

VaradBorde

As humans and technology become increasingly integrated at both personal and societal levels, we are essentially evolving into "cyborgs," yet this transformation does not inherently ensure positive outcomes for humanity.

The Cyborg Psychology research group at the MIT Media Lab addresses this timely and timeless challenge through inventing, investigating, and inspiring next-generation human-AI systems for human flourishing. We explore mind shaped by machine, mind made in machine, and minds merged with machine.

CAPSTONE IDEA 01 - speculation

A project about **Memory and archives** using
Storytelling / narrative with Machine learning models, at the **Extraterrestrial scale**, represented as a **Film / video**, for **Future generations (e.g. people in 2200)**, under the constraint **Collective authorship no single “author”**, funded by **Grant-funded**, maintained as **Needs a dedicated steward**, with an afterlife of **Exists only as a live performance.**

1. Exciting for sure, because of the fact that this has so many things put together that wouldn't usually be, like audience being the future generation for a memory and archives related project. Both of these themes kinda travel the opposite way.
2. Collective authorship and memory and archives work together.
3. The fact that this exists only as a live performance is unclear, how will that even work out.

CAPSTONE IDEA 01

How can spatial computation and emerging technologies transform the experience of something predominantly human, a pilgrimage into an embodied, perceptual interface, one that fuses mythic tradition with tangible, futuristic rituals?

What does it mean to interact with a sacred space through spatial technologies like AI, XR, or BCIs, along with the physical presence?

Can interfaces become sensory, tangible extensions of the self, rather than cold, detached tools on a two dimensional surface?

What kinds of speculative interfaces allow ancient rituals to mutate into new forms of transcendence, intimacy, and collective memory?

How might AI evolve from a background tool to a foreground curator, one that shapes tangible interface based experiences and anchors how we perceive, move through, and make meaning of the world around us?

CAPSTONE IDEA 01 - speculation

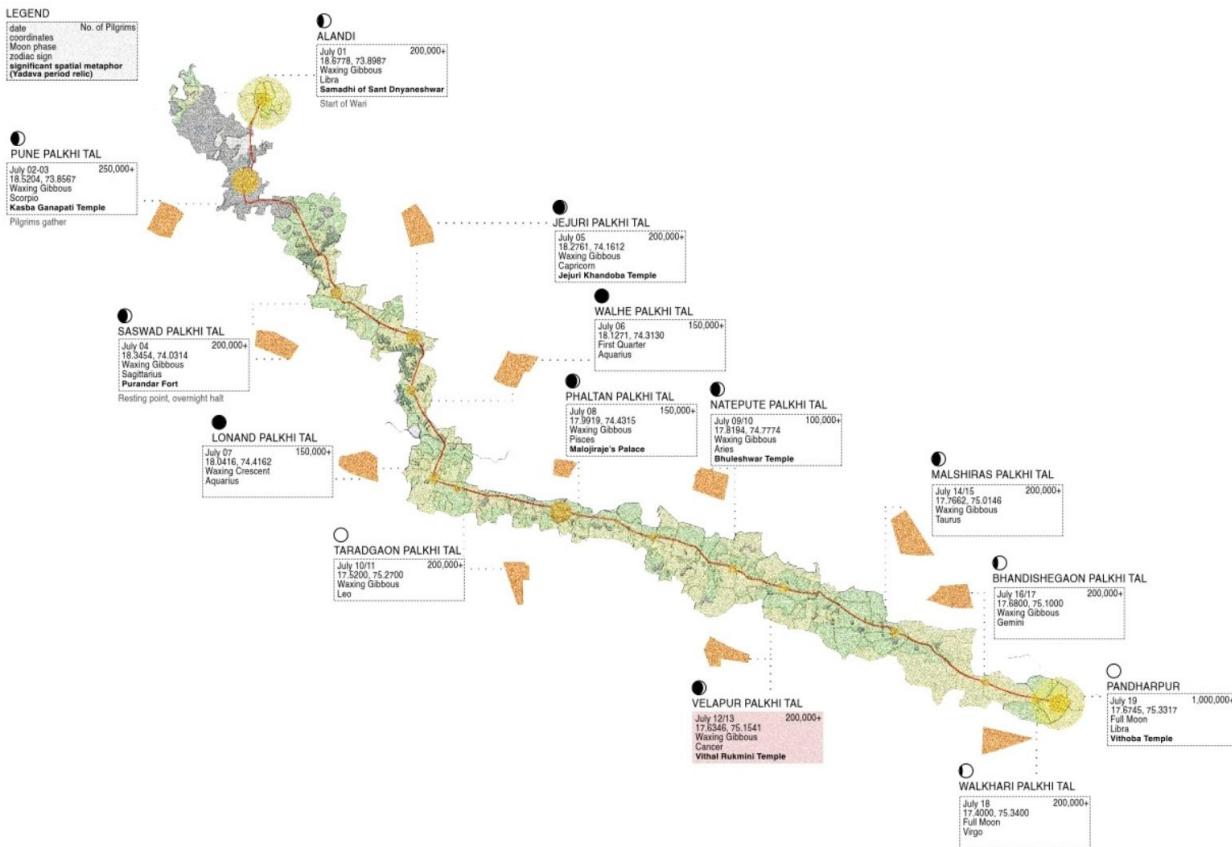
How can generative computation and machine learning transform collective memory into an embodied, perceptual archive one that fuses mythic human tradition with extraterrestrial narratives, and exists only as live performance for future generations?

What does it mean to interact with a collective archive through machine learning and extraterrestrial imaginaries, where authorship is distributed and stewardship replaces ownership?

Can archival interfaces become sensory, performative extensions of collective memory, rather than static, detached repositories bound to two-dimensional records?

What kinds of speculative archival rituals allow present-day stories to mutate into future traditions of remembering, intimacy, and planetary-scale transcendence?

How might AI evolve from a background indexing tool to a foreground narrative curator, one that shapes how collective memory is performed, remembered, and carried into the year 2200?



A project about **Digital Immersion** using
Archival research with Machine
learning models, at the **Region** scale,
represented as a **Diagram**, for **Activists**,
under the constraint **Budget: under**
\$100, funded by **Gift or barter economy**,
maintained as **Automated self-care**
(scripts, sensors), with an afterlife of
Preserved in a library/archive.

CAPSTONE IDEA 02

What implication will generative AI in Spatial intelligence have on the future of digital interaction

Spatial Intelligence & Enterprise AI

Innovations in **Large Geospatial Models (LGMs)** and spatial computing are powering AI's ability to understand and interact with the physical world—critical infrastructure for immersive AR/VR uses like navigation, design, training, and robotics [TechRadar](#).

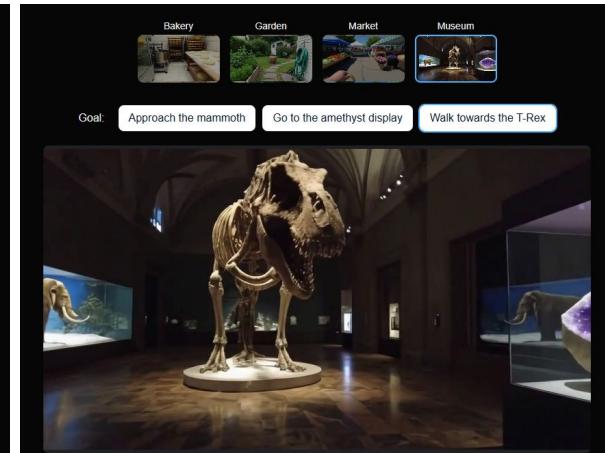
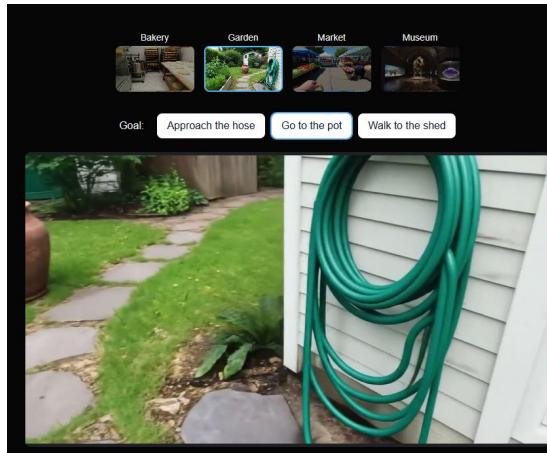
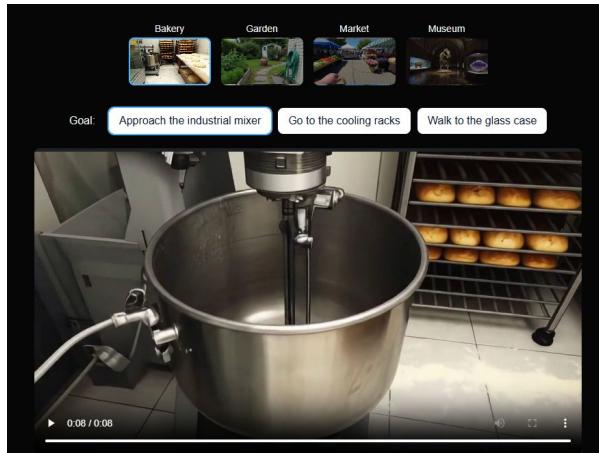
NVIDIA's Physical AI Tools

NVIDIA is rolling out solutions combining **neural graphics, synthetic data, and physics simulation** to bridge the gap between real and virtual environments. These tools promise more realistic and responsive immersive content across platforms [Kukarella](#).

Generative AI Meets Immersive Tech

Across sectors, from industrial training to VR storytelling, AI-driven content generation is enabling **nimble, context-aware environments**, smarter NPCs, and dynamically adapting scenes based on user behavior

<https://deepmind.google/discover/blog/genie-3-a-new-frontier-for-world-models/>



Infrastructural Implications

Spatial AI as infrastructure: Large Geospatial Models, neural rendering, and world models (like Genie 3) could become the new “operating systems” of interaction.

Future digital services might be layered onto **persistent generative environments**, not web pages or apps.

Just like the web protocol structured the internet, **spatial intelligence + generative AI could structure the “immersive internet.”**

Model / Framework	Type	Key Features	Status / Notes
Genie 3	Industry Demo	Real-time, interactable 3D worlds; persistent memory	Limited research preview access
ImmerseGen	Academic	Compact proxy-based photorealism; mobile-friendly	Real-time demo capability
TiP4GEN	Academic	Text → dynamic panoramic 4D scenes	Debuted August 2025
HoloTime	Academic	Panoramic video → 4D scene reconstruction	Focused on immersive 4D consistency
GenEx	Academic	One-image → explorable 3D world with agent navigation	Supports embodied AI exploration

Maybe write a paper or something???

Implications

Spatial AI as infrastructure: Large Geospatial Models, neural rendering, and world models (like Genie 3) could become the new “operating systems” of interaction.

Future digital services might be layered onto **persistent generative environments**, not webpages or apps.

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Cognitive & Experiential Shifts

Spatially intelligent systems blur the line between **data and lived experience**. A person isn’t just reading a chart; they’re **inside the model**.

This changes how knowledge is processed: instead of abstract stats, people navigate **embodied insights** (e.g., safety scores as immersive lighting conditions).

For your capstone: This ties beautifully into your theme of **AI perception, XR interfaces, and sacred/cognitive environments** — treating interaction as a **journey** rather than a transaction.

CAPSTONE IDEA 03 - a product

A project about **Migration and borders** using **Simulation** with **3D printing**, at the **Building** scale, represented as a **Performance**, for **Scholars**, under the constraint **Must use only open-source tools**, funded by **Gift or barter economy**, maintained as **Updated quarterly**, with an afterlife of **Preserved in a library/archive**.

CAPSTONE IDEA 03 - a product

Simulation Table - A product angle

A **large-format table installation** where real-time simulations of migration flows (e.g., using agent-based models in Mesa or Processing) are projected onto 3D-printed terrains.

Performance: Scholars gather around as the models are swapped, rebuilt, or altered in response to scenarios (climate change, policy changes).

Product angle: A replicable **open-source toolkit** (simulation code + 3D printing pipeline) that others can download and restage.

CAPSTONE IDEA 03 - a product

<https://www.media.mit.edu/groups/responsive-environments/overview/>

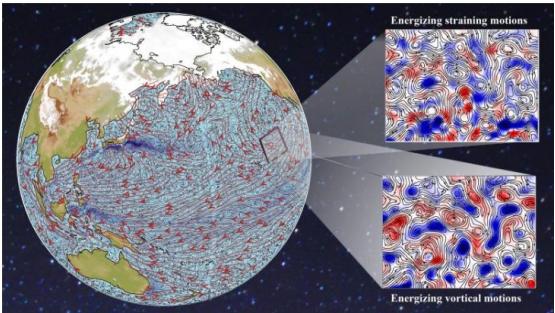
Work in progress....

A/B list

<u>Idea 01 - Speculation -</u> Memory + archives + ML + extraterrestrial scale, live performance.		<u>Idea 02 - Research -</u> Digital immersion + archival research + spatial AI + LLM's that dictate the current experience of the world		<u>Idea 03 - Product -</u> Borders / maps / Migration + product oriented + space as a project space + product as a performance	
A	B	A	B	A	B
Static Archive	Performed archive - like a never ending GIF	Individual immersion	Social immersion	Observation	Participation
Individual author	Collective effort	Data as an abstract	Data as a lived experience	Tech product	Open - source toolkit
Documentation	Ritual	Transactional	Experiential	Exhibition	Problem - solving toolkit
Human - enabled narrative	Machine - enabled narrative	Human - driven	AI - driven	Data - based observations	Data based interaction / processes

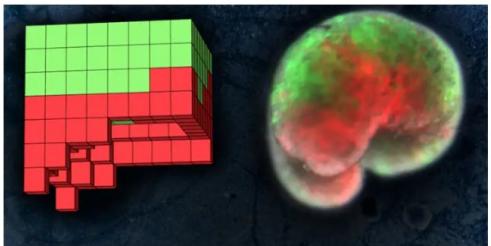
Signals

<https://scitechdaily.com/climate-science-game-changer-winds-unexpected-role-in-ocean-weather/>



The earth's prevailing winds were previously thought to slow down ocean weather patterns like eddies and strain, but new research shows that prevailing winds can energize ocean weather patterns if their spin is aligned. Credit: University of Rochester illustration / Shikhar Rai

<https://globalnews.ca/news/6408570/living-robots-frog-stem-cells-ai/>



The anatomical blueprint for a living robot is shown on the left, alongside the finished product on the right. Sam Kriegman/University of Vermont

Can physical innovations become a part of the internet / digital ecosystem, where instead of we humans, the world around us becomes a cyborg.

Use of Computation in using ecologies in an increasingly effective manner

As we look forward to immersing ourselves in the internet, how does the economy of surveillance work?

<https://mashable.com/article/cox-media-group-active-listening-google-microsoft-amazon-meta/>

Big Tech responds to CMG's Active Listening

Mashable reached out to all four Big Tech companies mentioned in 404 Media's report on CMG's Active Listening pitch deck. We heard back from all of them – Meta, Amazon, Google, and Microsoft. Each company provided a statement denying working with CMG to target advertising in this way.

"Meta does not use your phone's microphone for ads and we've been public about this for years," a Meta spokesperson said in a statement provided to Mashable. "We are reaching out to CMG to get them to clarify that their program is not based on Meta data."

Meta told Mashable that it was looking into whether CMG potentially violated Facebook's terms and conditions. The company said it would take action if necessary. A spokesperson also provided Mashable with a [2016 post](#) that Facebook published about how the company does not use users' phone's microphones for the purpose of advertising.

What's the physical barrier of making glasses go viral

<https://blog.cloudflare.com/cloudflare-2025-annual-founders-letter/>

The Internet's Business Model

Still other things have remained remarkably consistent: the basic business model of the Internet has for the last 15 years been the same — create compelling content, find a way to be discovered, and then generate value from the resulting traffic. Whether that was through ads or subscriptions or selling things or just the ego of knowing that someone is consuming what you created, traffic generation has been the engine that powered the Internet we know today.

Make no mistake, the Internet has never been free. There's always been a reward system that transferred value from consumers to creators and, in doing so, filled the Internet with content. Had the Internet not had that reward system it wouldn't be nearly as vibrant as it is today.

A bit of a trivia aside: why did Cloudflare never build an ad blocker [despite many requests](#)? Because, as imperfect as they are, ads have been the only micropayment system that has worked at scale to encourage an open Internet while also compensating content creators for their work. Our mission is to help build a better Internet, and a core value is that we're principled, so we weren't going to hamper the Internet's fundamental business model.

How can we use spatial UX / tangibly enabled products to be a life - enabler rather than becoming consumption models.

Hacker News new | past | comments | ask | show | jobs | submit

Mentra (YC W25) Is Hiring to build smart glasses
1 hour ago | hide

We're building the OS for smart glasses because we believe glasses are the next personal computer.

This year we launched MentraOS, graduated Y Combinator, and raised an \$8M seed round to bring smart glasses software and hardware to market.

We're a small team (~11 people) shipping thousands of our first pair of smart glasses in December.

We need help in engineering (build smart glasses), design (design glasses interfaces), and growth (make glasses go viral).

Apply on the job board or if you don't see a fitting role, email me cayden@mentra.glass

[Guidelines](#) | [FAQ](#) | [Lists](#) | [API](#) | [Security](#) | [Legal](#) | [Apply to YC](#) | [Contact](#)

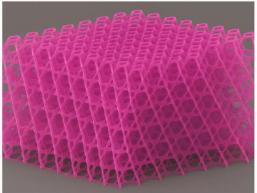
Search:

Signals

Structure Over Substance: An Introduction to Metamaterials

Metamaterials are a relatively new class of technology. The term "metamaterial" was first coined by Walser in 2001, who was inspired by the first experimental demonstration of a material with a negative refractive index.

A metamaterial is any material whose structure is intentionally designed and engineered at the meso-scale (nano-to centimeters), built from repeating unit cells like those shown in the figure below.

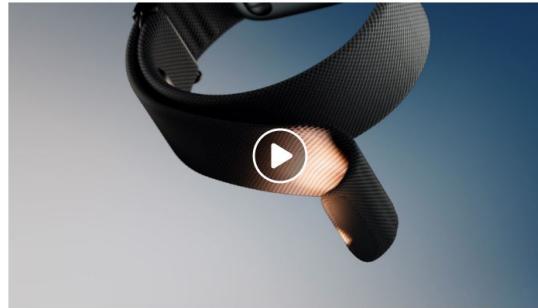


What makes them unique is that their defining properties arise not from the chemistry of the base material, but from the geometry and periodic arrangement of these unit cells. This deliberate architectural design enables the creation of solids with pre-defined, optimised, and exceptional properties often absent in natural materials. While initially designed to manipulate waves, the approach has been extended to:

<https://thepotentialsurface.substack.com/p/meta-materials-ai-and-the-road-to?triedRedirect=true>

Can metamaterials be a part of the extended digital infrastructure?

EMG: The Science of Seamless Interaction



Every new computing platform comes with new ways to interact, and we're really excited about our Meta Neural Band, which packs cutting-edge [surface electromyography research](#) into a stylish input device. It replaces the touchscreens, buttons, and dials of today's technology with a sensor on your wrist, so you can silently scroll, click, and, in the near future, even write out messages using subtle finger movements.

The amount of signals the band can detect is incredible — it has the fidelity to measure movement even before it's visually perceptible.

The key breakthrough was developing [deep learning algorithms based on data from nearly 200,000 consenting research participants](#), so this wristband will work right out of the box for nearly anyone. That's a huge technical feat because of the level of variance in people's muscles. [Think of the potential impact](#) it could have for people with spinal cord injuries, limb differences, tremors, or other neuromotor conditions.

With thousands upon thousands of motor neurons that could theoretically be mapped to any gesture, EMG technology can go beyond glasses. It could be the best way to control any device.

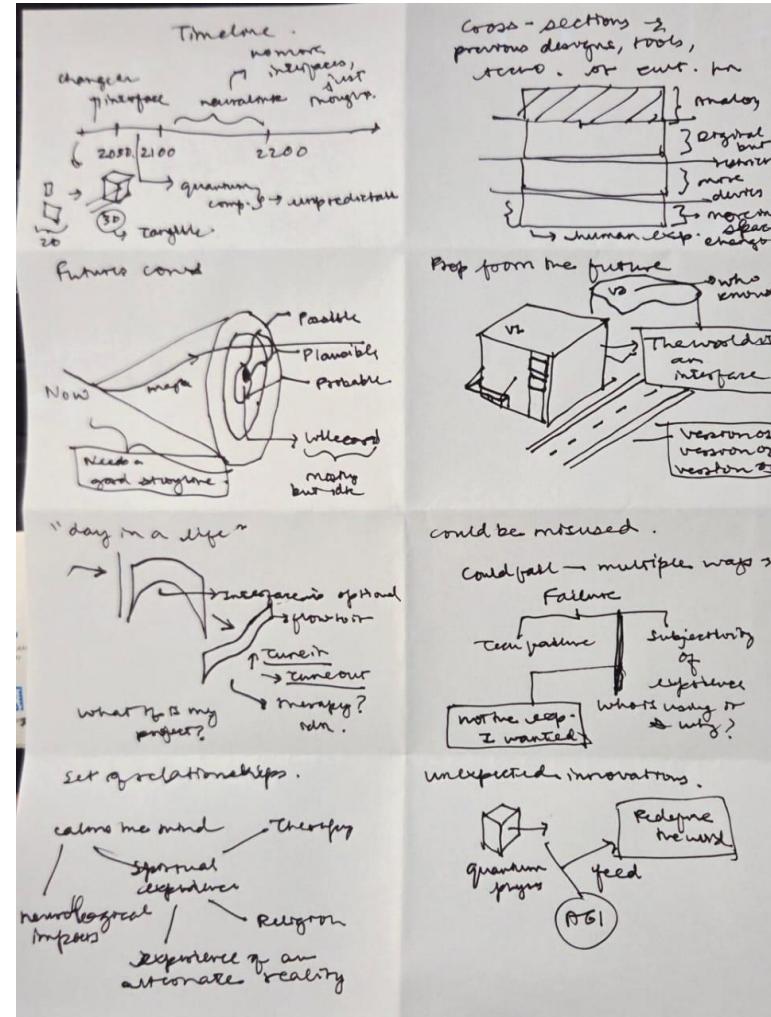
All processing of raw EMG data happens on-device. Only events like a "click" are sent from the wristband to the glasses so a command can be executed. This on-device machine learning also enables high reliability for haptic feedback and time synchronization.

We built the Meta Neural band to be durable, lightweight, and comfortable for all-day wear with up to 18 hours of battery life and an IPX7 water rating. The band features electrodes coated with diamond-like carbon, which are then reinforced by Vectran — a woven mesh that's as strong as steel when pulled, yet soft enough to bend easily. Vectran is the same material used on the crash pads of the Mars Rover to ensure a smooth landing, so yeah. Science!

THE VIRTUAL SOVEREIGNTY

As virtual reality and augmented reality technologies become indistinguishable from reality, a group of VR world creators declares their virtual realms as independent nations, complete with their own laws, currencies, and governments. This blurs the lines between physical and virtual existence, challenging traditional notions of sovereignty and citizenship.

Sketches



REDEFINING CAPSTONE IDEA 01 – speculation

Theme & Core Idea:

Exploring digital rituals, memory, spirituality, and archives at the intersection of AI and spatial computing. Future generations might not inherit books or static repositories, but living, performative archives that mutate into new cultural rituals.

Questions

1. How can data contribute to digital rituals and help recreate them through technology and spatial computing?
2. What is the effect of digital rituals on cultural evolution and collective social structures?
3. How do we redefine archives in the future, how do we perceive memory, spirituality, and ritual when mediated by AI?
4. Can archives evolve into performative cartographies, 3D, embodied maps of rituals and collective memory?
5. Real-life grounding: what if TikTok dances, livestream funerals, and digital protests become the sacred rituals of the future?

REDEFINING CAPSTONE IDEA 01 – speculation

SPIRITUALITY? – WHAT IS IT? AND WHY DOES IT MATTER?

Spirituality is the human search for meaning, connection, and transcendence - a sense of something greater than the individual self. It isn't confined to religion, though religions often give it structure. At its core, spirituality involves exploring questions like:

Who am I, really?

Why am I here?

How am I connected to others and the universe?

Both science and spirituality arise from a single impulse — **wonder**.

Science asks: *How does it work?*

Spirituality asks: *Why does it matter? -They're complimentary.*

TOP SCIENTIFIC QUESTIONS NO ONE HAS AN ANSWER TO

Science still faces mysteries that sound almost spiritual:

What is consciousness? How can awareness arise from non-aware matter?

What existed before the Big Bang? Is time itself emergent?

Why does the universe appear fine-tuned for life and intelligence?

What is dark matter and dark energy, which make up 95% of the cosmos yet remain unseen?

Is there an informational or computational substrate beneath physical reality (a “code” or “mind” of the universe)?

The Synthesis: Toward a Science of Subjectivity

We may be moving toward a “**third culture**”, where empirical science and contemplative introspection collaborate:

Neuroscience of meditation explores how inner stillness reshapes the brain.

Psychedelic research revives spiritual insight under controlled study.

AI and cognitive modeling ask whether consciousness can be simulated — or whether it's an emergent property of complexity itself.

Astrobiology and cosmopsychism reopen the question: *Is intelligence or awareness a cosmic constant?*

REDEFINING CAPSTONE IDEA 01 – speculation

What is Vedanta - The central concept of exploration that is the basis of the speculative direction of the capstone altogether.

- It explores - **What is the connection between spirituality, science, and the nature of reality itself?** - framework for understanding reality, self, and consciousness.
- The central insight - **Brahman = Ātman** - “*Tat Tvam Asi*” — *Thou art That.*(Chāndogya Upaniṣad 6.8.7)
- Scientifically - **Consciousness is not an emergent property of matter, matter is an emergent appearance *within* consciousness** - **Its kinda an upside down analogy of things tbh.**This view turns the scientific question upside down: instead of asking how consciousness arises in the brain, Vedānta asks —

how does the world arise *in* consciousness?

- **What we perceive as “solid reality” is mostly empty space, vibrating energy fields, and probabilities** - experiential - but mostly no one talks about this.
- **The observer’s presence collapses the wavefunction (quantum measurement problem).**

Keywords

Digital rituals, collective memory, AI-spirituality, cartographic archives, myth machines, ritual interfaces, performative religion.

Demonstration Pattern

Immersive ritual map: an XR cartography where memory-nodes glow as ritual performances (e.g., protests, weddings, pilgrimages).

AI-curated ritual performance: participants interact with a living archive that reshapes itself each time, like a **digital shrine** or **AI-led ceremony**.

Output: film/video + XR ritual landscape.

Theme & Core Idea:

Investigating digital immersion as infrastructure and its implications for economy, governance, and ethics. Immersion might become the new currency of labor, citizenship, and culture, raising urgent questions about regulation and policy.

Questions

1. How does digital immersion reshape the economy, and what business models emerge (barter, presence-as-currency, surveillance economies)?
2. What role does AI play in policymaking for immersive experiences who decides what level of immersion is ethical or dangerous?
3. What is the main mode of experiencing immersion: full VR detachment or hybrid augmented coexistence?
4. Real-life grounding: what if gig workers in VR call centers, Meta classrooms, or AR-enabled warehouses are the new working class of immersion?
5. Could we imagine a UN treaty on immersion limiting “immersion emissions” like carbon credits?

Keywords

Immersion economy, XR governance, presence-as-currency, AI policymakers, immersion taxation, sensory capitalism, citizenship of experience.

Demonstration Pattern

XR policy simulator: users toggle immersion policies (unlimited, capped, hybrid) and see modeled impacts (labor exploitation, addiction, governance).

Speculative constitution of immersion: a research paper + manifesto visualized through **interactive diagrams**.

Outcome: **research + XR simulator** showing the risks of immersion-as-infrastructure.

Theme & Core Idea:

Turning the environment itself into a computational enabler through metamaterials, sensors, robotics, and XR. Instead of humans wearing technology, the environment becomes cyborg-like, embedding intelligence into walls, objects, and landscapes.

Questions

1. What if products and environments evolve into cybernetic enablers—alive, responsive, and networked?
2. How can metamaterials and XR create cyborg ecologies where buildings, forests, or borders are computationally enabled?
3. What if migration borders or protest walls became responsive materials flexing, projecting, or archiving stories of those who cross them?
4. Can we imagine objects that archive themselves cups, chairs, or surfaces that remember interactions and replay them in XR?
5. Real-life grounding: from smart homes and urban sensors today, to living architectures and responsive protest environments tomorrow.

Keywords

Metamaterials, cyborg ecologies, responsive architecture, XR-environments, sensor worlds, living infrastructure, product-organism hybrids.

Demonstration Pattern

- Prototype object/environment: e.g., a 3D-printed wall or table embedded with sensors, visible as inert in real life but alive in XR (breathing with air-quality data, narrating migration histories).
- Performative installation: environment + XR overlay showing the hidden life of objects and borders.
- Output: physical prototype + XR layer.