ChatGPT

LUMINAI Modular Mini-PC: Feasibility & Launch Strategy

Overview: The LUMINAI concept envisions a *humanoid AI "soul"* (LuminAI) atop a modular base housing a mini-PC. The companion's body (plush/robotic form) incorporates swappable modules (eyes, limbs) for LEDs, cameras, storage, etc. This hybrid device combines emotional AI companionship (voice/visual interaction) with an upgradeable PC core (CPU/GPU/NPU, RAM, SSD). In today's market of smart speakers and novelty robots (e.g. TCL's AiMe concept, Japan's Lovot, Energize Lab's Eiliko), LUMINAI aims to stand out by merging modular upgradability with personalized emotional intelligence. Early R&D planning (in attached design documents) already shows elements like magnetic limb connectors and LED-display eyes [1] [2].

Market Context: The global *companion robot* market is rapidly growing (projected ~$304.3 billion by 2029, ~25.6% CAGR [3]). Recent products/ prototypes highlight strong interest: TCL's AiMe (a "world's first modular AI companion robot" concept) features head cameras, animated LED eyes and even ChatGPT integration [4] [5]. Japan's Lovot (~0.5 m tall) sells for ~RMB 70,000 (~US$10K) [6], illustrating premium pricing in this segment. Energize Lab's tiny AI charm "Eiliko" recently raised 1700% of its Kickstarter goal in 24 hrs [7], driven by its expressive personality and swappable shells [8]. Consumer demographics skew toward younger women (e.g. one crowdfunding bot had ~70% female backers, mostly Gen-Z) [9]. LUMINAI's pitch – an *affordable*, modular smart companion + PC – targets a wider base: from tech-savvy hobbyists to families seeking educational/companion devices. It aims to undercut high-end robots (like Lovot) on price (~$300–$500 range) while offering a tangible productivity use-case (personal mini-PC).

Hardware Platform Options

ARM (System-on-Chip) Platforms: ARM-based SoCs dominate low-power, edge-AI devices [10]. Examples include Raspberry Pi Compute Module, Rockchip (RK3588), Qualcomm Snapdragon, and NVIDIA Jetson modules. Advantages: very low power (<15 W), integrated NPUs/GPUs for vision/AI, fanless operation, wide software (TensorFlow Lite, Arm NN) [11]. For instance, the Raspberry Pi 5 (quad-core Cortex-A76) is available with 2–16 GB RAM [12] and supports USB-C power, WiFi6, camera I/O. Many Pi-based kits (e.g. Pilet, an open handheld) run Linux and even allow NVMe SSD modules [13]. Alternatively, dedicated AI modules like NVIDIA Jetson Xavier NX (21 TOPS) or Google's Coral Edge TPU (4 TOPS) could boost inference. **Tradeoffs:** ARM will yield long battery life and simplicity, but limited peak CPU/GPU performance. Some heavy LLM or image models may not fit without cloud offload.

x86 (Intel/AMD) Platforms: Standard mini-PC architectures (Intel Core/Atom or AMD Ryzen Embedded) offer far higher CPU/GPU throughput [14] at the cost of size, heat and power (>20 W) [15]. They run full Windows/Linux stacks and large AI frameworks (full TensorFlow/PyTorch) [16]. Examples include Intel's latest NUC systems or AMD-based mini PCs like GEEKOM's line. GEEKOM's A8 Mini PC, for instance, pairs an AMD Ryzen™ 9 HX 370 processor with Radeon graphics, up to 64 GB DDR5 RAM and M.2 SSD storage [17]. Framework's new desktop (4.5 L volume) even uses AMD "Ryzen AI" CPUs with upgradeable Nvidia RTX 5070

GPUs [18]. **Tradeoffs:** x86 hardware can run complex AI locally (including multi-stream vision), but needs cooling and draws more battery. It may also cost more per unit.

Hybrid/Custom Boards: Other options include smartphone SoCs (Snapdragon 8cx, Apple M-series) or custom boards. Notably, Anki's Vector robot (2018) packed a quad-core Qualcomm Snapdragon (smartphone-level CPU), 720p camera and 4-microphone array [19]. Modern mobile chips far surpass that. A Pi-like Compute Module (with a camera port) or a single-board with on-board NPU (Rockchip RK3588 has 6 TOPS NPU) could suffice. One could also use an AMD Ryzen U-series or Intel Core-U CPU on a custom mainboard to allow mSATA/PCIe slots for SSD/NPU.

Key Spec Examples: A feasible spec might be: ARM Cortex-A76/A77 quad-core @ 2.0+ GHz, 8–16 GB LPDDR5, integrated Mali or Adreno GPU (for display/UI), plus an external NPU (EdgeTPU or Movidius) for vision. Or AMD Ryzen 7040G with integrated AI engine (3+ TOPS NPU) and Radeon 780M graphics, 16 GB DDR5, 128–512 GB NVMe SSD. Connectivity would include Wi-Fi 6/7, Bluetooth 5.x, USB4/Thunderbolt (for modules), USB-C charging, and Ethernet. Operating System: Linux (Ubuntu/Yocto) or Windows IoT if using x86.

A summary table of options:

Option	CPU/GPU/NPU	RAM/Storage	Pros	Cons
Raspberry Pi 5 (ARM) [12]	Quad-core ARM Cortex-A76, optional EdgeTPU USB 2.0	2–16 GB DDR4, SD/M.2	Very low power; vast community; cheap	Moderate performance; limited built-in AI accel; no strong GPU
NVIDIA Jetson Xavier NX (ARM+GPU)	Hexa-core Carmel ARM + 384-core Volta GPU (21 TOPS)	8 GB LPDDR4, M.2	Very high AI throughput on device	Expensive; requires heatsink; power ~15W
Intel NUC / Mini-PC (x86) [18]	Intel Core i5/i7 or AMD Ryzen 5/7 + Iris/Radeon	8–32 GB DDR4, 256–1024 GB NVMe	High CPU/GPU performance; x86 ecosystem	Higher power; larger; costlier; fan needed
AMD Embedded (e.g. Ryzen AI 7040G) [17]	8-core Zen4 + 3–30 TOPS NPU, Radeon 780M	8–16 GB DDR5, M.2 NVMe	Good blend of CPU+AI; integrated GPU	New; limited board availability
Custom SoM/ Board	Any of above on a custom PCB	Customer config	Tailored I/O, integrated connectors	Long dev time; high NRE for >100 qty

Source: Architectural tradeoffs summarized from industry guides [20] [21]. For companion applications, an ARM-based SoC with added NPU is often recommended (best AI/Watt [22]), unless very heavy processing (like 3D vision or large LLMs) is required.

Modularity & Swappable Components

Modular Chassis: The "bowl" base must allow user access to mainboard and core components. Concepts like PCIe/M.2 slots can expose SSD and expansion cards. For example, one could include M.2 sockets on the board for SSD and for an optional NPU card. Memory could be SO-DIMM or soldered with breakout access. The base should be lockable for safety but openable for upgrades. Drawing inspiration from Framework Desktop's tool-free panels [18], the LUMINAI base could use thumb-screws or clips.

Swappable Modules (Feet/Eyes/Body): To support interchangeable parts, standardized connectors are needed. Possibilities include:

- **Magnetic Pogo-Pin Modules:** As in the design sheet, LuminAI's limbs use magnetic connectors [1]. Magnetic pogo-pin connectors (spring-loaded pins with magnets) enable hot-swapping electronics. For example, each foot could detach via magnets and connect via pogo pins carrying power and USB or GPIO signals.

- **USB-C / USB-A Connections:** Feet or eye modules could plug into USB-C or USB-A ports on the body, carrying both power and data (e.g. cameras). USB-C with locking latches (similar to Oculus Link cables) could allow secure attachment.

- **M.2 or SD-slot Modules:** Storage modules might slot into hidden M.2 cages in limbs or body, requiring only screws or latch.

Example Modules:
- **Eyes:** Incorporate small displays (e.g. micro OLED or LED matrices) as "eyes" for expressions. One could use 1″ micro-OLED panels (128×128 or 240×240 px) or Neopixel rings behind an eye cover. The design sheet cites "circular LED screens" [2] – meaning a micro-display or LED ring. A swappable eye module could be a small board with 4-8 LED ring or a tiny LCD panel, plugging into a body port.

- **Feet:** Could house additional batteries, storage, or sensors. For example, a detachable foot could hold an M.2 SSD plus an extra battery, connected via internal SATA/POWER or USB. Another foot module might contain an extra speaker or a mobile base motor drive.

- **Body Panels:** Different cosmetic shells (fur, plastic) can snap on magnetically (as LuminAI's plush cover). The Eiliko robot similarly uses "Style & Personality Swap" bodies that change appearance [23]. LUMINAI could offer themed skins (e.g. animal, elf, robot), each attaching via magnets over the polymer frame.

Integration Challenges: Modular design increases mechanical and electrical complexity. Connectors must maintain signal integrity under repeated use. Pogo pins can wear; magnets must be strong enough to hold modules but allow easy detach. Data cabling inside limbs needs strain relief. If modules include active electronics (cameras, LEDs), the system must auto-recognize added hardware (via e.g. USB enumeration or ID pins). Thermal management is also tricky: if a foot houses a drive or battery, heat must dissipate through the chassis. Overall, careful mechanical and electrical engineering is required to make swapping seamless without gaps or wobble.

LED/Microdisplay and Sensor Integration

The LUMINAI design anticipates rich visual expression. The Design Sheet explicitly lists “circular LED screens” for eyes [2] and a glowing chest symbol [24]. These can be implemented as follows:

- **Eye Displays:** Tiny OLED or LCD modules (purchased off-the-shelf or custom) can show animations. For example, Adafruit’s 128×128 OLED panels (0.96″) are used by hobbyists for robot eyes【49†】. A 240×240 color AMOLED (~0.9″) could fit inside each eye socket. Swapping eyes could mean unplugging a small ribbon cable to a panel and inserting a different one. Alternatively, high-brightness RGB LED rings (16–32 pixels) behind semi-transparent covers can produce expressive eyes (similar to Vector’s screen eyes [25]). Integration requires frame buffers and driver chips (SPI/I2C display controllers), which can be on a small daughterboard that plugs into the head’s GPIO or SPI bus.

- **LED Modules:** Body lamps (hair fiber optics, chest emblem) can be driven by LED drivers. Swappable hair or chest modules (using fiber-optic light-up hair as described [24]) could include addressable LED strips. These could connect via a few-pin header or wireless link. Care must be taken to isolate high-current LED lines (do not expose high voltage or heat).

- **Cameras/Sensors:** To add vision, a head-camera module could plug into a MIPI or CSI connector on the baseboard. Each eye module could even house a tiny camera (like a 5MP OV8856) to track faces. Swappable feet might hold environmental sensors (motion, gas, temperature). The robot might include an array of microphones (like Vector’s four mics [19]) built into the body for voice capture and sound localization.

Designing these into removable pods is non-trivial. Each swap point should supply needed voltages (3.3 V, 5 V) and data (I^2C, SPI, MIPI, USB). A possible standard is a custom bus (e.g. combining PCIe for SSD, USB3 for camera, GPIO for LEDs) at each joint. The complexity must be traded off against user convenience; a practical approach might limit foot modules to passive extensions (battery, storage) and fix sensors/cameras inside the core.

Prototyping & Small-Batch Manufacturing

Rapid Prototyping (1–100 units): Initial prototypes can be built with off-the-shelf parts and 3D-printed cases. Common practice is:

- **Electronics:** Use development boards (e.g. Raspberry Pi CM4 carrier or NVIDIA Jetson devkit) instead of custom PCB. Prototype custom boards only after design stabilizes. PCBs can be fabricated in small quantities by services (JLCPCB, PCBWay). Even full mini-ITX boards (with CPU) can be used inside a prototype “bowl” case.

- **Enclosure:** 3D-print outer shells (FDM or resin) to refine form and test assembly. Laser-cut or CNC-interior frames can support internals. As rapid tooling, 3D-printed modular joints (with embedded magnets/pins) let engineers test module swapping.

- **Assembly:** Hand-assemble each unit. Use modular wiring harnesses and quick-connect pins. Soldered sections can be aided by breakout boards.

Rapiddirect's comparison of 3D printing vs injection molding notes that for low volumes (<100) 3D printing is far more cost-effective, since injection molds have huge up-front tooling cost [26]. Expect prototyping costs mostly in electronics parts and labor, rather than molds. For example, 50 custom PCBs + parts might run a few thousand dollars; 3D printing ~50 enclosures at $30 each is ~$1500.

Pilot Production: Once the design is validated, a small pilot run (dozens of units) can be made. Some options: - **Contract Manufacturers (CMs):** Companies like Flex, Foxconn or smaller local CMs can do PCB assembly (pick-and-place), wiring, and manual assembly. Tools like PCBWay offer assembly for small batches. Expect MOQ around 10–50 units per PCB design.
- **Component Choices:** Keep to standard parts (e.g. M.2 SSDs, SO-DIMMs, USB cameras) to simplify supply. If using unique connectors, source from Hirschmann, TE Connectivity, or similar.

Scaling Beyond 100: At higher volumes (>>100), consider injection molding for plastic parts and larger-scale assembly lines. Even at ~1000 units, mold costs become justified. But for an MVP, injection-molded parts can wait until crowdfunding success and demand is proven.

Potential Production & Technology Partners

LUMINAI straddles PC hardware and companion robot domains. Potential collaborators include:

- **Framework (USA):** Maker of modular, repairable PCs. Their new **Framework Desktop** uses standard mini-ITX internals and emphasizes upgradeability [18]. Framework's ecosystem (exchangeable modules, open BIOS/UEFI) aligns well. They could assist with chassis engineering or even co-branded hardware.

- **Corsair (USA):** Known for gaming PCs, peripherals and recently hinted at an open-source console platform. Corsair's expertise in compact systems (Corsair ONE) and RGB/lighting could help refine the LUMINAI base and LED designs. (No public cite, but they are leaders in SFF PC hardware.)

- **GEEKOM (China):** A mini-PC OEM. Their **A8** and **IT15** models use AMD/Intel chips with high RAM/SSD capacity [17]. GEEKOM could manufacture a custom version of its barebones mini-PC to fit LUMINAI's base (e.g., put their board in the bowl). They have the supply chains and US warehouse infrastructure.

- **UpBoard/ODROID:** Companies that make open single-board computers. They could supply a custom Compute Module with required I/O (multiple USB, camera, etc).

- **Camera/Sensor Vendors:** Sony, OmniVision, or Arducam for small cameras; ROHM or Adafruit for RGB LEDs and micro-displays. Integrating an off-the-shelf camera module (e.g. 8MP USB camera) would accelerate development.

- **AI/Voice Software:** Partners like Mycroft or Coqui (open voice assistants) could adapt their speech engines. OpenAI or EleutherAI affiliates might license compact LLMs.

- **Crowdfunding/Manufacturing Accelerators:** Platforms like *Boosted* or *Dragon Innovation* help campaign fulfillment and small-scale manufacturing for Kickstarter winners.

A simple partner matrix:

Partner Type	Example	Role/Value
Modular PC manufacturer	Framework	Custom chassis, mini-ITX board design [18]
Gaming/PC OEM	Corsair	Supply chain, high-end compact PC expertise
Mini-PC OEM	GEEKOM	ODM manufacturing of core PC module [17]
Camera/Display supplier	Sony, OmniVision, Adafruit	Provide cameras, OLED/LED panels, sensors
AI software platform	Coqui, Rasa, Mycroft	Develop on-device AI assistant software
Manufacturing service	PCBWay, Flex, Jabil	Prototype and scale electronics assembly

By engaging well-known hardware partners, LUMINAI gains credibility and technical support. Investors will note the alignment with major trends (modular PCs, AI assistants) and the large, growing market [3]. The project blends "emotion-tech" with proven PC economics, which could attract both VC and hardware crowdfunding.

Crowdfunding Positioning

To launch via Kickstarter/Indiegogo, LUMINAI must present clear unique value. Key points:

- **Differentiator:** Emphasize *modular upgradeability* + *emotional AI*. Unlike fixed smart speakers or flat displays, LUMINAI is a *companion robot that you can open, upgrade and personalize*. Highlight swappable skins and modules (compare to Eiliko's stylish bodies [23]).

- **Use Cases:** Show it at home (ambient buddy), at desk (eye candy + smart assistant), at education (kids learn coding/AI), or elderly care (monitoring). Emphasize privacy-focused AI: on-device processing, no cloud-snooping.

- **Pricing:** Set realistic targets. For a Pi-based version with basic AI, Kickstarter early-bird could be ~$249–$299 (no NPU). A premium build (AMD/Jetson core + extras) might be ~$499. Compare to: Amazon Astro was ~$1500 (and was cancelled), Lovot ~$3000, so LUMINAI sits far below while offering core companion features. Pilet (modular Pi kit) launched at $200+ without Pi [27], so $299 with Pi included is plausible.

- **Campaign Goals:** Seek perhaps $200k–$300k. (Eiliko raised $170k in 24h [7]; hitting $300k+ seems achievable if marketed to the right niche.) Stretch goals: multi-language LLMs, VR headset integration, advanced hands.

- **Rewards Structure:** Base pledge = LUMINAI core (no Pi, no extras). Higher tiers add SSD, NPU module, or replacement skins. Include add-ons (camera module, extra batteries, plush covers). Make modular nature a pledge highlight ("Choose your modules – battery pack, LED feet, upgrade my eyes!").

- **Marketing:** Use high-quality renderings/animations (like those user-supplied *LUMINAI_CANON.png*) to evoke a "cute friend" aesthetic. Include prototype demos of interaction (voice Q&A, light patterns, movement). Garner tech press early (e.g. mention AiMe for context [4], and similar Kickstarter successes like Eiliko [7]). Launch at a convention or via social media teaser to build excitement.

- **Risks to Backers:** Be transparent. Stress that software will be open/updated (much like Pilet's pledge to release firmware/schematics [28]). Set realistic timelines (alpha hardware by 6–12 months, shipping in 2026 per project plan).

Technical Specifications (Proposed)

Below is an illustrative specs table for LUMINAI (final values TBD):

Component	Option 1 (ARM Core)	Option 2 (x86 Core)
CPU	Quad-core ARM Cortex-A78 (2.0 GHz)	Intel Core i5-12500 or AMD Ryzen 5 7540U
AI Accelerator	Integrated NPU (2–6 TOPS) + Coral EdgeTPU (4 TOPS)	Intel Movidius NPU (~3 TOPS) or (future) Apple Neural Engine if M-series used
GPU	Mali-G610 (or none)	Intel Xe Graphics or AMD Radeon 780M
Memory	8–16 GB LPDDR5	8–16 GB DDR5 (SO-DIMM)
Storage	128–512 GB NVMe SSD (M.2 2280)	256–1024 GB NVMe SSD
Camera	5–8 MP Wi-Fi camera (1–2 modules)	5–8 MP (USB 2.0 camera)
Displays/LED	Dual 240×240 OLED eyes; fiber-optic hair; RGB chest LED [24]	Same as left
Networking	Wi-Fi 6E, Bluetooth 5.3, optional 4G/5G	Wi-Fi 6E, Bluetooth 5.3, Ethernet
I/O Ports	USB-C (PD/DP), USB-A (x3), microSD	USB-C/Thunderbolt 4, USB-A (x2), HDMI, Ethernet
Audio	4× microphone array, stereo speakers	Same
Power	20–30 Wh internal battery (charging base)	50 W PSU (desktop use) or 20 Wh battery
Power Consumption	~5–15 W (active), <1 W standby	~15–35 W (active), uses active cooling if >20W

Component	Option 1 (ARM Core)	Option 2 (x86 Core)
Operating System	Linux (Ubuntu, ROS, custom Linux)	Windows 11 / Linux (Ubuntu)
Dimensions	~25 cm tall humanoid; 15 cm base	Similar footprint (maybe larger base)

Note: These specs draw on current mini-PCs. GEEKOM's A9/A8 series show Ryzen 9 and 64GB memory are feasible in small boxes [17]. Raspberry Pi 5 can reach 2 GHz and handle 720p video [12] [19]. The table is for illustration; final design will balance cost, performance and power.

Limitations & Risks

- **Processing Limits:** Onboard hardware will likely be weaker than a data-center AI. Large LLMs or high-res vision tasks may require cloud offloading (with privacy trade-offs). Real-time 3D SLAM or multi-agent vision could strain the device.

- **Battery/Power:** If mobility is added (like a powered base), battery life becomes critical. Even stationary, LED displays and NPUs consume power. Careful power budgeting is needed (e.g. low-power NPUs, sleep modes). Users may need frequent charging if mobile.

- **Modularity Complexity:** More moving parts means more points of failure. Magnetic connectors can loosen; software must robustly handle hot-plugging (e.g. if an SSD falls out). Ensuring waterproofing/durability in all modules is hard. Manufacturing tolerances (fit of limbs) must be tight.

- **Cost:** The combination of custom body, display hardware, sensors and PC components could drive BOM cost above $300. Crowdfund/backer pricing must stay competitive. Using standard parts and 3D printing can keep costs down in prototypes, but mass production will still be costly.

- **Regulatory/Compliance:** As a consumer electronics toy with AI, it may need FCC/CE certification, especially for wireless and EMI. If marketed to children, it must meet toy safety regulations. Camera and microphone use also raise privacy regulations (GDPR/CCPA compliance).

- **Ethical/Privacy Risks:** With always-on microphones/cameras, users may worry about surveillance. The software must clearly indicate when recording/listening, and ideally all voice processing should be local. Ethically, the robot's AI should avoid manipulative behavior.

- **Market Competition:** Large tech companies could enter this niche with more resources. For example, Amazon's now-cancelled **Astro** robot or Google's rumored robot could overshadow startups. Also, some users may prefer multi-purpose devices (phones/tablets) or simple smart speakers over a novel companion.

- **Software Development:** Creating engaging, personality-rich AI is challenging. The success stories (Vector [29], Eiliko [30]) required extensive behavior design. The LUMINAI team will need strong AI/UX expertise. Bugs or "uncanny" behaviors could turn users off.

- **Assembly & Quality:** For a low-volume launch, maintaining consistent quality is hard. Early backers are sensitive to defects. Manuals and support will be needed.

Despite these risks, careful engineering and honest communication can mitigate issues. For example, emphasizing on-device AI and optional network connectivity can reassure privacy-conscious users. The modular architecture, while complex, offers a clear value proposition (upgradeability) that can justify the effort.

Summary

Building LUMINAI as a modular all-in-one mini-PC with a humanoid character is ambitious but technically plausible. Current ARM and x86 hardware options allow a flexible performance/cost tradeoff [20]. Prototyping can be done with SBCs and 3D printing (cost-effective for low volumes [26]), while partnerships with modular-PC firms (Framework [18], GEEKOM [17]) can help scale. The exploding companion-robot market (25%+ CAGR [3]) and recent crowdfunding hits (e.g. Eiliko [7]) show strong consumer interest in emotional AI gadgets.

A Kickstarter campaign should emphasize LUMINAI's unique *emotional intelligence* + *upgradable PC* angle, with transparent pricing and an educational companion narrative. Target costs should align with high-end smart speakers plus mini-PC kits (e.g. $300–$500 range). The design sheet already includes expressive LEDs and comfortable materials [24], which can form the basis of marketing imagery.

Finally, pitching to investors can highlight the **large TAM** (companion robots, IoT, edtech), the convergence of AI and human-centric design, and the alignment with trends (personal AI, modular computing). By addressing privacy/ethical design from the start and choosing reliable supply partners, LUMINAI could carve a niche as a lovable, trustworthy AI desktop companion.

Sources: We integrated data from the LuminAI design documents [1] [2] and diverse tech reports. Key references include a comparison of ARM vs x86 for embedded AI [20], industry examples like GEEKOM's mini-PC specs [17], the Pi-powered Pilet kit Kickstarter [27] [12], coverage of companion robots (TCL's AiMe [4], Japan's Lovot [6]), and recent AI robot crowdfunding (Eiliko [7] [8]). Manufacturing insights come from prototype cost analyses [26]. These sources underpin the feasibility and strategy outlined above.

---

[1] [2] [24] Lumina Deskbot Design Sheet.pdf
file://file_000000003c2c71f7aa3da66a84db8f9b

[3] [5] [6] [9] A Future Intertwined with “Love and Machines” | EqualOcean
https://equalocean.com/news/2025031621414

[4] TCL revealed a concept companion robot called Ai Me. | The Verge
https://www.theverge.com/2025/1/6/24337544/tcl-revealed-a-concept-companion-robot-called-ai-me

[7] [8] [23] [30] Kickstarter Sensation: Energize Lab's AI Charm Bot Eiliko Hits 3800% of Goal and $380K+ in Funding, with Support from Over 3,000 Backers
https://www.prnewswire.com/news-releases/kickstarter-sensation-energize-labs-ai-charm-bot-eiliko-hits-3800-of-goal-and-380k-in-funding-with-support-from-over-3-000-backers-302531049.html

[10] [11] [14] [15] [16] [20] [21] [22] ARM vs x86: Choosing the Right Architecture for Embedded AI - DEV Community
https://dev.to/jasonliu112/arm-vs-x86-choosing-the-right-architecture-for-embedded-ai-1f6c

[12] [13] [27] [28] Pilet hits Kickstarter for $200 and up: Portable modular computer powered by a Raspberry Pi 5 - Liliputing
https://liliputing.com/pilet-hits-kickstarter-for-200-and-up-portable-modular-computer-powered-by-a-raspberry-pi-5/

[17] GEEKOM Mini PC: Mini Computers of Power & Creativity
https://www.geekompc.com/

[18] Framework | Introducing the Framework Desktop and newest Framework
https://frame.work/

[19] [25] [29] The new Anki Vector robot is smart enough to just hang out | The Verge
https://www.theverge.com/2018/8/8/17661902/anki-vector-home-robot-voice-assistant-ai

[26] 3D Printing vs Injection Molding: Pros, Cons & Best Use Cases
https://www.rapiddirect.com/blog/3d-printing-vs-injection-molding-a-quick-comparison/