter Lesson - while supervised methods are capable of delivering nice early demos, they are fundamentally worse at leveraging scaled datasets.

However, it is important to emphasize that these types of representation learning-based approaches, while promising and potentially disruptive, are not yet the clear winner. They remain methodologically immature compared to supervised learning approaches, and practical applications in robotics are still largely theoretical. The implications for companies in the space is that as representation learning-based methodological approaches mature, it is highly likely that simply scraping internet videos or harnessing other cheaply-collected datasets, potentially from robot fleets operating in the wild, rather than needing to hire expensive humans to collect bespoke datasets, will dramatically reduce the data collection costs and barriers to entry that make data scaling approaches defensible. However, this transition is not guaranteed and may take years to materialize.

2.6.3 Tesla's FSD: A Case Study in Sustainable AI Development

Tesla's approach to Full Self-Driving (FSD) provides a crucial case study for understanding how to build sustainable AI businesses in rapidly commoditizing hardware markets, particularly in the context of methodological uncertainty. Unlike other self-driving companies that struggled with unit economics, Tesla succeeded by framing the self-driving problem within the context of driving high margins for a relatively commodity hardware product, while maintaining the flexibility to adapt to whichever AI approaches ultimately proved most effective.

Tesla's FSD evolution demonstrates the importance of iterative development and early revenue realization in the face of uncertain technological outcomes. The company's approach has undergone several distinct phases, each adapting to new insights about which methods work best:

- **Hardware Integration (2014-2016)**: Tesla equipped vehicles with Autopilot hardware (HW1), establishing the foundation for future autonomous capabilities while maintaining focus on core vehicle sales.
- **Vision-Based Strategy (2016-2021)**: Tesla departed from industry norms favoring LiDAR and radar, adopting a camera-only approach that reduced hardware costs while leveraging their existing vehicle fleet for data collection, allowing them to maintain unit economics and generate revenue to sustain development.
- **FSD Beta Program (2020-Present)**: Tesla launched FSD Beta, allowing select users to test advanced autonomous features while front-loading revenue to fund R&D expenditures.

The critical insight from Tesla's approach is their ability to realize revenue early through the FSD Beta program. This early revenue realization allowed Tesla to reinvest heavily in FSD development while maintaining their core vehicle business, creating a self-reinforcing cycle that competitors like Cruise, Waymo, and Argo AI could not replicate.

Tesla's success contrasts sharply with other self-driving companies that failed due to high hardware costs, limited data access, and the absence of a robust revenue model. While companies like Cruise invested heavily in expensive sensor suites and specialized vehicles, Tesla leveraged their existing vehicle fleet and relatively simple camera hardware to achieve superior unit economics. The FSD Beta approach enabled Tesla to monetize their self-driving technology incrementally, providing the financial foundation necessary to sustain long-term AI development regardless of which methodological approaches ultimately proved most effective.

This business model approach is particularly relevant for humanoid robotics, where the uncertainty about which AI paradigms will ultimately succeed creates significant risk for companies that cannot sustain long-term development cycles. Tesla's model demonstrates that the key to success in uncertain technological environments is not picking the right technical approach from the start, but rather building a business model that can fund continued innovation and adaptation as the field evolves.

2.6.4 Strategic Implications for the Humanoid Robot Market

While there is significantly more technical analysis available on robot foundation models (likely enough to fill an entirely new whitepaper), this framing of the RFM landscape has important strategic implications for humanoid robot companies. The Tesla FSD case study provides crucial insights into how to build sustainable AI businesses in commoditizing hardware markets.

The most successful humanoid robot companies will be those that:

1. **Frame AI development within sustainable unit economics**: Like Tesla's FSD approach, successful companies will find ways to realize revenue early through incremental AI capabilities, rather than waiting for full autonomy. This might include premium software features, developer tools, or early access programs that generate cash flow to fund continued AI development.

2. **Leverage existing hardware ecosystems**: Following Tesla's vision-based strategy, companies should focus on maximizing the capabilities of relatively simple, commodity hardware rather than investing in expensive, specialized sensor suites. As with Apple, Tesla's pivot to manufacturing in Asia helped them leverage the large supply chain and expertise base. This approach reduces costs while enabling rapid scaling and data collection.

3. **Prepare for methodological uncertainty**: Given that continuous modality representation learning remains unproven in practice, companies should maintain flexibility in their AI approaches. The most successful companies will be those that can adapt to whichever methodological paradigm ultimately proves most effective, rather than betting everything on a single approach.

4. **Prioritize hardware-software co-design and seamless user experience**: Like Tesla's integrated approach, successful companies will focus on creating seamless user experiences that leverage both hardware and software capabilities, rather than treating AI as a separate, standalone feature.

5. **Create developer ecosystems and user communities**: Building on the lessons from both Tesla's FSD Beta program and successful smartphone platforms, companies should invest in developer tools, APIs, and community building that create network effects, word-of-mouth marketing, and platform lock-in.

6. **Establish strong, developer-friendly brands**: In a commoditizing market, brand and reputation become increasingly important for attracting talent, partnerships, maintaining premium pricing power, and monetizing AI capabilities.

3 Business Plan

We will now proceed to outline a developer-first business plan that leverages open-source hardware to intentionally commoditize manufacturing and enable a capital-efficient, distributor-based vertical business model (mirroring the hoverboard dynamic) while concentrating company value in our foundation model, brand, integration, developer ecosystem, and direct customer relationships. We will distribute through Amazon FBA to meet demand at scale while keeping our operations lightweight and data-driven, and we will pursue the necessary regulatory approvals and Amazon compliance required for mass consumer distribution.

Particularly, our current outlook on the humanoid robot landscape is that early adopters are primarily concentrated in the developer, entertainment, and education markets. In order to achieve high gross margins without sacrificing building a scalable, cost-competitive product, our monetization strategy focuses on leveraging our brand and developer ecosystem to drive aftermarket software and hardware sales. Taking inspiration from Tesla's FSD model and the Cursor IDE, our goal is to reinvest these gross margins towards developing our in-house foundation model and software product.

Underpinning our business model is a humanoid robot design which has been aggressively optimized for cost and manufacturability, achieving a COGS which is out-performs even vertically-integrated humanoid manufacturers. Particularly, unlike with the drone market, in which American companies suffered from quality control issues and an inability to vertically integrate effectively compared to their Chinese counterparts, we are able to leverage the relative sophistication of the secondary supply chain for humanoid components to achieve a cost structure that lets us avoid price pressure without sacrificing quality.

3.1 Positioning and Thesis

Our strategic product positioning is as follows:

- **Developer-First**: Success requires a large, engaged developer community to extend capabilities, create applications, form network effects, and grow enterprise use cases.
- **Open Hardware Advantage**: Publishing a complete reference design accelerates supply-side scale, lowers BOM and operational expenses via competition, and lets us maintain complete second-source coverage to mitigate supply chain risk, while we focus on software, UX, developer experience, and distribution.
- **Monetize Aftermarket Hardware and Software Sales**: We will leverage our brand and developer ecosystem to drive high-margin aftermarket software and hardware sales.

3.2 Product Strategy: Open Hardware + Proprietary Software

We will maintain a public, production-grade reference design and a permissive hardware license to enable ODM manufacturing at scale, optimized to run our proprietary foundation model and software stack:

- **Reference Design**: CAD, BOM, DFM notes, assembly instructions, test procedures, maintenance guides.
- **Software Stack**: Low-level drivers, control, perception, and APIs for high-level skills; first-party examples for manipulation, navigation, and evaluation.
- **Developer Experience**: Clear versioning, upgrade path, reproducible builds, and stable interfaces for third-party modules.
- **Community**: Public roadmap, RFC process, issue triage, and governance for contributions.

3.3 Manufacturing and Supply Chain

We will cultivate multiple ODMs capable of producing the reference design with interchangeable subassemblies. Our role is to enforce quality, verify conformance, and aggregate demand:

- **ODM Network**: Qualify 2-3 suppliers with component interchangeability and second-source coverage (motors, reducers, IMUs, compute).
- **Quality**: Target defect rate of 1 in 1000 actuators (1 in 50 robots). Burn-in: 5 battery cycles of 4-hour outdoor walking tests in sunny/warm conditions.
  - **Acceptance Test**: "Can it walk around for 4 hours without breaking?" This represents a simple yet comprehensive test of the control systems (low latency, packet integrity), electrical systems, and mechanical assembly, given that assembly and quality issues will easily cause the robot to break down under such usage.
  - **EOL**: 2 years, tracking with generational updates.
- **DFM/DFA**: Periodic design releases focusing on part-count reduction and fixture-based assembly.
  - **Assembly Time**: 0.3 units/day per production line ($\sim$110 units per line per year) (assumes 365 operating days/year; at 250 days/year output $\approx$ 75 units/line)
  - **Manufacturing Process**: Initial production uses CNC machining for low-volume, transitioning to forged components for high-volume production
  - **Target Volume**: 1,000-10,000 units annually, achieved through parallel ODM production lines. Scaling plan: 9-10 lines for 1k units/year; 30-40 lines for 3-4k units/year; 90-95 lines for 10k units/year across 2-3 ODMs.
- **Pilot Builds**: EVT/DVT/PVT gates with structured defect tracking and corrective actions.
  - **Lot Sizes**: 10-50 units per gate

– **Acceptance Criteria**: Less than a 2% defect rate, successful completion of burn-in testing, and passing acceptance test ("Can it walk around for 4 hours without breaking?") (PVT gate target $\approx$ 98% pass rate; EVT $\approx$ 90%, DVT $\approx$ 95%)

3.4 Bill of Materials and MSRP

We will use the bill of materials outlined in Table 1 for the K-Bot, including expected costs for the next-generation K-Bot. We separate the costs of manufacturing via CNC machining (low-volume, prototyping), forging (high-volume, requires upfront capital investment for molds), and expected Gen 2 costs (also utilizing forging for structural components). From our BOM and leveraging our additional costs from manufacturing and selling the Gen 1 K-Bot, we derive the suggested MSRP for the Gen 1 and Gen 2 products in Table 2. Note that Gen 1 represents our current product, while Gen 2 represents our planned next-generation product with optimized costs.

Table 1: Unit BoM comparison

Category	**Qty (per robot)**	**CNC**	**Forging**	**Gen 2 (Exp.)**
Structural components	1 set	\$4,500	\$1,200	\$800
Bearings, bushings, pins (COTS)	bulk	\$350	\$350	\$350
Actuators	20	\$3,500	\$3,500	\$1,500
Compute module	1	\$200	\$200	\$200
IMU	1	\$10	\$10	\$10
Cameras	2	\$20	\$20	\$20
Battery pack + BMS	1	\$700	\$700	\$300
Wiring harness, connectors, PCBAs	bulk	\$1,000	\$1,000	\$500
Fasteners (bolts, washers, nuts, inserts)	bulk	\$150	\$150	\$150
Total per unit	–	**\$10,430**	**\$7,130**	**\$3,830**

Table 2: Manufacturer's Suggested Retail Price (MSRP) analysis and cost structure breakdown.

Category	**Gen 1**	**Gen 2**	**Assumptions**
Base Cost Structure			
Base BOM	\$7,130	\$3,830	From Table 1
Yield Adjustment	\$7,276	\$3,908	Manufacturing yield losses
CM Margin	\$8,185	\$4,397	Contract manufacturer profit margin

Continued on next page

Table 2 – continued from previous page

Category	Gen 1	Gen 2	Assumptions
Logistics and Import Costs			
Freight / Brokerage	$325	$325	Shipping and customs brokerage
Tariffs	$1,064	$572	13% of FOB, K-Bot Gen 1 tariff rate
Total Landed Costs	$9,574	$5,293	Base + Logistics costs
Distribution Costs			
FBA Fees	$276	$180	Amazon FBA fulfillment fees
Total COGS	**$9,850**	**$5,473**	Total cost to get to customer
Pricing and Profitability			
Target MSRP	**$16,000**	**$8,000**	Market positioning strategy
Gross Profit	**$6,150**	**$2,527**	MSRP - Total COGS
Gross Margin	**38.4%**	**31.6%**	Gross Profit / MSRP

3.5 Fulfillment via Amazon FBA

Amazon FBA is our primary distribution channel to match viral demand and provide reliable last-mile logistics. FBA costs represent 1.7% and 2.3% of MSRP for Gen 1 and Gen 2 respectively (see Table 3). Note that our FBA cost model conservatively assumes a 10% return rate, while our KPI targets (Table 12) aim for $\leq$5% actual returns based on quality improvements and customer support. Return processing costs shown are placeholder estimates; actual costs at 10% rate would be \$50-\$150 per return including inspection, repackaging, and potential scrap. Storage assumes Amazon Oversize Tier 1 classification; costs may increase if carton dimensions exceed threshold. Additionally, we summarize the estimated compliance costs to meet Amazon FBA requirements in Table 4.

Table 3: FBA service overhead costs for current and next-generation robots, showing that FBA costs represent approximately 2% of MSRP for both generations.

Cost Component	**Gen 1**	**Gen 2**
Fulfillment Fee	\$59.31	\$43.12
Storage Cost (3 months)	\$54.00	\$54.00
Return Cost (10% rate)	\$2.00	\$2.00
Removal/Disposal	\$1.00	\$1.00
Compliance Overhead (1%)	\$160.00	\$80.00
Total FBA Cost	**\$276.31**	**\$180.12**
Percentage of MSRP	**1.7%**	**2.3%**

Table 4: Regulatory & Compliance

Domain	Standard / Policy	Evidence to Amazon / Regulators	Est. Cost (USD)
Electrical safety (robot)	UL 3300 (Service/Consumer Robots) *and/or* UL 1740 (Industrial Robots)	NRTL certification + listing report; product bears NRTL mark.	\$60k–\$120k
Electrical safety (subsystems)	UL/CSA 62368-1 (A/V-ICT)	Component CB/NRTL certificates or inclusion in end-product evaluation.	\$10k–\$30k
Power supply / charger	UL 1310 (Class 2) or UL 1012	Provide PSU NRTL certificate; verify ratings.	\$0 (off-shelf) / \$8k–\$25k (custom)
Battery - cells	IEC 62133-2	Supplier's CB report + certificate.	\$0 (qualified) / \$20k–\$40k (new cell)
Battery - pack (robot)	UL 2054 (pack) + IEC/UL 62133-2 (cells); IEC 62619 only if industrial application	Pack safety test report + (optional) NRTL cert; UN 38.3 TS provided separately	\$40k–\$100k
Battery - transport	UN 38.3 + Test Summary	UN 38.3 report + TS; UN3481 markings on shipments.	\$5k–\$15k
EMC (no radio)	FCC Part 15 Subpart B (Class B)	Accredited EMC report; SDoC file; labeling.	\$6k–\$12k
Radio (Wi-Fi/BT)	FCC Part 15C (2.4 GHz) + Part 15E (U-NII/5 GHz); KDB 996369 module integration; RF exposure per KDB 447498	Module FCC ID, host integration report (antenna, shielding, co-location), FCC labeling & manual statements; RF exposure calcs/SAR-exemption as applicable	\$3k–\$8k (module-only) / \$15k–\$30k (host)
RF exposure (radio)	FCC KDB 447498; 47 CFR §2.1091/§2.1093	MPE/SAR-exemption worksheet or SAR report; user distance statement in manual	\$0–\$8k
Environmental (EU/Int'l)	RoHS, WEEE/EPR	RoHS test file; WEEE registrations.	\$5k–\$20k
Labeling & docs	Regulatory marks, manuals; FCC labeling per 47 CFR 15.19/15.21; module FCC ID exposure per KDB 996369	Label artwork + uploaded test reports; FCC labeling and user manual statements; module FCC ID (physical or e-label) + host integration statements	\$2k–\$5k

Continued on next page

Table 4 (continued)

Domain	Standard / Policy	Evidence to Amazon / Regulators	Est. Cost (USD)
Amazon programmatic	Amazon Lithium Policy	Compliance docs uploaded via Seller Central.	$0 direct (ops time)
Amazon Dangerous Goods (hazmat)	FBA Dangerous Goods program	UN 38.3 Test Summary; SDS or Battery Exemption Sheet; ASIN DG classification	$0 direct (ops)
FBA inbound labeling (heavy)	Amazon shipping/routing requirements	'Team Lift/Heavy Package' labels for ¿50 lb; 'Mechanical Lift' for ¿100 lb; label top & sides	$0–$200
Lithium shipping specifics	49 CFR 173.185 + PHMSA lithium battery guides	PHMSA Lithium Battery Guide 2024 + 49 CFR compliance; marking, packaging, state of charge for air	$0–$5k
IoT device security (state)	CA SB-327; OR IoT law	Declaration of unique credentials / reasonable security features; manual update	$0–$5k
California Prop 65	CA Prop 65 (if applicable)	Prop 65 warnings on PDP and packaging; Amazon enforces in CA	$1k–$10k
Battery EPR (state)	CA AB 2440 (from 2027) et al.	Producer stewardship enrollment (if/when selling in CA)	TBD
CE Marking framework (EU)	RED (2014/53/EU) + Machinery Directive (until 2027) / Machinery Regulation (2027+)	RED cybersecurity delegated act (Aug 1, 2025); EC RED page; Machinery Regulation timeline	$15k–$40k
		US-only baseline (pre-cert radio, qualified cells):	**$130k–$300k**
		Add if host radio + new cells:	+$25k–$70k
		Add state compliance (CA Prop 65, IoT security):	+$1k–$15k
		EU entry (RED + Machinery + RoHS+WEEE/EPR):	+$20k–$60k

3.6 Projected Sales and Customer Profile

Our pre-order data and customer conversations provide insights into early adopter customer behavior. In particular, our customer profile tracks very similarly to Unitree, and we reference their product sales numbers in Table 5. We summarize additional aspects of our customer profile in Figure 3, 4, and 5. To view the raw data, see Table 17 in the Appendix.

Table 5: Projected sales and market penetration analysis by year.

Category	**2026**	**2027**	**2028**	**2029**	**Assumptions**
Market Size (Units)	20,000	100,000	500,000	2,500,000	Unitree-type robot
Market Penetration	1.0%	5.0%	5.0%	5.0%	Penetration estimates
Unit Sales	**200**	**5,000**	**25,000**	**125,000**	Market Size × Penetration
Revenue	**$1,600K**	**$40,000K**	**$200,000K**	**$1,000,000K**	Unit Sales × $8,000 MSRP
Cost of Goods Sold	$1,095K	$27,367K	$136,834K	$684,172K	From Table 2
Gross Profit	**$505K**	**$12,633K**	**$63,166K**	**$315,828K**	Revenue - COGS

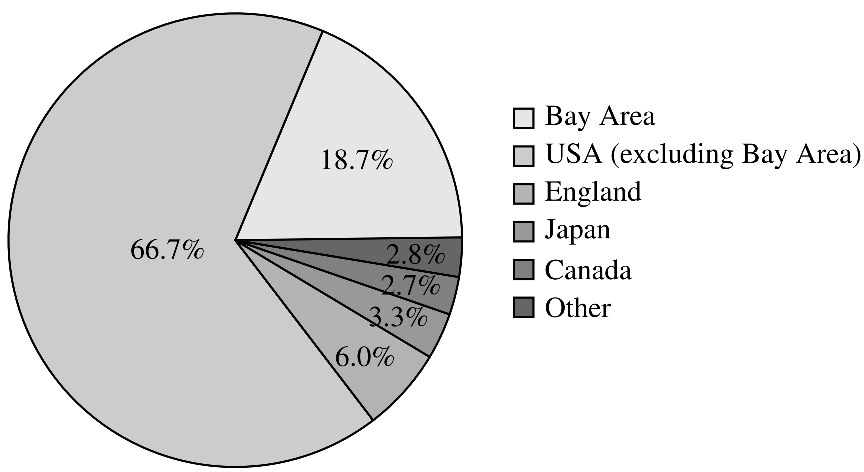

Figure 3: Customer location, with the Bay Area split out. Note that we did not make all locations available initially, and we have restricted the available locations to countries where we are confident that we will be able to fulfill orders.

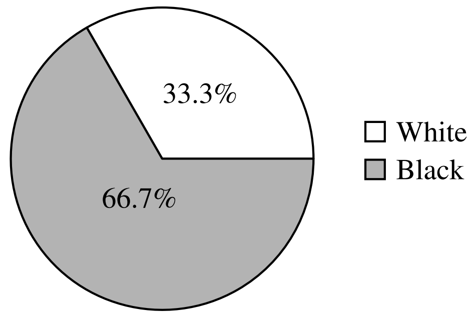

Figure 4: Customer color preferences for customers who purchased the full autonomy package and had the option to choose white instead of black.

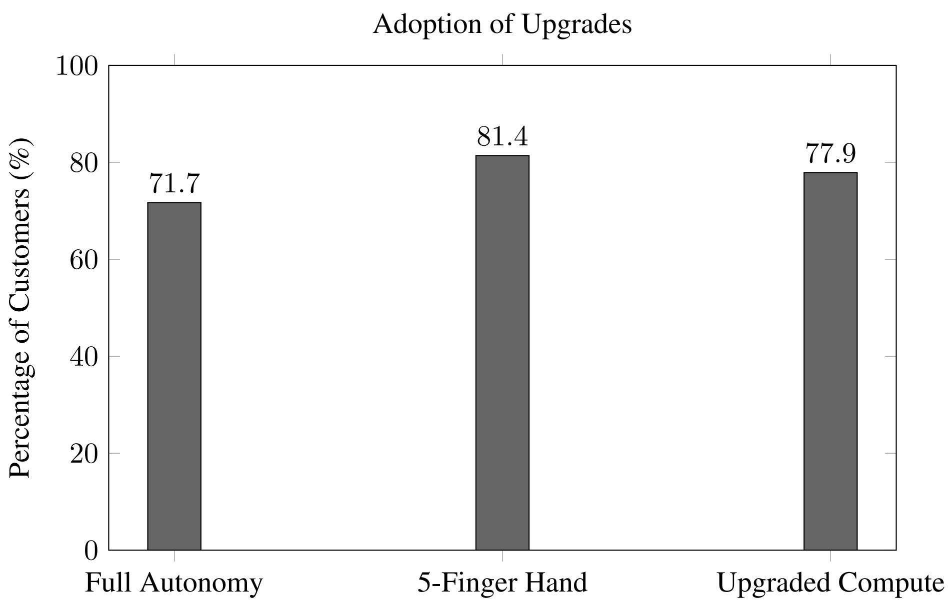

Figure 5: Take rate of each upgrade option (excluding customers who purchased the K-Bot before the additional options were made available). Note that the Full Autonomy option required customers to also purchase the 5-Finger Hand and Upgraded Compute options.

3.7 Hardware and Aftermarket Unit Economics

Table 6 outlines our pricing and unit economics for the Gen 1 and Gen 2 products, respectively. Table 7 outlines our estimated aftermarket upgrade pricing, costs, and adoption rates, where adoption rates represent percentage of robot owners who purchase each upgrade within 2 years. Our adoption rate data is estimated from the take rate of upgrades following our initial launch. Table 8 outlines our projected aftermarket upgrades revenue and profitability analysis.

Category	**Gen 1**	**Gen 2**
BOM		
Base BOM	$7,130 (Table 1)	$3,830 (Table 1)
Yield adjustment (98% target)	+2.04% = $7,276	+2.04% = $3,908
CM margin (12.5% midpoint)	+12.5% = $8,185	+12.5% = $4,397
Landed Cost		
Freight / brokerage	$325	$325
Tariffs (13% of FOB)	$1,064	$572
Total Landed Cost	**$9,574**	**$5,293**
All-in COGS		
FBA fees	$276.31	$180.12
Total COGS	**$9,850**	**$5,473**
MSRP & Margins		
Target MSRP	$16,000	$8,000
Gross margin	$6,150	$2,527
Gross margin (% of MSRP)	38.4%	31.6%

Table 6: Estimated pricing and unit economics for Gen 1 and Gen 2 products. Our strategy is to position our robot as a commodity product to avoid pricing pressure, while monetizing through aftermarket hardware and software sales. As a result, we target typical gross margins for Chinese consumer electronics products.

Upgrade Category	**MSRP**	**COGS**	**Gross Margin**	**Est. Adoption Rate**
Spare arm	$4,000	$1,500	62.5%	25%
5-Finger Hand	$5,000	$2,000	60.0%	50%
Compute module upgrade	$2,000	$1,200	40.0%	80%

Table 7: Estimated aftermarket upgrade pricing, costs, and adoption rates, where adoption rates represent percentage of robot owners who purchase each upgrade within 2 years. Our adoption rate data is estimated from the take rate of upgrades following our initial launch.

Category	**2026**	**2027**	**2028**	**2029**	**Assumptions**
Aftermarket Revenue	$1,020K	$25,500K	$127,500K	$637,500K	Table 5, 7
COGS	$467K	$11,675K	$58,375K	$291,875K	Table 5, 7
Gross Profit	**$553K**	**$13,825K**	**$69,125K**	**$345,625K**	Revenue - COGS
Gross Margin	**54.2%**	**54.2%**	**54.2%**	**54.2%**	–

Table 8: Aftermarket upgrades revenue projections and profitability analysis.

3.8 Foundation Model and Software Product

During our pre-order launch, we offered customers an add-on software product in addition to their base hardware purchase, analogous to Tesla's FSD product or the Cursor IDE. This package demonstrated strong market demand with a 71.7% take rate when structured as a $4,000 one-time payment. We believe this price point provides strong evidence for the viability of an equivalent subscription price of $200 per month. Conceptually, this price maps quite nicely onto equivalent labor market prices - it is not uncommon to pay a maid $200 per month for house cleaning services, and it aligns with current pricing for premium foundation models.

We specifically opt to adopt this subscription model rather than pursuing Tesla's strategy of front-loading revenue in order to fund R&D. The philosophical motivation for this approach, aside from structuring the business for long-term sustainability, is that we anticipate R&D costs to scale with the size of our fleet - it is clearly a better idea to scale R&D investment as the size of the in-the-wild fleet grows.

Our aim in doing this is to maintain a tight feedback loop between our R&D efforts and our product revenue, ensuring that any R&D investments directly drive product improvements. As a product that is fundamentally oriented towards developers and early adopters, we expect that delivering a heavy cadence of customer-focused AI features will be a highly effective way to drive product adoption and customer retention.

Our AI development strategy focuses on building end-to-end models for robot autonomy, with all profits from the Full Autonomy package reinvested into R&D across three key areas:

- **GPU Infrastructure**: GPUs to train subsequent versions of our Full Autonomy system.
- **Data Acquisition**: Synthetic data generation, real-world data collection, and third-party dataset licensing.
- **Engineering Talent**: A small team of vertically-integrated AI engineers capable of quickly adapting research findings into our own product, modeled after Tesla's FSD team's success during the research-intensive early stages of the self-driving car market.

Table 9 outlines our revenue projections, R&D investment, and capital structure for the Full Autonomy package. The business maintains 94% gross margins due to the software nature of the product with on-device model inference, with minimal direct costs associated with distribution, tracking with the cost structure of Tesla's FSD product.

Table 9: Full Autonomy package cost and revenue model.

Category	**2026**	**2027**	**2028**	**2029**	**Assumptions**
Unit Sales and Take Rate					
Gen 2 Units Sold	200	5,000	25,000	125,000	From Table 5
Take Rate (71.7%)	143	3,585	17,925	89,625	From customer data
Cumulative Subscriptions	143	3,728	21,653	111,278	Running total
Monthly Price	$200	$200	$200	$200	$2,400 annual equivalent
Annual Revenue	**$344K**	**$8,948K**	**$51,968K**	**$267,068K**	–
Direct Costs and Distribution					
Software Distribution	$5K	$130K	$758K	$3,895K	$35 / bot / year
Customer Support	$17K	$447K	$2,598K	$13,353K	5% of revenue
Total Direct Costs	**$22K**	**$577K**	**$3,356K**	**$17,248K**	–
Profitability Analysis					
Gross Profit	$322K	$8,371K	$48,612K	$249,820K	Revenue - Direct Costs
Gross Margin	**93.5%**	**93.6%**	**93.5%**	**93.5%**	–
AI R&D Investment					
GPU Count	64	256	512	1,024	Estimated cluster size
GPU Cost	$1,036K	$4,149K	$8,297K	$16,595K	–
Data Storage	$14K	$373K	$2,165K	$11,128K	$100 per active subscription per year
Data Acquisition	$300K	$100K	$0	$0	Bootstrap initial dataset
RFM R&D	**$1,350K**	**$4,622K**	**$10,463K**	**$27,723K**	Total R&D investment
Net Profit	**-$1,028K**	**$3,749K**	**$38,149K**	**$222,097K**	Gross - R&D
R&D % of Revenue	392.4%	51.6%	20.2%	10.4%	–

3.9 Historical Financial Performance

Here we provide a summary of K-Scale's financial performance over the last 12 months of operation, providing a baseline for R&D costs associated with developing a humanoid robot prototype. By leveraging an open-source, developer-first product strategy, we believe K-Scale to be the most capital-efficient humanoid company operating in the United States today. Given the current highly-commoditized nature of humanoid robots, we believe there is an opportunity to further streamline hardware operations while pivoting to focus on higher-margin aftermarket software and hardware sales.

Month	**Oct '24**	**Nov '24**	**Dec '24**	**Jan '25**	**Feb '25**	**Mar '25**
Change in Cash	-92.4K	-306.2K	-278.6K	-165.2K	-548.4K	-236.1K
Cash In	151.5K	4.0K	4.8K	50.7K	43.1K	4.5K
Cash Out	-243.9K	-310.2K	-283.4K	-215.8K	-591.5K	-240.6K
Ending Balance	2.43M	2.13M	1.85M	1.68M	1.13M	896.8K
	Apr '25	**May '25**	**Jun '25**	**Jul '25**	**Aug '25**	**Sep '25**
Change in Cash	-271.2K	12.0K	598.8K	-360.7K	-208.7K	-117.0K
Cash In	1.6K	231.9K	776.1K	1.4K	1.0K	36.1K
Cash Out	-272.8K	-219.9K	-177.4K	-362.1K	-209.7K	-153.1K
Ending Balance	625.7K	637.7K	1.24M	875.8K	667.1K	550.0K

Table 10: Cash flow summary over the last 12 months of operation.

3.10 Go-To-Market and Community

We will prioritize developers and early adopters to catalyze ecosystem growth:

- **Channels**: FBA as primary; direct site for B2B/custom bundles; community marketplace for modules.
- **Content**: Hackathons, tutorials, sample projects, benchmarks, reproducible applications, and engagement through our Discord channel.
- **Support**: Forum (primarily our Discord community) and commercial support tiers for B2B customers.

3.11 Roadmap and Milestones

Below, we outline our roadmap and milestones for the Gen 2 product. This roadmap is based on our experience bringing to market the Gen 1 product, so we believe it is a realistic conservative estimate of our product development timeline. We intend to use our pre-order cohort as "early adopters", given that they are mostly technical users who were acquired through organic marketing and word-of-mouth, so we expect that this group of customers will be extremely valuable for providing initial feedback. We will gate releases on reliability and developer experience, with public milestones outlined in Table 11. Our key business risks and corresponding mitigation strategies are detailed in Table 16.

Table 11: Expected product development roadmap for the Gen 2.

Milestone	Timeline	Lot Size	Exit Criteria
Development & Testing Phase			
EVT	Nov 15, 2025	10 units	90% pass rate on 4-hour walking test, under 5% component failure rate
DVT	Dec 15, 2025	25 units	95% pass rate on 4-hour walking test, 2% component failure rate, successful environmental testing, limited early adopter order fulfillments from pre-order list
SDK v1.0 Beta	Jan 6, 2026	–	End-to-end model running on our own robot hardware. Unveil demo unit at CES 2026
PVT	Feb 15, 2026	50 units	98% pass rate on 4-hour walking test, 1% component failure rate, successful FBA packaging validation
Certification Complete	Mar 15, 2026	–	Target markets: US (FCC, UL), Canada (IC); Parallel testing with NRTL partners starting Dec 2025
Market Launch Phase			
FBA Launch	April 1, 2026	300 units	Initial ASINs: Base unit, spare parts kit, limited upgrade options and aftermarket parts (single SKU); Inventory: 300 units
Full Product Launch	May 11, 2026	–	Full documentation, tutorials, and community launch, coinciding with ICRA 2026; Hackathon and developer conference to follow
RFM v1.0	Jun 1, 2026	–	Our own model running on our own hardware; full foundation model release
Enterprise Phase			
HW v3.0	Jan 6, 2027	–	Next-generation hardware product launch with improved performance and reliability
RFM v2.0	Mar 1, 2027	–	Next-generation robotics foundation model release with enhanced capabilities
Dev → Enterprise	Jun 1, 2027	–	Enterprise product launch; developer-led adoption program; enterprise sales team deployment

3.12 KPIs

We will track comprehensive metrics across operational, product, community, commercial, and financial categories as outlined in Table 12. Note that while our target return rate is 5%, our FBA cost model (Table 3) conservatively budgets for a 10% return rate to account for early-stage product and market uncertainties.

Table 12: Key Performance Indicators (KPIs)

Category	**Metric**	**Target**	**Frequency**
Operational			
Manufacturing	Lead time (order to delivery)	30 days	Weekly
	Yield rate (passing acceptance test)	98%	Per lot
	Defect rate (DOA + RMA)	2%	Monthly
	Assembly time per unit	0.3 units/day	Daily
Supply Chain	ODM partner count	2-3 active	Quarterly
	Second-source coverage	100% critical components	Monthly
	Inventory turnover	4-8× annually	Monthly
Product Quality			
Reliability	Field uptime	95%	Monthly
	MTBF (Mean Time Between Failures)	500 hours	Quarterly
	4-hour walking test pass rate	98%	Per lot
Community & Brand Engagement			
Discord Community	Discord members	10,000	Weekly
	Daily active Discord users	500	Daily
	Discord message volume	1,000/day	Daily
YouTube Presence	YouTube subscribers	25,000	Monthly
	Video views per month	100,000	Monthly
	Video upload frequency	1/week	Weekly
In-Person Events	Hackathon participants	200/event	Per event
	Developer conference attendances	2/year	Annually
Commercial & Sales			
Sales Performance	Units shipped	200+ (2026)	Monthly
	Revenue growth	50%+ QoQ	Quarterly
	Gross margin	25%+	Monthly

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Table 12 (continued)

Category	**Metric**	**Target**	**Frequency**
Aftermarket Sales	Aftermarket hardware revenue %	15% total revenue	Monthly
	Customer lifetime value	$25,000	Quarterly
Customer Experience	Support ticket resolution	24 hours	Daily
	Return rate	5%	Monthly
	Pre-order conversion rate	75%	Monthly
Financial & Growth			
Financial Health	Monthly burn rate	$100K (post-scale target)	Monthly
	Runway	18 months minimum	Monthly
	Revenue per employee	$200K+	Quarterly
Market Penetration	Market share (humanoid robots)	5%	Quarterly
	Viral coefficient	1.5+	Monthly

3.13 Hiring Roadmap

Based on the past two years of operations, we believe we have a high degree of confidence in our ability to identify and hire the necessary talent to execute on this roadmap, while avoiding the over-hiring issues that has plagued many other humanoid startups in the past. Key to this strategy is orienting our hardware team towards working with suppliers and vendors, maintaining strong cross-ecosystem relationships that can leverage external expertise, rather than focusing inwards.

Projecting forwards, our largest hiring efforts will focus on building a strong software and machine learning team, comprised of a small number of focused full-stack machine learning engineers, rather than building out a large team to do open-ended research. The purpose of doing this is to be able to quickly adapt industry-wide research findings into our own product while executing on a focused machine learning agenda, oriented towards driving customer value.

Table 13: Human resources and salary projections by department.

Department	**2026**	**2027**	**2028**	**2029**	**Assumptions**
Hardware Engineering					
Hardware Engineers	7	8	9	10	Core product development team
Hardware Salaries	$1,050K	$1,200K	$1,350K	$1,500K	$150K average per engineer
AI Engineering					
AI Engineers	5	7	10	15	Scaling with autonomy development
AI Salaries	$1,500K	$2,100K	$3,000K	$4,500K	$300K average per engineer
Operations					
Operations Staff	2	2	3	4	Operations and support team
Operations Salaries	$300K	$300K	$450K	$600K	$150K per operations staff
Sales					
Sales Staff	0	3	4	5	Enterprise launch in 2027
Sales Salaries	$0	$450K	$600K	$750K	$150K average per sales rep
Total Salaries	**$2,850K**	**$4,050K**	**$5,400K**	**$7,350K**	–

3.14 Projected Costs and Funding Requirements

We summarize all projected costs in Table 14. Based on our cost structure and business model, we expect that we can achieve break-even cash flow by Year 2-3, projecting from our current financial performance and cost structure. Based on these costs, we estimate that we will require $25M in equity-based financing. This serves the following purposes:

- **Secured Debt**: The business needs to be sufficiently well-capitalized to secure manufacturing and inventory loans, per Table 14.
- **Two-Year Runway**: We estimate that $25M in financing will provide us with a comfortable two-year runway, sufficient to achieve break-even cash flow and develop a healthy cash balance.

Additional investment will provide us with additional runway and allow us to accelerate our ML roadmap. Compared to similar companies in the space, we believe that we are in a strong position to leverage existing tailwinds to maintain a conservative valuation while focusing on business fundamentals.

Table 14: Total projected business costs.

Category	2026	2027	2028	2029	Assumptions
Personnel and Operations					
Payroll	$2,850K	$4,050K	$5,400K	$7,350K	From Table 13
Facilities	$108K	$250K	$350K	$450K	
R&D Investment					
Equipment	$100K	$500K	$500K	$500K	Financed
Equipment Loan Interest	$5K	$30K	$55K	$80K	Assume 5% interest rate
Manufacturing Financing					
Forging Tooling	$1,200K	$0	$1,200K	$0	Tooling for high-volume production
Tooling Loan Interest	$60K	$60K	$120K	$120K	Assume 5% interest rate
Initial Inventory	$1,587K	$0	$1,587K	$0	Startup inventory investment
Safety Stock	$794K	$0	$794K	$0	Buffer inventory
Inventory Loan Interest	$119K	$119K	$238K	$238K	Assume 5% interest rate
Total Interest	**$184K**	**$209K**	**$413K**	**$438K**	All financing costs
Manufacturing Operations					
ODM Qualification & Setup	$300K	$0	$300K	$0	Supplier qualification costs
Pilot Production	$332K	$0	$332K	$0	Initial production runs
Total Manufacturing	**$692K**	**$60K**	**$752K**	**$120K**	Includes operations + tooling interest
Marketing and Sales					
Digital Marketing	$1.5K	$3,000K	$15,000K	$30,000K	Online advertising and campaigns
Community Events	$75K	$150K	$300K	$450K	Developer meetups and hackathons
Trade Shows	$50K	$100K	$200K	$300K	Industry conference participation
Total Marketing	**$127K**	**$3,250K**	**$15,500K**	**$30,750K**	All marketing activities

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Table 14 – continued from previous page

Category	2026	2027	2028	2029	Assumptions
Legal and Compliance					
US Compliance	$300K	$0	$300K	$0	Regulatory approval costs
International Expansion	$0	$40K	$0	$0	International market entry
Legal & IP Protection	$75K	$25K	$25K	$25K	Patent and legal costs
Total Legal	**$375K**	**$65K**	**$325K**	**$25K**	Legal and compliance costs
AI R&D Investment					
RFM R&D	$1,350K	$4,622K	$10,463K	$27,723K	From Table 9
Total Operating Expenses	**$5,686K**	**$12,506K**	**$33,203K**	**$66,856K**	–

3.15 Projected Profit & Loss

Table 15 presents our comprehensive financial projections combining all revenue streams (hardware, aftermarket, software) with all operating expenses. Key highlights:

- **Break-even**: We project achieving positive operating income in 2027 with $21.9M EBIT on $74.4M revenue.
- **AI R&D Investment**: 2026 includes $1.35M for a 64-GPU cluster to support our ambitious foundation model development, reflecting our commitment to building robust spatial world models and VLA architectures.
- **Operating leverage**: Operating expenses per unit decline from $28,630 in 2026 to $538 by 2029, demonstrating significant economies of scale as we grow.
- **Operating margins**: Improve from -147% in year one to 44% by 2029 as fixed costs and AI R&D are amortized across growing unit volumes.
- **Blended margins**: 47-48% gross margins driven by high-margin aftermarket (54%) and software (94%) revenue streams.

Table 15: Projected Profit & Loss Statement (Combined).

Category	2026	2027	2028	2029	Notes
Revenue					
Hardware Revenue	$1,600K	$40,000K	$200,000K	$1,000,000K	Table 5
Aftermarket Revenue	$1,020K	$25,500K	$127,500K	$637,500K	Table 8
Software Revenue	$344K	$8,948K	$51,968K	$267,068K	Table 9
Total Revenue	**$2,964K**	**$74,448K**	**$379,468K**	**$1,904,568K**	–
Cost of Goods Sold					
Hardware COGS	$1,095K	$27,367K	$136,834K	$684,172K	Table 5
Aftermarket COGS	$467K	$11,675K	$58,375K	$291,875K	Table 8
Software COGS	$22K	$577K	$3,356K	$17,248K	Table 9
Total COGS	**$1,584K**	**$39,619K**	**$198,565K**	**$993,295K**	–
Gross Profit	**$1,380K**	**$34,829K**	**$180,903K**	**$911,273K**	Revenue - COGS
Gross Margin	**46.6%**	**46.8%**	**47.7%**	**47.8%**	–
Operating Expenses					
Payroll	$2,850K	$4,050K	$5,400K	$7,350K	Table 13
Facilities	$108K	$250K	$350K	$450K	Table 14
Equipment & Financing	$105K	$530K	$555K	$580K	Table 14
Manufacturing	$692K	$60K	$752K	$120K	Table 14
Inventory Loan Interest	$119K	$119K	$238K	$238K	Table 14
Marketing & Sales	$127K	$3,250K	$15,500K	$30,750K	Table 14
Legal & Compliance	$375K	$65K	$325K	$25K	Table 14
AI R&D	$1,350K	$4,622K	$10,463K	$27,723K	Table 9
Total OpEx	**$5,726K**	**$12,946K**	**$33,583K**	**$67,236K**	Table 14
EBIT	**-$4,346K**	**$21,883K**	**$147,320K**	**$844,037K**	Gross Profit - OpEx
Margin	**-146.6%**	**29.4%**	**38.8%**	**44.3%**	–
Key Metrics					
Units Sold	200	5,000	25,000	125,000	Table 5
Revenue per Unit	$14,820	$14,890	$15,179	$15,237	–
OpEx per Unit	$28,630	$2,589	$1,343	$538	–
Cumulative EBIT	-$4,346K	$17,537K	$164,857K	$1,008,894K	Break-even in 2027

References

[1] "Self-balancing scooter," Wikipedia, May 2025, accessed: October 20, 2025. [Online]. Available: https://en.wikipedia.org/wiki/Self-balancing_scooter

[2] S. Chen, "Two-wheel, self-balancing vehicle with independently movable foot placement sections," U.S. Patent 8,738,278, May 2013, filed: February 2013, Issued: May 2014. [Online]. Available: https://patents.google.com/patent/US8738278B2

[3] ——, "Hovertrax - the original self-balancing scooter," Kickstarter, May 2013, accessed: October 20, 2025. [Online]. Available: https://www.kickstarter.com/projects/hovertrax/hovertrax-the-original-self-balancing-scooter

[4] T. Magazine, "Hoverboard scooters are catching fire and burning down houses," Time, Dec 2015, accessed: October 20, 2025. [Online]. Available: https://time.com/4134514/hoverboard-scooters-batteries/

[5] G. Bledt, M. J. Powell, B. Katz, J. Di Carlo, P. M. Wensing, and S. Kim, "Mit cheetah 3: Design and control of a robust, dynamic quadruped robot," in 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2018, pp. 2245–2252.

[6] J. Tanz, "The weird, paranoid, wonderful world of hoverboards," Wired, December 2015, describes the chaotic boom and manufacturing scale in late 2015. Accessed on September 30, 2025. [Online]. Available: https://www.wired.com/2015/12/the-weird-paranoid-wonderful-world-of-hoverboards/

[7] U.S. Consumer Product Safety Commission, "Cpsc announces recall of more than 500,000 self-balancing scooters/hoverboards," Release Number 16-225, July 2016, the official recall notice that marked the peak of the safety crisis. Accessed on September 30, 2025. [Online]. Available: https://www.cpsc.gov/Recalls/2016/cpsc-announces-recall-of-more-than-500000-self-balancing-scooters-hoverboards

[8] Fortune Business Insights, "Self-balancing scooter market size, share & covid-19 impact analysis, ... and regional forecast, 2022-2029," Fortune Business Insights, Tech. Rep., September 2022, a representative market analysis report providing historical data, trend analysis for the recovery period, and future forecasts. Accessed on September 30, 2025. [Online]. Available: https://www.fortunebusinessinsights.com/self-balancing-scooter-market-103126

[9] "How many drones are bought each year?" Drone Brands, May 2025, accessed: October 20, 2025. [Online]. Available: https://www.dronebrands.org/how-many-drones-are-bought-each-year/

[10] "Worldwide consumer camera drone sales numbers for 2015 and 2016," Drone Flyers, December 2015, accessed: October 20, 2025. [Online]. Available: https://www.droneflyers.com/worldwide-consumer-camera-drone-sales-numbers-for-2015-and-2016/

[11] "The business of drones 2017," Dr. Drone, January 2017, accessed: October 20, 2025. [Online]. Available: https://drdrone.com/blogs/drone-news-drone-help-blog/business-of-drones-2017

[12] "Dji already dominates consumer drones," Yahoo Finance, May 2025, accessed: October 20, 2025. [Online]. Available: https://finance.yahoo.com/news/dji-already-dominates-consumer-drones-110000770.html

[13] "Electric vehicle," Wikipedia, May 2025, accessed: October 20, 2025. [Online]. Available: https://en.wikipedia.org/wiki/Electric_vehicle

[14] "History of smartphones," Wikipedia, May 2025, accessed: October 20, 2025. [Online]. Available: https://en.wikipedia.org/wiki/History_of_smartphones

[15] "Hoverboard parts: Understanding the components," HyperGogo, May 2025, accessed: October 20, 2025. [Online]. Available: https://www.hypergogo.com/blogs/news/hoverboard-parts

[16] "Hoverboard motors and sensor boards," Alibaba, May 2025, accessed: October 20, 2025. [Online]. Available: https://www.alibaba.com/showroom/hoverboard-sensor-motor.html

[17] "What motors are used in humanoid robots?" Lam Motor, May 2025, accessed: October 20, 2025. [Online]. Available: https://lammotor.com/what-motors-are-used-in-humanoid-robots/

[18] "Unitree starts selling $16,000 humanoid robot," Ars Technica, May 2024, accessed: October 20, 2025. [Online]. Available: https://arstechnica.com/gadgets/2024/05/unitree-starts-selling-16000-humanoid-robot/

[19] O. X.-E. Collaboration, "Open x-embodiment: Robotic learning datasets and rt-x models," arXiv preprint arXiv:2312.07843, 2024, the RT-X project paper describing cross-embodiment learning across 34 research labs. [Online]. Available: https://arxiv.org/abs/2312.07843

[20] S. Dasari, A. Gupta, F. Ebert, M. Tancik, Y. Wang, S. Singh, and S. Levine, "Robonet: Large-scale multi-robot learning," Conference on Robot Learning (CoRL), 2019.

[21] A. Brohan, N. Brown, J. Carbajal, Y. Chebotar, and et al., "Rt-1: Robotics transformer for real-world control at scale," arXiv preprint arXiv:2212.06817, 2022.

[22] A. Brohan, N. Brown, Y. Chebotar, and et al., "Rt-2: Vision-language-action models transfer web knowledge to robotic control," arXiv preprint arXiv:2307.15818, 2023.

[23] F. Ebert, S. Dasari, S. Tian, S. Nair, C. Finn, and S. Levine, "Bridgedata v2: A dataset for robot learning at scale," arXiv preprint arXiv:2309.03853, 2023.

[24] Open X-Embodiment Collaboration, "Open x-embodiment: Robotic learning datasets and rt-x models," arXiv preprint arXiv:2310.08864, 2023.

[25] M. A. Research, "Video joint embedding predictive architecture (v-jepa)," arXiv preprint arXiv:2402.01326, 2024, video foundation model for learning from unstructured video data. [Online]. Available: https://arxiv.org/abs/2402.01326

[26] K. He, X. Chen, S. Xie, Y. Li, P. Dollár, and R. Girshick, "Masked autoencoders are scalable vision learners," arXiv preprint arXiv:2111.06377, 2021.

[27] Z. Tong, Y. Song, J. Wang, L. Song, J. Xu, B. Dai, and T. Xu, "Videomae: Masked autoencoders are data-efficient learners for self-supervised video pre-training," arXiv preprint arXiv:2203.12602, 2022.

[28] A. Arnab, M. Dehghani, G. Heigold, C. Sun, M. Lučić, and C. Schmid, "Vivit: A video vision transformer," in ICCV, 2021.

[29] K. Grauman, A. Westbury, A. Punjani, and et al., "Ego4d: Around the world in 3,000 hours of egocentric video," CVPR, 2022.

[30] N. Shafiullah, K. Pertsch, D. Kalashnikov, and S. Levine, "Robotic learning with unlabeled play data via latent plans," Conference on Robot Learning (CoRL), 2022.

Appendix A: Business Risks and Mitigation Strategies

Comprehensive business risks and corresponding mitigation strategies across manufacturing, financial, regulatory, market, operational, strategic, and technology domains. While the core of our strategy hinges on being able to harness the dynamics of the hoverboard market and leverage partnerships with experienced ODMs through our open-source hardware strategy, through our initial product beta we have also identified a number of key risks to address with our subsequent product roadmap

Table 16: Key business risks.

Risk	Mitigation Strategy
Manufacturing & Supply Chain Risks	
Quality Drift Across ODMs	Mitigate via conformance testing, golden sample kits, and dual-sourcing audits. This risk is largely mitigated by working with multiple ODMs, using COTS components, and structuring our partnerships to enable OEM buy-in.
Component Shortages	Maintain 100% second-source coverage for critical components (motors, reducers, IMUs, compute); buffer inventory; qualify alternative suppliers during EVT/DVT phases.
Manufacturing Yield Issues	Target 98% yield rate with structured EVT/DVT/PVT gates; implement burn-in testing (5 battery cycles, 4-hour outdoor walking tests); maintain 2% defect rate acceptance criteria. Gate-specific targets: EVT $\approx$ 90% pass, DVT $\approx$ 95%, PVT $\approx$ 98%; steady-state field yield 98%.
ODM Partnership Instability	Qualify 2-3 active ODM partners with component interchangeability; structure mutually beneficial partnerships; maintain golden sample kits for quality reference.
Rapid Commoditization Pressure	Leverage open-source strategy to accelerate commoditization and capture market share early; focus on brand, developer ecosystem, and aftermarket sales rather than hardware margins; maintain cost leadership through aggressive BOM optimization.
Financial & Cash Flow Risks	
Revenue Shortfall	Hit sales targets; achieve 25%+ gross margin through organic marketing and developer-led growth; leverage high-margin aftermarket sales.

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Table 16 (continued)

Risk	**Mitigation Strategy**
Cash Runway Depletion	Maintain 18-month runway; avoid major R&D investments before clear product cash flow; monitor monthly burn rate; secure additional funding at key milestones; use alternative financing options where practical.
Pricing Pressure	Maintain competitive pricing: Gen 1 $16K MSRP, Gen 2 $8K MSRP; leverage our vertical integration strength and holistic, top-down approach to product design to highly optimize BOM.
High Inventory Risk	Leverage Amazon FBA and ODM partnerships to minimize inventory exposure; maintain safety stock of only 2-3 months; use just-in-time manufacturing principles; avoid 3D Robotics-style inventory trap.
Aftermarket Revenue Dependency	Diversify revenue streams beyond aftermarket sales; maintain strong hardware margins as backup; build recurring software revenue through Full Autonomy subscriptions.
Regulatory & Compliance Risks	
Certification Delays	Parallelize pre-compliance testing; use certified modules; pre-book labs; target US (FCC, UL) and Canada (IC) certification by Mar 15, 2026; budget $130k-$300k for US baseline compliance.
FBA Throughput or DG Rejections	Early DG review, correct SDS/UN 38.3 artifacts, buffer stock; maintain proper lithium battery compliance (UN 38.3 + Test Summary); ensure proper labeling for over 50lb packages. Leverage industry standards.
International Expansion Delays	Budget additional $20k-$60k for EU entry (RED + Machinery + RoHS+WEEE/EPR); plan for California Prop 65 compliance ($1k-$10k); prepare for state IoT security laws.
IP Litigation	Leverage our own open-source IP portfolio and COTS components; work with OEM partners to share the litigation risk; rapidly commoditize our open-source design.
Safety Regulations	Implement comprehensive safety testing protocols; maintain detailed safety documentation; prepare for potential CPSC intervention similar to hoverboard industry; establish safety-first culture.
Market & Customer Risks	

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Table 16 (continued)

Risk	Mitigation Strategy
Low Customer Adoption	Target 10,000 Discord members and 25,000 YouTube subscribers by launch with estimated 3% conversion rate; target high hackathon attendance and word-of-mouth growth in Bay Area robotics community.
High Return Rates	Target sub-5% return rate; maintain 24-hour support ticket resolution and active Discord engagement; implement comprehensive quality testing (4-hour walking test, 98% pass rate).
Developer Community Stagnation	Target low-friction onboarding and developer app creation by working closely with early adopters and soliciting community contributions; host hackathons and developer conferences.
Market Timing Risk	Launch during peak viral demand window; leverage celebrity endorsements and social media exposure similar to hoverboard adoption pattern; maintain flexible production capacity to scale rapidly.
Competition from Established Players	Focus on developer-first approach and open-source ecosystem; maintain cost leadership; build strong brand recognition in developer community; leverage first-mover advantage in commoditized market.
Operational & Technical Risks	
Product Reliability Issues	Leverage world-class robotics team with proven track record (Isaac Lab developers); implement developer-driven rapid iteration with continuous community feedback; comprehensive burn-in testing (5 battery cycles of 4-hour outdoor walking tests); target 95% field uptime, 500-hour MTBF, 99% post-update stability; maintain acceptance test criteria of 98% yield and sub-2% defect rate; aggressively solicit feedback from early adopters through Discord community and direct customer relationships.
Technical Talent Acquisition	Leverage existing team's reputation and academic relationships (Georgia Tech, University of Toronto) for differentiated talent pipeline; maintain focus on small team of vertically-integrated full-stack ML engineers rather than large open-ended research team; orient hardware team towards supplier/vendor relationships and cross-ecosystem partnerships to leverage external expertise; avoid over-hiring issues that plagued other humanoid startups.

Continued on next page

Table 16 (continued)

Risk	Mitigation Strategy
Supply Chain Disruptions	Diversify supplier base with 2-3 qualified ODMs; maintain 100% second-source coverage for critical components (motors, reducers, IMUs, compute); implement buffer stock strategies; leverage open-source design to enable rapid partner qualification; avoid over-reliance on single OEM; monitor lead times (30-day target).
FBA Operational Issues	Optimize FBA costs (1.7-2.3% of MSRP); maintain proper packaging for heavy items (over 50lb labeling requirements); ensure lithium battery compliance (UN 38.3 + Test Summary); early DG review with correct SDS artifacts; buffer stock for throughput requirements.
Scaling Operations	Maintain lean operations with focus on core competencies; outsource non-core functions to ODM partners; leverage community contributions for application development; scale team gradually with business growth (18 employees by Year 2, 67 by Year 4); target 0.3 units/day assembly time with structured EVT/DVT/PVT gates.
Strategic & Business Model Risks	
Hoverboard Analogy Failure	Continuously monitor market dynamics; maintain flexibility to pivot strategy; focus on fundamental value creation through developer ecosystem and brand building; avoid over-reliance on single market analogy.
Open Source Strategy Backfire	Maintain strong IP portfolio; ensure competitive advantages in integration and developer experience; build moats around brand and ecosystem rather than hardware alone.
Tesla FSD Model Limitations	Adapt subscription model to robotics context; maintain strong unit economics; focus on incremental value delivery; avoid over-promising on autonomy timeline.
Brand Dilution	Maintain premium brand positioning despite commodity hardware; focus on developer experience and community building.
Technology & AI Risks	
Foundation Model Development Failure	Leverage world-class robotics team (developers behind Isaac Lab, industry-standard RL framework); implement architectural innovation separating “what” from “how” models; use efficient data strategy requiring $<10\%$ real robot teleoperation; maintain 3-stage post-training recipe (active data collection, learned rewards, mechanistic interpretability).

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Table 16 (continued)

Risk	Mitigation Strategy
AI Development Delays	Maintain realistic autonomy timeline; focus on incremental improvements and iterative development following Tesla FSD model; reinvest software subscription revenue (94% margins) directly into GPU infrastructure, data acquisition, and RFM R&D; scale R&D investment with fleet size rather than front-loading.
Methodological Uncertainty	Maintain flexibility across multiple AI approaches (Spatial World Models, VLA architectures, egocentric human data, procedural simulation, low-cost device data); avoid betting everything on single paradigm; leverage academic partnerships (Georgia Tech, University of Toronto) for research insights and validation.
Hardware-Software Integration Challenges	Maintain integrated hardware-software co-design with common optimized core around bimanual form factor; prioritize commercially viable components for fast supply chain; implement continuous feedback loops with developer community to rapidly identify and address design issues; ensure platform designed for ease-of-use and low/no-code application creation.
Hardware Reliability and Performance	Implement Kineto-Static Duality design principle for energy efficiency and load support; developer-driven iteration with embedded community feedback; comprehensive burn-in testing (4-hour walking tests); maintain 98% yield target and 2% defect rate; leverage mature component supply chain significantly improved from hoverboard era (2013).
Developer Platform Adoption Failure	Build agentic solution relying on embodied foundation models (Spatial VLMs, VLAs, LBMs); enable programming through natural interfaces (language and show & tell); provide integrated environment with clear versioning, stable APIs, and reproducible builds; maintain public roadmap, RFC process, and governance for community contributions.
Competitive & Market Dynamics Risks	
Large Tech Company Entry	Build strong developer ecosystem and brand loyalty; maintain cost leadership; focus on specialized robotics expertise; leverage open-source community advantages.
Chinese Manufacturer Competition	Focus on developer experience and brand building; identify high-quality OEM partners and secure OEM buy-in through open-source strategy; leverage US market access and regulatory compliance.

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Table 16 (continued)

Risk	Mitigation Strategy
Market Saturation	Focus on expanding use cases and applications; build strong aftermarket ecosystem; maintain innovation in software and AI capabilities.
Economic Downturn Impact	Maintain lean operations and strong cash position; identify multistage lead investor.

Appendix B: Community Engagement Data

This appendix contains additional evidence derived from present community engagement.

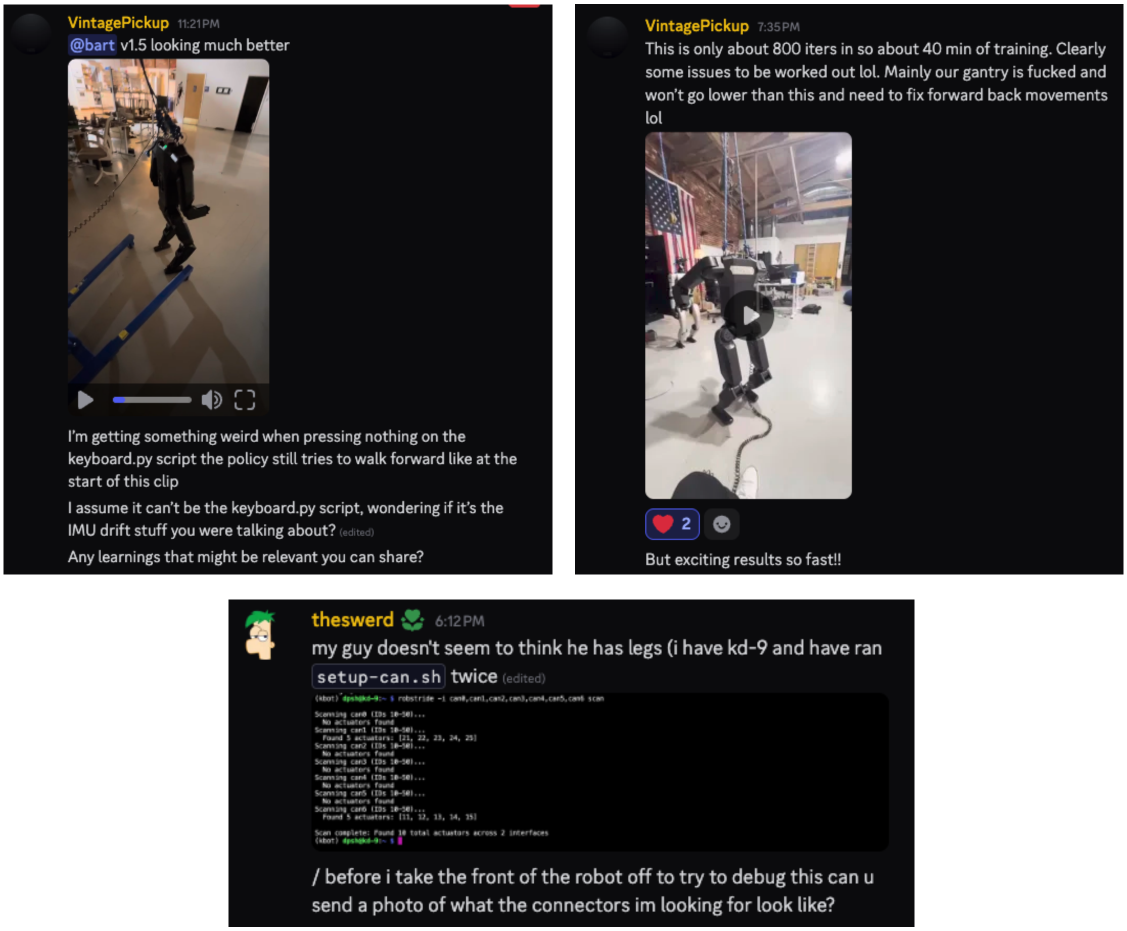

Figure 6: Examples of customer requests from our support Discord channel, demonstrating the benefits from doing active developer support and engaging with our customers and community - we get real-world usage data, and our customers pay us to help improve our product.

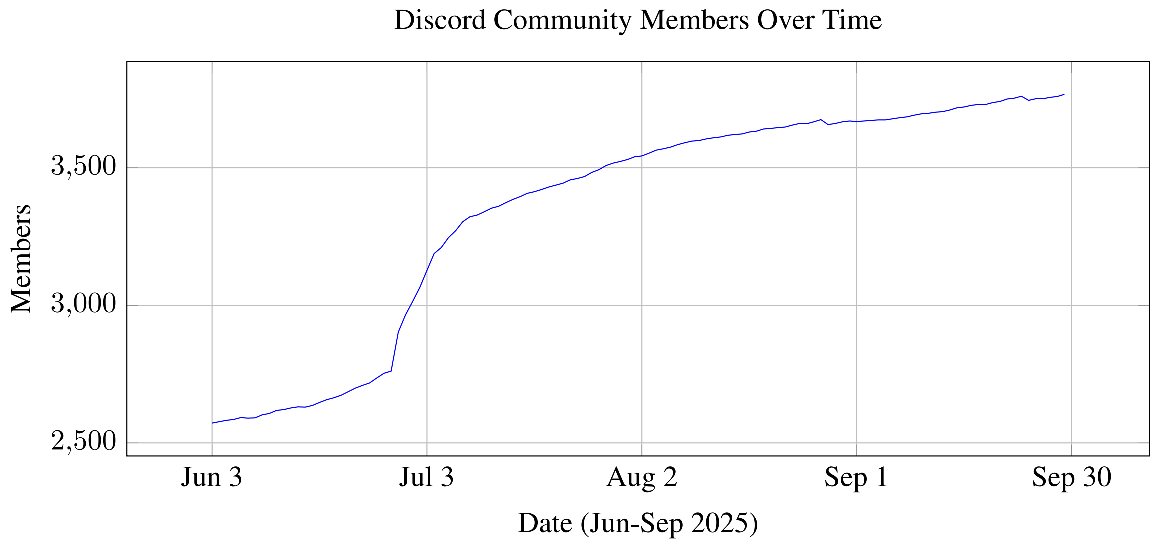

Figure 7: Discord community members over the last three months, showing a spike in members directly following our product launch, indicating that a large portion of our Discord community represents likely future customers and developers.

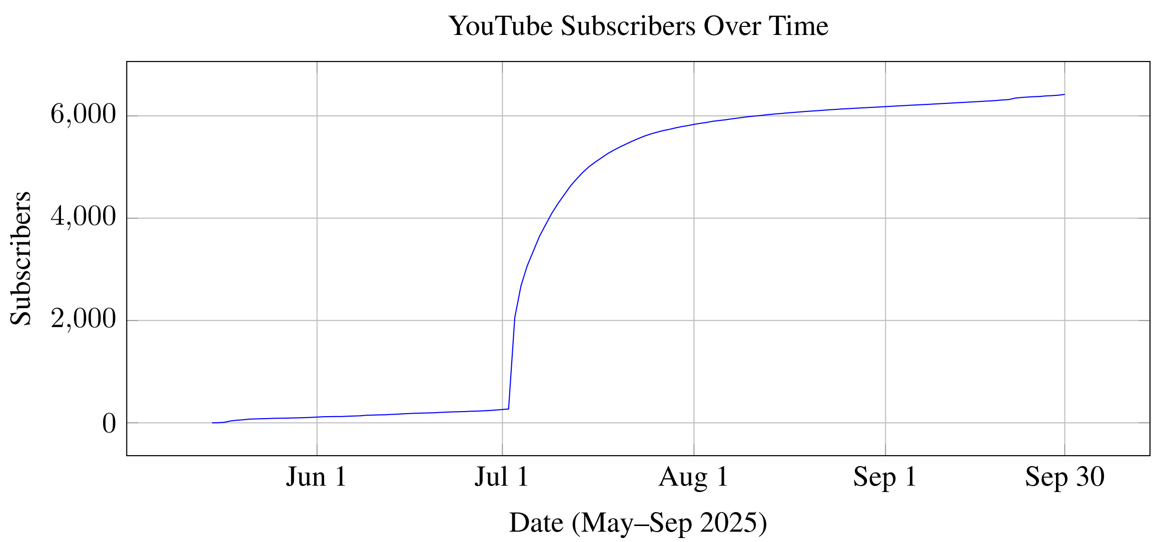

Figure 8: Cumulative subscribers from May 15, 2025 to Sep 30, 2025, showing a spike in subscribers directly following our product launch, indicating that much of our YouTube audience represents likely converting customers.

Appendix C: K-Scale Customer List Raw Data

This appendix provides a comprehensive listing of K-Scale's customer pre-orders, including package selections, pre-order amounts, and customer background information. The data represents the current customer base as of the analysis date. Each order is secured by a deposit, initially starting at $100 before being raised to $500.

- **Cnt** = Number of robots ordered.
- **UC** = Upgraded Compute (a $2000 upgrade from the Amlogic VIM4 to a Jetson Orin).
- **5FH** = 5 Finger Hand, instead of the default parallel gripper.
- **FA** = Full Autonomy, providing "future insurance" for early adopters.
- **Rfnd** = Refund, if the purchaser requested a refund.
- **WAO** = Without Additional Options - for our September 1st launch, we added the additional options to test price gating on our customers, but these options were not made available to all customers.

Table 17: Raw K-Bot pre-order data.

Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Founder, stealth startup ("Robot Chiropractor")	9/23	1					✓	$10,000.00	$10,000.00
COO of Chariot Technologies Lab	8/18	1	✓	✓	✓			$17,999.00	$500.00
Research Lead, Google Deepmind	8/18	1	✓	✓	✓			$18,499.00	$500.00
Student robotics league coordinator	8/13	1	✓	✓	✓			$18,499.00	$500.00
Test and measurement equipment manufacturing engineer	8/12	1	✓	✓	✓			$17,999.00	$500.00
Retired, independent consultant	8/11	1	✓	✓	✓			$18,499.00	$500.00
Unknown	8/8	1	✓	✓	✓			$18,499.00	$500.00
Senior Director, Oracle	8/6	1	✓	✓	✓			$18,499.00	$500.00

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Table 17 – continued from previous page

Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Student robotics league coordinator	8/6	2	✓	✓	✓	✓		$36,498.00	$1,000.00
Macintosh service, repair and upgrades	8/3	1	✓	✓	✓			$17,999.00	$500.00
Executive Director, The Future Labs (University of Austin)	8/1	1	✓	✓	✓			$18,499.00	$500.00
Assistant Professor in Robotics, University of Toronto	7/28	1	✓	✓	✓			$18,851.86	$508.05
Founder, stealth startup. Former CEO, 3D Robotics	7/28	1						$10,999.00	$500.00
Unknown	7/28	1	✓	✓	✓			$17,999.00	$500.00
Amazon Robotics engineer	7/26	1	✓	✓	✓			$18,854.74	$508.03
Senior Software Engineer, Apptronik	7/23	1						$11,499.00	$500.00
Founder and CEO, Emenate (security system startup)	7/23	1	✓	✓	✓			$19,286.80	$508.58
Cloud infrastructure consultant. Former Director of Software Development as Linedata	7/22	1	✓	✓	✓			$18,499.00	$500.00
Co-founder, Tensorplex Labs (Web3 startup)	7/22	1	✓	✓				$14,616.31	$507.73
Co-founder and CEO, Fastino AI (LLM startup)	7/22	1						$10,999.00	$500.00
Co-founder and CEO, Tau Robotics (robotics foundation model startup)	7/21	1		✓				$11,999.00	$500.00
Founder, Anitron (robotics foundation model startup)	7/20	1	✓	✓				$14,499.00	$500.00
Co-founder, Yanitron (AI-based digital twins startup). Former CEO, Smarttrak	7/20	1	✓	✓	✓			$18,499.00	$500.00
President, Zelpm Inc.	7/18	1	✓	✓				$14,617.26	$508.12
CEO, EmplifAI (AI interview platform)	7/17	1	✓	✓	✓			$18,677.38	$507.67

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Table 17 – continued from previous page

Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Founder / President, Servin Corporation (embedded systems company)	7/16	1				✓		$11,499.00	$500.00
Chief Innovation Officer, ingubu	7/15	1		✓				$13,195.40	$507.77
Manufacturing technician, Intel	7/15	1	✓	✓	✓			$18,499.00	$500.00
Unknown	7/14	1	✓	✓	✓			$18,499.00	$500.00
Unknown	7/12	1	✓	✓	✓	✓		$18,499.00	$500.00
CEO, OpenMind (robotics foundation model startup)	7/11	2	✓	✓				$27,998.00	$1,000.00
Account executive, Salesforce	7/10	1	✓	✓	✓			$18,676.43	$507.56
Industrial fellow, University of Technology Sydney. Quant	7/9	1	✓	✓	✓			$18,499.00	$500.00
Founder, Graphbook AI (open-source ML workflow framework)	7/9	1	✓	✓	✓			$18,499.00	$500.00
Unknown	7/8	1	✓	✓	✓			$19,288.00	$507.97
VP of Operations, Sei Development Foundation	7/7	1	✓	✓	✓			$18,499.00	$500.00
CEO, Engage (engagework.com)	7/7	1	✓	✓	✓			$18,499.00	$500.00
Principle Engineer, Nuance Communications	7/7	1						$11,499.00	$500.00
Senior Solutions Architect, Basis Worldwide	7/7	1	✓	✓	✓			$18,499.00	$500.00
AI Senior Staff Engineer, Meta	7/7	1	✓	✓	✓			$18,499.00	$500.00
Industrial designer, Daimler	7/6	1	✓	✓	✓			$18,499.00	$500.00
Senior Director, Heritage Lab (LLM startup)	7/6	1	✓	✓	✓			$18,858.85	$508.01
Founder and CEO, Capital Factory	7/6	1	✓	✓	✓			$18,499.00	$500.00
Co-founder and CEO, Electron Robotics	7/5	1	✓	✓	✓			$18,499.00	$500.00
Founder, Modulr (Web3 robotics startup)	7/5	1	✓	✓				$14,499.00	$500.00

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Table 17 – continued from previous page

Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Lead Frontend Engineer, Coatue Management	7/5	1	✓	✓	✓			$17,999.00	$500.00
Managing Partner, Overpass Acquisitions	7/4	1	✓	✓	✓			$18,499.00	$500.00
Unknown	7/4	1						$11,499.00	$500.00
Project Manager, Qualcomm	8/3	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/4	1				✓		$9,499.00	$500.00
Engineer #15 at Meta. Founder / CEO of Kit.com	7/4	1						$8,999.00	$500.00
Photographer	7/4	1	✓	✓	✓	✓		$16,499.00	$500.00
Professor, Hiroshima University	7/4	1	✓	✓	✓			$16,646.94	$507.83
Founder and CEO, Envoy, previously engineering at Google / Twitter	7/4	1	✓	✓	✓			$15,999.00	$500.00
Founder and CEO, Frodobots. Creator, Ultimate Fighting Bots (robot boxing)	7/4	5						$44,495.00	$2,500.00
Technical lead for Llama Stack at Meta; ex-CMU distributed systems researcher	7/4	1	✓	✓	✓			$15,999.00	$500.00
Software Engineer, Red Hat	7/4	1	✓	✓	✓			$16,499.00	$500.00
German maker. Website: matthiasm.com	7/4	1	✓	✓	✓			$17,257.47	$508.46
Unknown	7/4	1	✓	✓				$12,586.56	$507.65
Unknown	7/4	1	✓	✓	✓			$15,999.00	$500.00
Unknown	7/3	1						$9,499.00	$500.00
Unknown	7/3	1						$9,499.00	$500.00
Roboticist and YC partner; founder of Anybots; now UK-based	7/3	1	✓	✓	✓			$17,255.43	$508.36
Hardware/robotics exec leading robotics & consumer hardware at OpenAI; ex-head of VR hardware at Oculus	7/3	1	✓	✓	✓			$15,999.00	$500.00
Unknown	7/3	1	✓	✓	✓			$16,499.00	$500.00

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Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Owner, Beholder Vision. Former VP at Goldman Sacks	7/3	1	✓	✓	✓			$17,256.42	$507.90
Solutions Architect at Nvidia	7/3	1		✓				$9,999.00	$500.00
Researcher, Hiroshima International University	7/3	1						$9,540.77	$507.81
Cofounder/CTO of Ruckus Wireless; later cofounder/CTO at Cogniac (computer vision)	7/3	1	✓	✓	✓			$15,999.00	$500.00
Software Engineer, F5 Networks	7/3	1	✓	✓	✓			$16,499.00	$500.00
Data Engineer, YourStake	7/3	1	✓	✓	✓			$15,999.00	$500.00
Unknown	7/3	1	✓	✓	✓			$16,499.00	$500.00
Roboticist, creator of The Robot Studio, Huggingface partner	7/3	1						$10,150.05	$507.86
Unknown	7/3	1	✓	✓	✓			$15,999.00	$500.00
Technical Director, Nvidia	7/3	1	✓	✓	✓			$16,499.00	$500.00
CTO, Rakuten Ready	7/2	1	✓	✓	✓			$15,999.00	$500.00
Founder, stealth Web3 company	7/2	1	✓	✓	✓			$16,499.00	$500.00
Co-founder, Loosh.ai (Web3 company)	7/2	1	✓	✓	✓			$16,828.41	$507.70
Embedded Software Engineer, Meta Reality Labs Research	7/2	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/2	1						$9,499.00	$500.00
COO, Mirror Physics (world model startup)	7/2	1	✓	✓	✓			$16,499.00	$500.00
Founder and CEO, Lucid Bots	7/2	1	✓	✓	✓			$16,499.00	$500.00
Co-Founder, Aura Dispatch	7/2	1	✓	✓				$11,999.00	$500.00
Unknown	7/2	1	✓	✓	✓			$16,499.00	$500.00
Head of AI and Innovation, Catalyte (AI hiring startup)	7/1	1	✓	✓	✓			$16,499.00	$500.00

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Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Student, Oregon State University	7/1	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/1	1	✓	✓	✓			$16,499.00	$500.00
Founder and Research Lead, Extensional Labs (AGI Lab). Former PhD research, ETH Zurich	7/1	1	✓	✓	✓			$16,499.00	$500.00
ML/creator/developer (a.k.a. "Sentdex"); runs educational ML content.	7/1	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/1	1	✓	✓	✓			$16,499.00	$500.00
Head of Robotics AI, REK Robotics (boxing league)	7/1	1	✓	✓	✓			$15,999.00	$500.00
Founder and CEO , GT Edge AI (embedded systems startup)	7/1	1	✓	✓	✓			$16,499.00	$500.00
Head of AI, Denver-based software company. Previosuly at Twitter and DoD.	7/1	1				✓		$9,499.00	$500.00
Undergraduate, UCLA	7/1	1	✓	✓	✓			$15,999.00	$500.00
Co-founder/CTO figure behind Tether; Omni (Mastercoin) contributor	7/1	1						$9,499.00	$9,499.00
AI engineer/independent model developer	7/1	1		✓				$10,499.00	$500.00
Former Co-founder and CTO, Prende Health.	7/1	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/1	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/1	1	✓	✓	✓			$16,499.00	$500.00
Co-founder and CEO, Autolane (autonomy operating system startup)	7/1	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/1	1	✓	✓	✓			$16,499.00	$500.00
Senior Director, Michigan Virtual Learning Research Institute	7/1	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/1	1				✓		$8,999.00	$500.00
Director of IT, Diversied Minerals Inc.	7/1	1						$9,499.00	$500.00

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Table 17 – continued from previous page

Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Unknown	7/1	1	✓	✓	✓			$16,499.00	$500.00
Founder, Leoben Company (domestic candle manufacturer)	7/1	1	✓	✓	✓			$16,499.00	$500.00
MongoDB cofounder/former CTO; founder/CEO of robotics platform Viam	7/1	1	✓	✓	✓			$16,499.00	$500.00
Mixpanel cofounder; founder/CEO of Playground AI	7/1	1						$9,999.00	$500.00
Unknown	7/1	1	✓	✓	✓			$16,499.00	$500.00
AI Engineer, Superbuilders	7/1	1	✓	✓	✓			$16,499.00	$500.00
Robotics Simulation Architect, Lucky Robotics	7/1	1	✓	✓	✓			$16,499.00	$500.00
Unknown	7/1	1	✓	✓	✓			$16,499.00	$500.00
Founder, Summon (humanoid robot integrator)	7/1	1						$10,150.01	$508.27
Applied Scientist, Amazon Lab126	7/1	1						$9,999.00	$500.00
CEO, Visor (VR headset)	5/21	1					✓	$8,999.00	$100.00
CEO, Rek (Robot boxing league)	5/20	2					✓	$17,998.00	$200.00
Lead Biomechanical Engineer, Healing Innovations	5/20	1					✓	$8,999.00	$8,999.00
Senior Applied Scientist, Amazon	5/20	1					✓	$8,999.00	$100.00
R&D Manager, Humanoid Robotics at Shaeffler	5/20	1					✓	$8,999.00	$100.00
Robot Learning Engineer, RLWRLD	5/19	1					✓	$8,999.00	$100.00
Senior Member of Technical Staff, YTC America Inc.	5/19	1					✓	$8,999.00	$100.00
Robotics Engineer, Dexterity, Inc.	5/19	1				✓	✓	$9,998.00	$150.00
Unknown	5/19	1					✓	$8,999.00	$100.00

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Table 17 – continued from previous page

Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Identity/product leader; Director of Platform Product at Beyond Identity; formerly AWS (Cedar/Cognito)	5/19	1					✓	$8,999.00	$100.00
Founder and CEO, Sortium. Web3 / robotics Twitter influencer	5/19	1					✓	$8,999.00	$100.00
Roboticist and YC partner; founder of Anybots; now UK-based	5/19	1					✓	$9,465.19	$101.62
Senior Engineering Manager, Hudl. Former CTO, StatsBomb	5/19	1					✓	$1,091.29	$50.88
NVIDIA Jetson principal engineer / developer evangelist; founder of Jetson AI Lab	5/19	1					✓	$8,999.00	$100.00
Software Engineer, Vicasso	5/19	1					✓	$8,999.00	$8,999.00
Sensior Application Support Engineer, DriveWealth	5/18	1				✓	✓	$8,999.00	$100.00
Unknown	5/18	1				✓	✓	$8,999.00	$100.00
Co-founder, DriveCentric (AI-powered automotive CRM)	5/18	1					✓	$8,999.00	$100.00
Machinist, early Bitcoin adopter	5/18	1					✓	$9,285.16	$101.65
Co-founder, Intuition Machines, Inc. (creator of hcaptcha)	5/18	1					✓	$8,999.00	$100.00
Assistant Professor in School of Construction, Virginia Tech	5/18	1					✓	$9,998.00	$150.00
Managing Director, Autodiscovery (UK's fastest growing robotics company)	5/18	1					✓	$9,465.07	$102.42
Founder and Research Lead, Extensional Labs (AGI Lab). Former PhD research, ETH Zurich	5/18	1					✓	$8,999.00	$100.00
Founder and CEO, Western Magnetics Company (actuator startup)	5/18	1					✓	$8,999.00	$100.00

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Occupation	Date	Cnt	UC	5FH	FA	Rfnd	WAO	Total	Paid
Founder and CEO, Zeon Systems (YC-backed lab automation startup)	5/18	1					✓	\$8,999.00	\$100.00
Co-Founder, Sandstone Care	5/18	1					✓	\$8,999.00	\$100.00
Co-founder and Former CEO, Websense (sold to Raytheon)	5/18	1					✓	\$8,999.00	\$100.00
Founder, SurveyMonkey	5/18	1					✓	\$8,999.00	\$100.00
Chief Product Officer, Adiuvo. CEO, Machines For Humands (robotics for construction)	5/17	1					✓	\$9,463.57	\$102.27
Embedded Software Engineer, Ohme / formerly Dyson	5/17	1					✓	\$1,091.80	\$51.80
Founder, Bluue Co (AI-powered medical devices)	5/16	1					✓	\$8,999.00	\$499.00
Former Head of Robotics at Scale AI	5/15	1					✓	\$8,999.00	\$499.00
Apple VP (Technology) known for leading Apple Watch; recently aligned with Apple's AI org	5/15	1					✓	\$8,999.00	\$5.00
Former GitHub CEO; prolific AI investor/operator	4/13	1					✓	\$9,000.00	\$500.00
Former Senior Software Engineer, Boston Dynamics	3/24	1					✓	\$9,000.00	\$500.00
AR/VR Engineer, Apple	2/23	1					✓	\$9,000.00	\$500.00