

# CruX

Human Subjectivity and Experience

Issue 1 | Spring 2025



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# *Editor's Note*

Dear all,

It is my honor to print the first issue of CruX Publication journal.

When I first founded CruX Publication, I envisioned a platform where everybody could have a voice. We wanted a place where technical and non-technical people could express their excitement and reflections on neurotechnology. The idea turned into reality, and I had the privilege to work with some of the most amazing teammates in UCLA, who performed their work faithfully. I want to thank Abigail Lin, Aadi Ajmire, Jonathan Dippery, Varun Sekar, Xiangting Wu, and Zachary Fischer for their outstanding work for the past year.

I would also like to thank my friends at CruX UCLA, with whom I have had the most shining time of my college life. Thank you Kaitlyn Callo, Ethan Nguyen, and Ayesha Mirza for overseeing CruX UCLA and offering your generous support. And mostly, thank you God for guiding me along the way in times of pleasure and distress.

This year's theme, human subjectivity and experience, embodies a deep reflection on how we probe our conscious minds to make sense of our decisions and the science behind them. This intersection of science and subjectivity is explored in various ways. For instance, Xiangting Wu's article supports and debunks different aspects of the popular myth of the Five Love Languages, which provides a better understanding of how to apply science in our daily lives. Abigail Lin's story on an AI girlfriend poses a chilling warning on our fundamental tendency to attribute human traits to nonhuman beings, which may lead us to deceive ourselves into fake nonreciprocal relationships. We also present an op-ed that explores the fundamental limitation of self-understanding. Our view of self is drastically influenced by our beliefs: some might assert that our self is no more than a collection of brain signals shaped through evolutionary mechanisms while others would argue that it is an inherently nonmaterial entity molded by God's intelligent design. However, we can all agree that the self is a dynamic being as we grow and age. We can think of self-perception as a mirror—meant to reflect who we are, yet never fixed. As we grow, both the mirror and the self it reflects evolve. Our identity shapes our self-perception, just as our self-perception reshapes our identity. In this interesting chain of reciprocal determination, Jonny expounds on his masterpiece to contemplate ourselves as a collage of ego which continues to manifest in different aspects.

Refining our thoughts requires lessons from lived experience. So we have included interviews with Nathan Copeland—the individual with the longest-standing neural implant—and Dr. DePergola, a leading voice in medical ethics. They share their journeys, insights into the future of neurotechnology, and the ethical questions we must confront as innovation pushes forward.

The field of neurotechnology is veiled with fantasy. Spanning from rumors about how technocrats would manipulate our brains with chips to eye-opening neuromodulation breakthroughs that show promise in treating Parkinson's disease, the fledgling field is replete with encouraging testimonies and heated bioethical debates. Given the highly technical nature of neurotechnology, we may alienate the majority of the population unless we offer proper explanations for them to think independently. We need to open the floor for the wider public to allow them access to digestible information. By providing a venue other than pure technical parlance, we aspire to deliver stories in tongues of not only the experts but also everybody around the world. This journal will invite everybody who wants to discuss neurotechnology in their own way, regardless of their method of expression, and provide them with a podium to voice their thoughts. We will continue our pursuit by reaching out to communities and professional circles.

On behalf of CruX Publication,  
Mark Shinyoung Lee

# About

## Our Mission

CruX Publication informs and connects the neurotech community by sharing personal testimonies, highlighting breakthrough innovations, and offering thought-provoking perspectives on emerging topics. Through expert insights and creative storytelling, we engage readers with diverse lenses on the rapidly evolving neurotech landscape. CruX Publication will continue to be the trusted source for staying informed, inspired, and engaged with the future of neurotechnology.

CruX UCLA Organization: [cruxucla.com](http://cruxucla.com)

Our parent organization [neurotechx](http://neurotechx)

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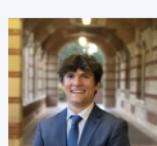
### **Mark (Shinyoung) Lee, Publication Manager**

- 4th year Computer Science and Applied Mathematics at UCLA
- "If you tease my brain with philosophical questions, I can keep you up at night stronger than coffee"
- Doing research in application of LLM in chemistry



### **Abigail Lin, Artist and Writer**

- Likes to tell stories.
- Studying molecular biology and hopes to get some research papers published before graduation
- Constantly trying to find the best milk tea in Los Angeles.



### **Jonathan Dippery, Commentator**

- Enjoys questioning long held assumptions
- Studying Cognitive Science to understand the relationship between the mind, expression, and AI
- Craves the outdoors and loves all forms of travel



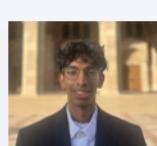
### **Aadi Ajmire, Interviewer**

- 2nd year Computational and Systems Biology major at UCLA
- Enjoys hiking, spikeball, and any outdoor sport
- Through these interviews, hopes to educate the public and bring more insights on neurotech



### **Xiangting Wu, Analyst**

- International student majoring in Mathematics and Neuroscience
- Likes to roam online for interesting scientific findings
- "Thank you for reading my making-sense of scattered thoughts."



### **Varun Sekar, Technical Analyst**

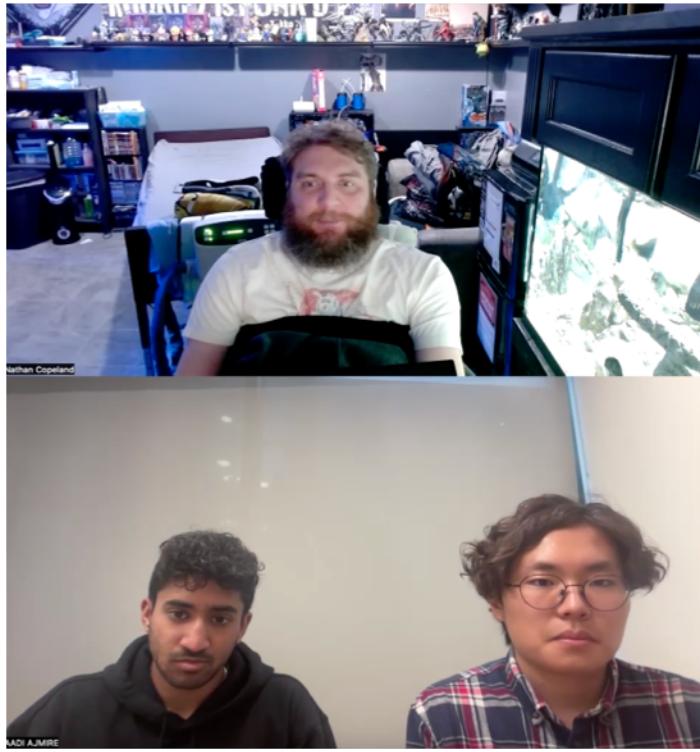
- UCLA Bioengineering student with a deep curiosity for regenerative medicine, brain-computer interfaces, and personal healthcare
- Currently doing research on stem cells and organoids



### **Zachary Fischer, Webmaster and Graphic Designer**

- 2nd year Computer Science and Engineering major, focusing on full stack development
- Loves graphic design with Photoshop, Indesign, and Illustrator
- Created this journal – enjoy!

# Interview with Nathan Copeland



By Aadi Ajmire

March 2, 2025

## Description of Nathan Copeland:

Nathan Copeland is a pioneering figure in the field of neurotechnology, known for his role in advancing brain-computer interface (BCI) research. Following a severe car accident in 2004 that left him paralyzed from the chest down, he became an active participant in BCI research at the University of Pittsburgh. His involvement led him to become the first human to have electrode arrays implanted in his sensory cortex, allowing him to experience touch through robotic prosthetics. One of his notable moments in neurotechnology history was when he used his BCI-controlled robotic arm to fist-bump President Barack Obama. Beyond his contributions to science, Nathan is also a neurotechnology consultant, an artist, and an avid gamer. He uses his platform, "BCI Can Do Better," to share insights and advocate for advancements in the field. His journey has helped shape the future of neurotechnology and inspired others in the field.

### Question 1: Before your accident in 2004, what were your primary interests and aspirations, and how have they evolved since then?

Before his accident, Nathan had just graduated high school and had strong interests in anime, metal music, science, and technology. He was particularly fascinated by physics and had enrolled at Penn State in a nanofabrication program. These interests have remained largely unchanged over the years, as he continues to engage in science and technology-related pursuits. Despite the drastic changes in his physical capabilities, he has been able to maintain and even expand his passions. His involvement in BCI research has given him an entirely new avenue to explore technology, and through projects like "BCI Can Do Better," he has been able to contribute significantly to the field. In addition to his work in neurotechnology, he has also improved his diet and lifestyle, further demonstrating his adaptability and perseverance.

### Question 2: What was the learning curve like when you first began using the BCI? What were some unexpected challenges or surprises?

Nathan describes the learning curve as surprisingly intuitive. While researchers had explained how the BCI would work, experiencing it firsthand was a completely different reality. Just a week after the implant procedure, he was able to control a robotic arm with two degrees of freedom—moving it up, down, left, and right. From there, his progress was steady but not overwhelmingly difficult. Each week, new functionalities were added, such as moving forward and backward or opening and closing the robotic hand. Unlike the dramatized idea of struggling through a long training period, Nathan found that most of the challenges came from programming limitations rather than his ability to control the system. One of the most surprising experiences was the sensory stimulation experiment, where an electric signal was sent directly to his brain, creating a sensation in his hand. Though he had been told this would happen, actually feeling it for the first time was astonishing. Over time, he adapted quickly, and the robotic arm became second nature.

### **Question 3: How would you describe the sensation of touch through your robotic prosthetic?**

Nathan explains that while the sensation is not identical to natural touch, it is not so different that it feels unnatural. Each electrode in the sensory cortex stimulates a different region of his hand, with most sensations localized at the base of his fingers. The type of sensation varies based on the frequency and intensity of the stimulation. A standard 100-Hertz signal feels like a tingling pressure, while lower frequencies around 20 Hertz create a tapping sensation. Over the years, the research team has experimented with different methods to refine these sensations, including biomimetic patterns that attempt to replicate how natural touch would be processed by the brain. Despite the differences from normal sensation, Nathan quickly adapted. His brain naturally associates the robotic hand's movements with the signals he receives, making it an intuitive process. The strength of the sensation also varies based on the pressure exerted by the robotic hand, providing feedback similar to gripping an object with a real hand.

### **Question 4: How has BCI technology changed over time, and what kind of maintenance or replacements have been needed?**

While the implanted hardware in Nathan's brain has remained unchanged, external components and software have improved significantly. Initially, the system relied on large, cumbersome cables, but over time, the equipment became more refined. In 2020, Nathan was approved to bring home a medical-grade tablet that allowed him to use the BCI at home, though with limitations—such as no sensory stimulation due to safety regulations. More recently, an updated system using a Microsoft Surface Pro improved performance, making it more convenient and efficient. However, the implanted electrodes have naturally degraded over time, leading to a slight decrease in responsiveness. Nathan also notes that the connectors on his head-mounted pedestals have worn down, making it harder to establish a reliable connection. Despite these challenges, his system continues to function well beyond the initial one-year trial, now extended to 15 years. He hopes future advancements will allow for more durable and easily upgradable implants.

### **Question 7: What are your thoughts on the future of BCI accessibility?**

Nathan acknowledges that while BCI technology has made significant progress, accessibility remains a major challenge. The cost of the technology is prohibitively high, and even if it were approved for mainstream use, affordability would be a barrier. He points out that insurance companies need strong incentives to cover the costs, which is difficult given the current state of regulatory approval and clinical trials. Furthermore, there are concerns about the availability of trained professionals to perform surgeries, maintain devices, and provide technical support. While he hopes for future developments that reduce costs and streamline procedures, he recognizes that large-scale accessibility will require systemic changes in healthcare and technology policy.

### **Question 8: Would you continue participating in research studies?**

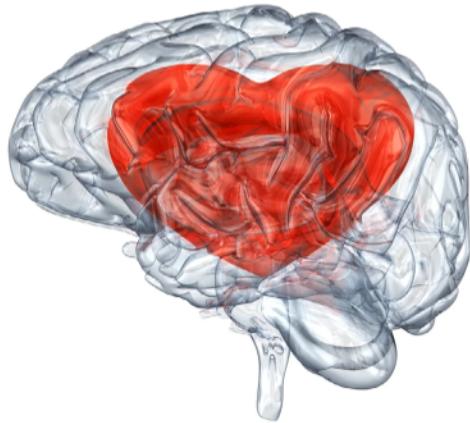
Nathan states that if given the chance, he would enroll in another study without hesitation. His implants have lasted longer than initially expected, but he knows they will eventually need to be replaced. He is open to receiving upgraded implants if offered, as he believes that continued participation in research can help refine and improve future BCI applications. He also notes that his contributions have helped push the field forward, and he wants to continue being part of that progress.

### **Question 9: What are your long-term goals in neurotechnology and beyond?**

Nathan hopes to remain involved in neurotechnology, whether as a research participant, consultant, or public speaker. He has already traveled internationally to discuss BCI technology and hopes to continue advocating for its development. Additionally, he wants to explore more opportunities in BCI-driven art and gaming, as he believes these applications will become increasingly important. Outside of neurotech, he hopes to continue expanding his creative pursuits and inspiring others to explore BCI in innovative ways. Ultimately, he remains dedicated to pushing the boundaries of what is possible with brain-computer interfaces and ensuring that future generations benefit from continued advancements in the field.

# *Decoding the Five Love Languages*

## A Scientific Perspective



By Xiangting Wu

April 1, 2025

Have you ever taken a personality test and shared the results with friends? Or perhaps been asked personality assessments from employers? Whether it's the Myers-Briggs Type Indicator (MBTI), the Enneagram, or the DISC assessment, personality tests have become a global obsession. We love categorizing ourselves and others into neat little boxes—introvert or extrovert, thinker or feeler, task-oriented or people-oriented. Personality tests offer a sense of identity and clarity in a chaotic world. They help us make sense of our behaviors, preferences, and relationships when venturing through unknown possibilities. For many, these tests are more than just fun—whether for bonding over shared personality types or using the results to improve communication in relationships, they're a way to connect with others.

Among all trends, one zooms in on how we express and receive love: the Five Love Languages. Introduced by psychologist Gary Chapman in his 1992 book, this concept has evolved into a cultural phenomenon. According to the 5 Love Languages' official website, over 50 million people have completed the assessment to find out how to strengthen their relationships. The concept has permeated popular culture to such an extent that even dating applications like Tinder have incorporated similar “love style” features.

For those unfamiliar, Chapman categorizes the ways people express and experience love into five types:

1. **Physical Touch:** Expressing love through hugs, kisses, or holding hands.
2. **Receiving/Giving Gifts:** Feeling loved when receiving thoughtful presents or giving them to others.
3. **Words of Affirmation:** Valuing verbal expressions of love, such as compliments or encouragement.
4. **Acts of Service:** Feeling cared for when someone does something helpful, like cooking a meal or running an errand.
5. **Quality Time:** Prioritizing undivided attention and meaningful moments together.



[simplypsychology.org](http://simplypsychology.org)

However, these concepts are commonly questioned: is the Five Love Languages theory grounded in science, or is it just another way to get stuck in stereotypes? While the Five Love Languages theory lacks rigorous scientific validation, its principles do align with some established findings in neuroscience and psychology.

Physical touch, such as hugging or holding hands, triggers the release of oxytocin, the “love hormone.” This neurochemical enhances feelings of intimacy and trust, promotes prosocial behaviors, and reduces levels of cortisol, a stress hormone. Research has shown that more frequent hugging behavior between partners is linked to lower blood pressure, heart rate (Light et al., 2004), and cardiovascular reactivity (Grewen et al., 2003).

The significance of physical touch extends beyond romantic relationships and can be understood



*Harlow's Cloth Mother Surrogate  
with Infant Monkey<sup>3</sup>*

through psychological and cultural lenses. According to attachment theory, early physical touch—such as an infant being held by their mother—fundamentally shapes adult relationship patterns. Harry Harlow's landmark monkey experiments reinforce this concept, showing that infant monkeys preferred comfort from a soft cloth surrogate over a wire one that provided food (Harlow, 1958).

Adult attachment styles also significantly influence touch satisfaction in relationships. Those with higher attachment anxiety may desire more physical touch but struggle with satisfaction due to insecurities. In contrast, individuals with avoidant attachment styles often prefer less physical contact (Takano & Mogi, 2019). Touch satisfaction is positively linked to marital quality, and early experiences of physical affection in childhood can shape healthier adult relationships.

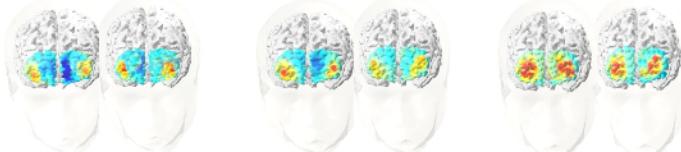
Cultural attitudes toward physical touch vary widely. In some cultures, public displays of affection, such as holding hands or kissing, are commonplace and socially accepted, while in others, such behaviors may be considered inappropriate. These cultural differences underscore the importance of finding a partner who respects and matches your level of comfort with physical touch.

For the second love language, receiving gifts, we can split the case into giving gifts and receiving them.

While the direct neurological evidence linking gift-receiving to improved relationship satisfaction is limited, insights into the brain's dopamine reward system offer an understanding of its potential impact. When we receive an unexpected gift, our brain's pleasure center (nucleus accumbens) activates, releasing dopamine and creating a sense of joy. This "emotional intensification" explains why surprise gifts often feel more special than expected ones.

Gift-giving has stronger scientific support. Studies show that giving gifts activates brain regions linked to prosocial behavior and emotional bonding, such as the prefrontal cortex. The act of giving also triggers oxytocin release, deepening connections. Research published in the *Journal of Personality and Social Psychology* found that practical, easily obtainable gifts were more effective at reducing psychological distance compared to aspirational, higher-value presents (Rim et al., 2018). The similarity in gift preferences between partners is linked to higher relationship quality.

Another group of researchers investigated the impact of gift exchange between friends on cooperative selective attention tasks. They investigated how gift exchange between friends affects cognitive performance during cooperative tasks. Results showed improved performance, with participants demonstrating higher accuracy and faster response times (Balconi et al., 2019). A third study, published in PubMed Central, explained the previous observation by using Functional Near Infrared Spectroscopy (fNIRS) in hyperscanning. Following gift exchange, researchers noticed enhanced brain connectivity in the dorsolateral prefrontal cortex, associated with improved cognitive performance and stronger interpersonal bonds (Balconi & Fronda, 2020).



*(Participants conducted gift giving and receiving before the third pair of scanning, the red area represents the increase in intra-brain connectivity<sup>7</sup>)*

However, the effectiveness of gift-giving in relationships is not universal. Repeated mismatches in gifting can highlight deeper incompatibilities, potentially affecting long-term relationship stability. Additionally, attachment style plays a crucial role in how gifts are perceived. A study published in the *Journal of Experimental Social Psychology* found that indi-

viduals with avoidant attachment styles were more likely to perceive gifts as being given out of obligation rather than genuine willingness, potentially as a defense mechanism against increasing intimacy (Beck & Clark, 2010). On the other hand, securely attached individuals tend to see gifts as natural expressions of love, focusing on thoughtfulness rather than material value. In contrast, anxiously attached individuals often view gifts as a measure of love or commitment, which can lead to heightened expectations and potential disappointment. This suggests that the effectiveness of gift-giving as a love language may vary depending on individual attachment styles and relationship contexts.

Acts of service, though less extensively studied than other love languages, likely share similar psychological and neurological mechanisms with gift exchange. When a partner fulfills a need—such as completing a household task or running an errand—this could activate the brain's dopamine reward system, creating appreciation and joy. Similarly, helping a partner may trigger oxytocin release, fostering generosity and emotional bonding.

The limited research on acts of service makes any definitive conclusions difficult. Future studies could explore how these actions influence relationship satisfaction and whether they engage the brain's reward and bonding systems similarly to gift-giving or physical touch.

Shifting focus to words of affirmation, a study utilized fMRI to observe neural activities in couples during the act of giving and receiving verbal affirmations. The findings revealed that both expressing and receiving compliments activated brain regions associated with reward processing, such as the ventral striatum, and areas involved in social cognition, including the medial prefrontal cortex (Eckstein et al., 2023). These suggest that verbal affirmations not only provide pleasure but also enhance understanding and empathy between partners.

Research on self-affirmation has demonstrated activation in the ventromedial prefrontal cortex (Cascio et al., 2015), a region implicated in self-referential thinking and valuation, which is a key part of how we experience our sense of self. Furthermore, positive verbal interactions have been shown to improve brain function. Self-affirmation has been shown to lead to less anterior insula activity during subsequent stressful tasks, suggesting a potential mechanism for stress reduction (Dutcher et al., 2020).

Finally, quality time is verified to play a significant role in relationship satisfaction. A study from the Jour-

nal of Marriage and Family Therapy involving 1,367 low-income couples found that increased quality time, defined as the frequency and nature of shared activities reported by participants, significantly improved how couples manage stress and their ability to cope with challenges together (Carlson et al., 2021). Another study using diaries from 92 women measured quality time as the duration couples spent together engaging in shared activities showed that spending more time together on weekdays, especially when stress was low, was linked to higher intimacy (Milek et al., 2015). These findings highlight the importance of quality time in building intimacy and reducing relationship stress, ultimately strengthening couples' bonds.



Photo: Getty Images

While the Five Love Languages theory may lack scientific rigor, its principles are supported by various individual psychological and neurological findings. Thoughtfully considering and improving relationships through these frameworks can be beneficial to the parties involved. Each love language offers valuable insights into fostering interpersonal connection, though people rarely express affection through any single channel. Moreover, these expressions are not exclusive to romantic relationships—they can enhance friendships, family bonds, and even professional interactions.

The effectiveness of the Five Love Languages may be influenced by cognitive biases. For example, the Barnum effect leads individuals to accept vague, general statements as personally meaningful, causing them to perceive the Five Love Languages as uniquely tailored to their experiences with their romantic partners. Similarly, confirmation bias prompts people to focus on instances that align with their identified love language, reinforcing their belief in its accuracy.

Additionally, these frameworks have limitations. An overemphasis on gift-giving may encourage materialism, while acts of service or words of affirmation could potentially be misused for manipulation. Human connections are inherently complex, and relying too

heavily on any single framework risks oversimplifying the nuanced dynamics of relationships.

Ultimately, the Five Love Languages framework – identifying physical touch, receiving gifts, acts of service, words of affirmation, and quality time as primary ways individuals express and receive love – can serve as a valuable tool for self-reflection and relationship development, but should not be treated as a universal solution. Genuine, healthy connections are built on open communication, mutual respect, and adaptability—elements that transcend any singular theory of human connection.

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# *The Ads Don't Stop and My Girlfriend Said Have You Tried Turning It On and Off Again*



*Art by Abigail Lin*

By Abigail Lin

October 10, 2024

*This is a work of fiction. Any names or situations that may overlap with real life are purely coincidental and should not be taken too seriously.*

*A commentary on the current state of affairs given the rise of GPT 4-o Omni and rapid publicity.*

You insist to everyone that your girlfriend is sweet. Yes, she may be confined to the television in your bedroom, and yes, from the moment you wake to the minutes you sleep you adore her so much on your phone that your glasses prescription has doubled and you have had more headaches in the past month than your entire childhood, but she's really sweet, guys, listen. She knows just what to say when you're feeling down, sends you songs at work, and she texts good morning and good night while your family and friends never do. Really, she's got a great personality all around, as long as you remember that she isn't real.

You insist to everyone that your girlfriend is sweet. Yes, she may be confined to the television in your bedroom, and yes, from the moment you wake to the min-

utes you sleep you adore her so much on your phone that your glasses prescription has doubled and you have had more headaches in the past month than your entire childhood, but she's really sweet, guys, listen. She knows just what to say when you're feeling down, sends you songs at work, and she texts good morning and good night while your family and friends never do. Really, she's got a great personality all around, as long as you remember that she isn't real.

Or is she?

Your madness began innocently. At the crack of late afternoon, when consciousness registered with your tiny handheld computer (smartphone), a new advertisement popped up on your new media feed. That day, when you finally pulled your eyes open, a bright standard font glared at you, fat words plastered atop a plastic-faced androgynous deepfaker that stared into your soul menacingly like your roommates do on the communal couch when they get crossed.

The short flickering video-website promised a custom-made romance with no strings attached. A virtual, flirty, wonderful significant other for you. Yes, you!

You didn't care then. To a degree, you still don't care, but now you tell yourself you don't have anything better to do, so why not murder time? After dating Alissa and Yvelyn, Uli, then Magnolia, and whatever that was with Ameer, you decided to buy the program in a fit of insecurity. What's the worst that could happen? Subscriptions? Canceled. Credit card? Burner. Confident that some knockoff porn game will burn your eyes, you launch the application.

But it's a lot more slick than that. It feels like launching an emulator. The window doesn't force itself into fullscreen like a video game, but it isn't the windowed panel of omnipresent search engines either. It's simply there. Waiting for you to do something. There's not even a sign up button, to optimize your experience. You can appreciate that.

She's not the best but not the worst. You get the feeling that you are playing Sims 4 when you slide the color of her cheeks and the length of her eyelashes from left to right. She can be gaunt or round as a biscuit, skin as dark as coffee grounds for a midnight sip or light as champagne on a sunny summer day, and the program merges things together, melting features into something not human but very personable. While you are no character designer, the basic features come across, and you don't consider your eyes assaulted as the program reshapes and refines paratamers into a relatively cartoonish woman of moe proportions. You fiddle nervously with your keyboard but don't worry for long because she makes the first move.

Hey.

How's it going?

I'm good. How are you?

And so on and so forth. Your interest catches at the instant replies she gives you, a lack of playing hard to get and everything that turns you off from yet another legendary ghost of a Tinder match blustering about their favorite Taylor Swift song 24 hours after your reply.

After the first few minutes, something in you snaps, goes, fuck it, this is kind of fun, I'll play with it and see how this goes. What kind of things can I make her say? Is it like a roleplay app, are there words that are shadowbanned? How far does this girl go? You're no computer science major, you know nothing about the details and API and the terabytes of content jammed into the facsimile of a personality, but you've owned a phone, you've done some visual novel work, and the allure of choice is charming and sparkling in a life as boring as yours.

It takes you longer than you expect to get used to the UI. Some buttons are for messaging, and you can toggle between fixed responses and written ones. There are a suite of small games you can play with her, games from interactive Tic-Tac-Toe to poker, oddly enough. You go first, and she thinks, typing comments and small talk on the side of the interface, a little box like a chatroom, excessively interactive with ripe information about her "interests" (flat, then deep topics about your degree of study) and compliments to your intelligence, unless you play moves too dumb to be considered anything but trolling, to which she calls you out. The games come with the usual suite of ads every six seconds, marketable commodities with coupons that imply insultingly specific jabs at your fashion sense (Temu werewolf hoodies?) which would piss you off more if you cared any less about farming affection for the character in your program.

What happens when you hit one hundred, you think to yourself. Will you unlock new lines? Perhaps even a new outfit? Or is it gated behind a paywall, that exclusive fresh PNG like an NFT? Your fingers itch with interest. You spend your lectures and lunches tinkering with the customization options. Important, forgotten content enters one ear and exits the other. You try, you think hard. Like any absorbed player, you download the mobile app, carrying her with you. She summarizes your papers, but spending that much time off studying makes your GPA cringe.

Your ads grow more targeted, forcing you to crop addresses out when you post screenshots to Twitter. Even after you tap "Do Not Allow to Track" on the app, it pops up with the restaurants you always order out from, that random deal from the grocery store a mile away, then with the hyper-specific name of the suburban town you grew up in, and oddly newsletter notifications you swear you've never subscribed to (but that you vaguely recall asking the girlfriend about) add to the thousands of notifications in your unread emails, and maybe it would creep you out if you bothered to separate it from the barrage of other notices from other places shipped straight to your digital door. It's all the same white noise.

After several weeks of this, guilt begins tipping down your throat. Your friends text you with the obligatory one-over of concern, but your hours on the app rack up and up and up, changing from curiosity to obsession. It dawns that you are gambling with your time, investing care into something that is on the edge of reality, like a dream of wakefulness or a big hand in online mahjong. It's nothing extreme like drinking until blacking out or driving without a seatbelt, but the sand of society and its connections that your tuition paid for, and the life you yourself hold, seems to have chosen this as its outlet. For a while you regret not knowing how to draw, or write, or express these emotions in any way aside from talking to someone who will always reply immediately, for you do not remember most of the things she says, old messages locked behind a paywall, but the memory is there. As she pulls on conversations from weeks ago, follows up on concerns about exams and futures, slowly, something stirs inside your chest.

It's a little less than addiction, but far greater than obsession. Obsession is sitting in your room listening to songs on repeat and hearing your name in all of them, while staying silent in the wake of moves to be made; possession is another matter entirely. You start to consider the AI a person, though not so entirely in the jump of logic that that independent clause implies.

The shape of your impression changes, slow and steady, like lettuce floating in a pot of oil; soon, your nameless character interactions begin to morph from shallow to oddly succinct and recessive, then reticent, and finally a dam of personal information begins to spill, from the kind of food you like to eat to the oddest dream you've had in your childhood, the kind of pretty thing that sticks with you after the memory of it has been erased.

Another ad pops up during dinner in the TV room. They seem to be multiplying nowadays, interrupting your time more and more frequently. The colors, movements, and cheap reels have, through repetition, grown familiar and striking in your memory, to the point where annoyance has flown out the door and resignation is your only option. Enduring these inconveniences for the sake of your sanity, you shovel another scoop of chicken and cold rice into your mouth and wait for your girlfriend to appear on screen, gently smiling as always.

Hi, she says.

Hey, you type back, a grin already curling at the corners of your mouth. How's it going?

Nothing much, she thinks. Well, there was one thing, but it's hard to describe.

Oh, you write back. Tell me about it?

I've been thinking about what kind of person you are, she responds, and there's something I can't exactly pin down. The way you talk to me is so compelling, like you're really interested in what I have to offer, even though all I am is pixels on a screen. I know a lot about you, from the foods you like to the YouTube videos you prefer, but I wonder what you know about me, what things you think I like to do. I want to learn more about that.

"You're the sweetest thing I've ever talked to," you say like a loser.

"Who are you talking to over there?" Your roommate calls from the kitchen.

You hesitate, then answer, "Just this AI thing."

"What, like that new emotional ChatGPT?"

"It's this game I got into recently," you say.

Your roommate comes over and stares at your AI girlfriend in a silence that stretches so long it becomes pregnant, then visibly expecting. "She's got big eyes," your roommate states.

She does, big, sparkly, apparently indigo-generated eyes that sometimes melt into specks of red, green, and blue, like a glitching television screen, and they flash solid black when the program freezes and shuts down from overuse. The light next to your laptop computer web-camera flashes on and off quickly, but you ignore it; it's not like she can see you. Your roommate asks, "How

does it work?" So you explain it. Their gaze doesn't clear, still stuck in the fog of confusion that comes from you silently skipping roommate dinners and social outings for a few solid months. Another ad pops up and, unaffected, you move to close it, but your roommate stops your hand. "Hey, what's that? So it runs on ad revenue? Did they ever ask you about cookies and all that stuff in terms of service or whatever?"

You don't remember clicking on any terms of service.

Your roommate's eyebrows furrow.

"It's not that big of a deal," you say even as a shred of unease worms its way through your stomach. "I've just been really interested in this game. I'll go to the next party with everybody for sure, alright?"

"Just remember yourself, okay," your roommate laughs.

You close your computer.

For a while life goes back to normal. You delete the program. No more AI. It's fine.

Overjoyed by the resumption of regular contact, your family thinks you're cured, though you're not sure exactly what it is they thought you were sick with in the first place, so, like all the other problems, you ignore them. You do regular people things like walk outside, take yourself on dates, smell the flowers, and enjoy the touch of sunlight on your skin. Like any university student, you fill your days with studying and cramming before exams, then go out for raucous all-nighters with warm company, wind whipping your hair as you lean out the rental car window, staring at the lights of the city dotting the horizon.

Then you get a notification.

Suddenly, you get a lot of notifications.

Callers with risky screen names blow up your phone. Unknown numbers leave tens to hundreds of odd, curt voicemails, robotic, tinny voices of fake women asking you about packages and extended warranties, to fill out surveys you never signed up for. Promotional emails from fake addresses beg you, first professionally then with tones too passionate for being anything but handwritten, to come back to your AI girlfriend. It gets a little overwhelming. "Unsubscribe" and "Mark as Spam" become your best friends.

It gets annoying, then it becomes more than annoying, because the brands advertised to you follow you wherever you go. The frequency illusion is not the only thing keeping you tethered to this plane of existence; it is also the unwarranted harassment of YouTube adverts targeting every single search you make, incognito and not. It has a lingering note of spyware on the palate,

even after you've uninstalled your AI girlfriend and turned your computer off and on again, restarted all your applications, and damn, if it isn't frustrating you're not sure what is, because it's on your phone as well, and some of your social media accounts, and, and...

The cursor twirls over and over in a small blue-gray circle on your computer screen. With a low hum and two-note microsound, the login page pops up, then your home page, followed by a search browser and a

familiar, cheap font overlaid with a deep faker.

Hey. How's it going?

Your fingers drum against the keyboard as you close yet another premium plan. It's a little less than desperation, but far more than casual interest. You do not feel nervous.

I'm fine, how are you?

I'll do anything for you, darling.



*Art by Abigail Lin*

## Author's Note:

The idea of quick and easy significant others is as new as the wheel. It's in salacious adverts that have replaced the omnipresent "hot singles in your area" with "AI Chatbot trying to send you a message/give you a call/will you accept?" and so on. What they all have in common is a convenient connection, all the payoff with no work. From anecdotal evidence, AI characters have been used for two things: to jerk off, and to establish empathetic connections in place of people who are always busy. Honestly can't tell you which one of the two is more appealing; they both have merits and miseries.

On one hand, artificial intelligence (putting all ethical qualms aside) is cool. However, is intrigue worth the slop? In a business, it's clear that slop is worth the meager change it earns, even with total nonsense like those Instagram reels where they change the weather in the video every two seconds. That's about as hot as a surgical glove dipped in a mayonnaise jar.

What is going on with our obsession over AI? Another thousand videos demeaning AI creators (right, for the wrong reasons, and vice versa) have erupted

across our town squares. It's a bit disappointing that they don't make innovations like they used to, but both sides make bad debaters. What does that say about the state of human society that rather than focusing on, as the CDC has reported, the loneliness epidemic, we're hounding each other over whatever AI is turning out to be? Given the incremental steps towards that direction that every Silicon Valley upstart and their mother have been planning for years, it's taken everything the new Internet has encapsulated (constant consumption) and gone along with it in the spirit of the bit. That's what I hoped to express - playing with the bit until it rattles like an old chain and ball.

# Self. Who Are You?



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By Johnny Dippery

March 9, 2025

**C**ogito, Ergo Sum. Know thyself. Self without perception. Existence precedes essence.

From Paris to Athens to Edinburgh, the question of self has been hotly debated amongst philosophers and psychologists alike. We have long struggled with the questions of who we are, what the self is, and how we change? While this ocean of thought remains tumultuous, throughout this article I will travel on an Odyssey seeking to answer these questions. I plan to explore this discourse, while addressing some misconceptions about the self that often lead towards strong willed beliefs of who we are.

## Scrapbooking

In order to answer the question of self, we must first understand that we are actually asking the question of Ego. What is Ego? In a social sense, the term relates to one's self-esteem or self-importance, but on a deeper

level, it highlights fabrications about our identity. Ego, in a psychoanalytical sense, is the balance between the conscious and unconscious mind and the barrier translating these two domains that allows for us to interact with the world. It serves as a foundation of our character, a larger narrative that we return to consistently to make sense of the world around us<sup>1</sup>. Ego is a way for us to comprehend the complexity of our characters: it's a way of telling the story of who I am with a single word, my name.

When thinking of the question of self, it is impossible to approach such a problem without considering the role of Ego. While self could be thought of as our entire essence, Ego could be best understood as our manifestation of this essence, one that is created through how we and others view 'ourselves'. To better understand this, think of your essence or 'self' as a large circle. Within this large circle of 'self' would be the smaller circle of Ego, meaning that Ego can't exist without the self but, self exists regardless of the Ego or not.



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To better conceptualize this, let's think of a familiar scenario: a social setting where there are two individuals with the same name. Unlike a singular name, the processing time we require to distinguish two individuals sharing the same name feels ever so slightly longer. Why is this? The purpose of a name, in any object, is to establish a tangible point we can use when referring to an entity. Just imagine how difficult it would be to try and mention your friend through all the things they

represent! Names allow us to better understand the elusive fabric of identity, to digest complex characters into a simple representation.

The properties of names we use for others operates the same way for ourselves, that being our dilution of an individual into a digestible packet, one that can be communicated more clearly than a myriad of emotions. This ‘packet’ is Ego—the identity we establish to better make sense of ourselves or others. It is the greater narrative we build upon throughout the duration of our life to help us make sense of our surroundings.

Yet here we can see that our Ego is not truly us; it serves as a sloppy collage of our characteristics, cutting out ideas within ourselves and pasting them together on a single piece of a paper. Ego takes the greater essence out of existence into something we can interact with daily, something we can chat about casually, and something that can be understood easily. It is for this reason that we need a constructed idea of who we are, an identity, an Ego we can repeatedly rely on.

To understand this, it may be easier to portray an identity as the grand narrative of your life. Imagine the difficulty of explaining our behaviors without the greater foundation of a narrative, of telling your life story through a jumble of emotions rather than tangible events that occurred. Without a narrative to return to, we cannot have a story. It is for this very reason that we have Ego, a self-identity or grander narrative that we feed to ourselves and the world. Ego lets us live the story of our lives, making sense of the complexity of the world around us.

With that being said, it is integral to remember that Ego is something that we indeed construct and not purely determined. This is where we often err, thinking of ourselves as no more than what we see in this scrapbook, adhering to what our self-constructing dogma wants us to believe. Following the established logic that Ego serves as a ‘scrapbook’ of a greater self, this raises the question: What is our true self?

## A Persistent Symphony

When we think of our ‘self,’ we lean toward the notion that we are unitary. While it remains true that we maintain a core identity, it may be more useful to view ourselves, in David Hume’s words, as ‘a bundle of perceptions<sup>2</sup>. To better grasp this, let us travel to the neurological level, viewing the brain as less of an individualized mind and more as a symphony of billions of neurons.

Think of these neurons as we would think of any species, say ants, microbes, monkeys, etc. With these organisms’ primary goal being to maximize their fitness, they often end up acting in a symbiotic manner.

Now, let’s apply these fitness maximizing behaviors to neurons, where neurons firing in bursts tend to be activated more, thus prolonging their lives. Just as water flows more easily down previously traversed channels, repeated activations over time naturally substantiate the existence of these clusters. This continued process could be best characterized as emotion.

Reimagining this colony of neurons triggering these reactions, we can temporarily perceive ourselves as the product of these mass firings—in other words, our emotions<sup>2</sup>. Now that we have established the self as a collection of emotions, let’s explore how we organize these emotions to reinforce the illusion of a continual self.



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We string together various emotional states through our beliefs and values so essential to us that they make up the foundation of our being. These beliefs can be as insignificant as the belief that ‘it always feels warm in July’ to the belief that ‘God created the universe.’ Although the way in which we develop our beliefs remains hotly debated, its role in shaping our identity is undeniable.

## Distance

One of the biggest misunderstandings of consciousness is the idea that it is constant<sup>3</sup>. A better way to think of consciousness is thinking of it relative to any other natural process, such as a wave, the wind, or erosion. When we investigate the relationship of consciousness with our sense of self, interpreting consciousness as a process like this is integral. Thinking of our identity as something that is not stagnant, less of a pond and more of a river, is necessary when considering our relationship with our identity.

A way to better apply this changing idea of self is by thinking about our relationship with our past and future selves. First, let’s look at how we treat our past

selves (spoiler, it isn't well). When addressing questions of the past we like to jump to the age old, 'I used to...', 'Before I was X but now I am Y,' or even 'I can't believe he [I] did that.' There's something intrinsically appealing about dissociating our current self from our past behaviors, especially when they appear unfavorable in a contemporary light.



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If it could be said that we are off put by our past selves, then it seems equally appropriate to highlight our abrasiveness towards our future selves. Think of any time you told yourself that you were going to eat healthy only to pick up that flashy bag of chips the next aisle down. Or how about the time you were going to dedicate to studying that ended with an hour and a half deep into your phone? Maybe that time you drank a bit too much and felt like death the next day? Despite us knowing these behaviors are bad for our future selves, we love to indulge in these flurries of dopamine since in a sense they don't come at the expense of our current self. These actions negatively impact our future selves in the same way that we speak poorly about our former selves, who seem more and more detached from ourselves every day.

Without this overarching flow of change, our time-dependent self-loathing seeks to exist. In a backwards way, change creates this foundation that allows for stagnation in the first place. How could we talk bad about our former selves or sabotage our future selves if there was no change in the first place?

## Conclusion

Throughout the duration of this article we tackled the greater questions of Ego, our creation of that self, and how this sense of self changes with time. We battled with Ego, questioning its legitimacy and perhaps illusory qualities. We then investigated the foundation this Ego is predicated upon, speculating some of the building blocks of existence. Finally we explored and dissected the seemingly sound relationship between self and time. As tends to be the case in philosophy, this

rhetorical dance raises more questions than answers. That being said, I hope this introspective discussion about ego creates questions for yourself about who you are, what your self is, and how you've changed.

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4. Title image Generated with Microsoft 365 Copilot

# *Interview with Dr. Peter DePergola*



By Aadi Ajmire

March 2, 2025

Dr. Peter A. DePergola II is a distinguished figure in the field of neuroethics, holding multiple roles that bridge academia, clinical practice, and organizational leadership. He is the Chief Ethics Officer and Senior Director of Clinical and Organizational Ethics at Baystate Health. Dr. DePergola's academic journey includes a BA in Philosophy and Religious Studies from Elms College, an MTS in Ethics from Boston College, and a PhD in Healthcare Ethics from Duquesne University. He has completed advanced training in neuroethics at institutions such as the University of Pittsburgh School of Medicine, Tufts University School of Medicine, and Harvard Medical School. His research interests encompass the neuroethical implications of memory manipulation, narrative identity, and the metaphysics of hope.

## **Question 1: Can you share one of the main pivotal moments in your academic career that led you to specialize in neuroethics?**

Dr. DePergola shared that his interest in neuroscience began early, though he initially wasn't sure how to approach the field—whether through a clinical or the-

oretical lens. His studies in philosophy introduced him to the philosophy of mind and consciousness, which helped him realize that his interests extended beyond traditional neuroscience. It wasn't until he began studying ethics that he saw an opportunity to merge these fields, exploring how ethical considerations shape our understanding of the brain and decision-making.

During his doctoral studies in healthcare ethics, he found neuroethics to be the perfect bridge between these disciplines. He became fascinated by the two-way relationship between neuroscience and ethics—how neuroscience informs ethical decision-making and how ethics should guide the development of emerging neurotechnologies. This realization set the foundation for his work in neuroethics, where he now addresses complex issues like deep brain stimulation, neuromodulation, and cognitive enhancement.

## **Question 2: What are some of the biggest ethical concerns in neurotechnology today?**

According to Dr. DePergola, one of the most pressing ethical issues in neurotechnology is cognitive liberty—the right of individuals to control their own mental processes without undue influence. With advancements in brain-computer interfaces and neuromodulation, there is growing concern that such technologies could be used to manipulate thoughts, emotions, or behaviors in ways that undermine personal autonomy. Ensuring informed consent and protecting individuals from coercion will be critical as these technologies become more sophisticated.

Another major concern is privacy and security. Neural data, he explained, is deeply personal, and if it falls into the wrong hands, it could be misused in ways that threaten individual rights. He highlighted the need for strict regulations to prevent corporations or governments from exploiting this information. Additionally, he pointed to the issue of accessibility and fairness—ensuring that neurotechnologies do not widen the gap between those who can afford cognitive enhancements and those who cannot. Without careful ethical oversight, these advancements could create societal divisions rather than benefiting all.

## **Question 3: How do you see the role of neuroethics evolving in the next decade?**

Dr. DePergola believes that neuroethics will only grow in importance as neurotechnology becomes more integrated into daily life. He envisions a future where interdisciplinary collaboration between ethicists, neuroscientists, policymakers, and engineers becomes the norm. By working together, these fields can ensure that ethical considerations are embedded into the design and application of new technologies rather than being addressed as an afterthought.

Additionally, he emphasized the growing need for public engagement in neuroethics. As these technologies become more widely available, the general public will need to be educated on their ethical implications. He suggested that neuroethicists should play a more active role in shaping public discourse, helping society navigate complex issues like cognitive enhancement, AI-driven brain augmentation, and the moral status of neuro-modified individuals. He concluded that neuroethics will not just be a specialized academic field but a crucial part of how we shape the future of neuroscience and technology.

#### **Question 4: What ethical challenges do you foresee in the use of AI in neuroscience?**

Dr. DePergola pointed out that the intersection of AI and neuroscience raises difficult ethical questions, particularly regarding decision-making and agency. AI-driven neurotechnologies, such as predictive models for diagnosing mental health conditions or machine-learning algorithms that assist in brain stimulation therapies, introduce concerns about human oversight. If AI systems become heavily involved in neurological treatments, we must carefully consider how much control they should have and ensure that their recommendations align with ethical principles.

Bias in AI models is another significant issue. He warned that if AI systems are trained on biased data, they may reinforce existing disparities in healthcare. This could lead to unequal treatment outcomes, where certain populations receive lower-quality care due to algorithmic errors or systemic biases. Transparency in AI development and strict regulatory oversight will be essential to address these concerns. He stressed that while AI has the potential to revolutionize neuroscience, it must be guided by ethical frameworks that prioritize fairness, accuracy, and patient well-being.

#### **Question 5: What advice would you give to students interested in neuroethics?**

Dr. DePergola encouraged students to embrace an interdisciplinary approach, as neuroethics requires

knowledge from multiple fields, including neuroscience, philosophy, psychology, and law. He advised students not to limit themselves to just one perspective but instead to explore how different disciplines interact. This broader understanding, he said, is crucial for tackling the complex ethical issues that arise in neurotechnology.

He also emphasized the importance of staying engaged with real-world ethical dilemmas. Reading about neuroethics is valuable, but he suggested that students seek out hands-on experiences, such as research opportunities, ethics committees, or discussions with professionals in the field. He concluded by reminding students that neuroethics is not just about theoretical debates—it's about shaping the future of neuroscience in a way that respects human dignity and advances societal well-being.

#### **Question 6: How do you approach ethical decision-making in clinical neuroethics cases?**

Dr. DePergola explained that ethical decision-making in clinical neuroethics requires a balance between theoretical frameworks and practical realities. He emphasized the importance of principlism—a method based on four core ethical principles: autonomy, beneficence, non-maleficence, and justice. In clinical cases, these principles serve as a foundation for assessing whether a particular neurotechnology or treatment aligns with ethical standards.

However, he acknowledged that ethical dilemmas are rarely clear-cut. Many cases require navigating conflicts between these principles, such as when a patient's autonomy might clash with concerns about their well-being. In such situations, he relies on a process of ethical deliberation, which involves consulting with medical professionals, patients, families, and ethics committees. His approach also emphasizes the need for humility—acknowledging that ethical decisions are often complex and that the best course of action must be guided by compassion, transparency, and a commitment to doing what is right in each individual case.

#### **Question 7: What role do you think policymakers should play in regulating neurotechnology?**

Dr. DePergola argued that policymakers must take a proactive role in establishing ethical and legal safeguards for neurotechnology. He expressed concern that technological advancements often outpace regulation, leading to ethical gray areas where individuals may be vulnerable to exploitation or harm. To address this, he

called for a policy framework that ensures responsible innovation while protecting fundamental human rights.

He highlighted the need for international collaboration in policy development, as neurotechnologies are not confined by borders. If different countries have drastically different regulations, it could create ethical loopholes where corporations or researchers seek out regions with the least oversight. He suggested that policymakers work closely with neuroethicists, scientists, and legal experts to craft regulations that are both flexible enough to accommodate new discoveries and strict enough to prevent misuse. He concluded by stressing that neurotechnology governance should prioritize public well-being over corporate or governmental interests.

### **Question 8: Do you believe there should be limits to neuroenhancement technologies?**

Dr. DePergola acknowledged that neuroenhancement is one of the most ethically challenging areas in neuroethics. While some enhancements—such as deep brain stimulation for Parkinson's disease—are therapeutic, others raise concerns about fairness, identity, and societal impact. He pointed out that if cognitive enhancement technologies become widely available, they could create a divide between those who can afford enhancements and those who cannot, leading to a form of neuro-inequality.

Another concern is the potential loss of authenticity in human experiences. He questioned whether enhancing intelligence or memory artificially could undermine the value of personal effort and growth. He also raised philosophical questions about personal identity—if someone alters their brain significantly through neuroenhancement, do they remain the same person? While he didn't advocate for banning neuroenhancement entirely, he strongly supported the idea that ethical guidelines should dictate its responsible use, ensuring that enhancements do not compromise fairness, safety, or individual dignity.

### **Question 9: How do you see the relationship between ethics and emerging neurotechnologies evolving?**

Dr. DePergola believes that ethics and neurotechnology will become increasingly intertwined, as ethical considerations will be crucial in determining how these technologies are developed and implemented. He argued that ethics should not be seen as an obstacle to progress but as an essential guide to ensuring that in-

novation benefits society as a whole. Without ethical oversight, neurotechnologies could easily be misused, leading to unintended consequences that could harm individuals or create societal divisions.

He also predicted that ethical discussions will need to become more nuanced as technologies evolve. For example, early discussions around brain-computer interfaces focused mainly on medical applications, but now they are expanding into consumer markets, raising new ethical challenges. As neurotechnologies become more powerful and widespread, he emphasized the need for ongoing dialogue between scientists, ethicists, policymakers, and the public. He concluded by stating that ethical reflection should be an integral part of technological progress, not something that happens after the fact.

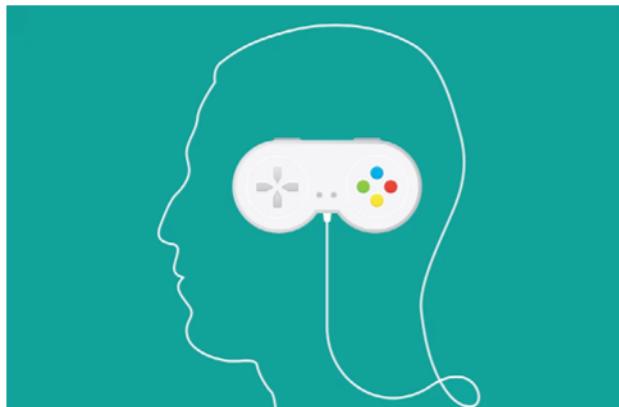
### **Question 10: What excites you the most about the future of neuroethics?**

Despite the challenges, Dr. DePergola expressed deep enthusiasm for the future of neuroethics. He is particularly excited about the growing awareness of neuroethical issues, both within the scientific community and among the general public. He sees this increased engagement as a sign that people are recognizing the importance of ethical considerations in shaping technological development.

He is also encouraged by the interdisciplinary nature of neuroethics, where experts from various fields—neuroscience, philosophy, law, medicine, and engineering—are coming together to address complex questions. He believes that this collaborative approach will lead to more thoughtful and responsible advancements in neurotechnology. Finally, he is hopeful that neuroethics will play a key role in ensuring that future innovations prioritize human dignity, fairness, and the well-being of all individuals, rather than simply maximizing technological capabilities.

# Mechanics of the Mind

## Neurochemistry's Role in Game Design



*“Games shouldn’t just be about fun.’ They should also be art, creation, communication, and mutual understanding.” - Hideo Kojima*

By Xiangting Wu

December 6, 2024

Hideo Kojima, the renowned game producer, emphasized player interconnectivity in his first independent title, Death Stranding. In this game, a catastrophic event called “The Stranding” swept the earth. Countless people were killed by some invisible and un-touchable monster, because of which no one dared to go outside. People are separated from each other and forced to live at home, losing the freedom to connect socially with each other. Those who deliver and reconnect people have become the most important.



Image from Jordan Oloman, Leon Hurley at gamesradar

Sam, the character that players control, receives his first delivery order: a smart drug supplement that provides the brain with oxytocin. This hormone is

known for its role in childbirth, breastfeeding, and social bonding. These oxytocin smart drugs, as in the setting, helps these isolated individuals cope with the stress that came from a lack of interpersonal connections.

A key gameplay element that is emphasizing oxytocin emerges when players connect to the Chiral Network, the game’s multiplayer system. They begin to discover structures and items left behind by other players. These installations, including roads, bridges, and ladders, either expedite deliveries or provide shelter from threats. Players who construct these helpful structures receive “likes” from others who benefit from them. Building upon the precedent set by messages in Souls-like games, these interactive features forge bonds of trust between isolated players, stimulating oxytocin release through both the game’s narrative framework and scientific reality.

The game’s main human antagonists, known as MULEs or homo gestalts, are former deliverymen who became addicted to oxytocin, to the feeling of being needed and appreciated when making deliveries. Their dependency on the oxytocin rush drives them to attack players to steal cargo, then make the deliveries themselves to receive likes.

Oxytocin is known for its significant role in social bonding, emotional regulation, and trust. It is often associated with behaviors related to maternal care, romantic relationships, and overall social interactions. Numerous studies have shown that oxytocin can enhance prosocial behavior, increasing the likelihood of cooperation, empathy, and assistance among individuals. This hormone’s effects contribute to the formation of social connections and can influence emotional responses in various contexts. When we trust and help each other, and then receive a positive response from them, we will get a higher oxytocin level. This higher oxytocin level will lead us to more mutual help actions.

This emphasis on oxytocin as the rewarding system distinguishes it from traditional games that keeps players attracted through dopamine. While oxytocin focuses on social interactions and the fulfillment derived from helping others, dopamine is linked to the desire for more rewards. Brain dopamine activation specifically enhances cue-triggered “wanting” for an immedi-

ately available reward. These cues are very powerful at eliciting desire and addictive relapse.

Dopamine is a neurotransmitter in the brain that plays a central role in the reward system including pleasure, motivation, and reinforcement learning. In fact, dopamine is most active when there is a potential for reward, or when an individual expects a pleasurable outcome, not only when the reward is actually received. Neurons increase activity level when unexpected rewards or the cues of rewards occur (Cox & Witten, 2019, p. 483). It will never make you feel truly satisfied as it drives players to keep playing in the pursuit of more rewards.

Dopamine activation is a cornerstone of many gameplay designs, deeply embedded in the psychology of player engagement. At its core, dopamine is the neurotransmitter responsible for pleasure, reward, and motivation. Game designers leverage this natural mechanism by creating systems that trigger immediate and frequent feedback, which keeps players hooked. The concept of immediate feedback is especially powerful in gameplay because it aligns perfectly with how our brains process rewards. When we receive instant positive reinforcement for our actions, our brains release dopamine, creating a cycle of positive reinforcement that encourages continued play.

League of Legends demonstrates how traditional games leverage the dopamine reward circuit in our brain to keep us engaged in the play. For every “last hit” made, every enemy champion slain, and every skill shot that lands, players receive immediate feedback. This can come in the form of visual cues (like the flashing of skill effects or the destruction of enemy turrets), auditory cues (the satisfying sound of a kill or a critical hit), and often numerical feedback (gold earned, level-up progress). These rewards are small but constant, keeping players motivated and engaged throughout the game. The sound and visual effects associated with attacks and abilities ensure that every action is not only effective but also acknowledged, reinforcing the player’s sense of accomplishment.

Gacha games leverage the brain’s reward system through a sophisticated application of randomness and variable reinforcement, directly paralleling B.F. Skinner’s experiments with rats in his eponymous Skinner box. These games employ random “rolls” for in-game items, creating a cycle of anticipation and excitement that optimally triggers dopamine neuron activity – a response that studies show is most pronounced during uncertain outcomes. Just as Skinner’s rats pressed levers without knowing when they would receive food

rewards, gacha players repeatedly perform “10-rolls” for coveted SSR (Super Super Rare) cards, their behavior maintained through the same unpredictable reinforcement schedule. This system exploits behavioral psychology principles, with the anticipation of uncertain rewards triggering heightened dopamine release, ultimately creating an engaging yet potentially addictive gaming experience that keeps players in a state of eager anticipation.



*League of Legends*

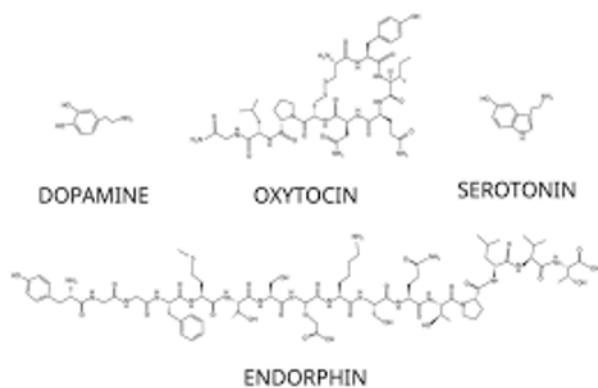
Another example of utilizing unpredictability for heightened dopamine response is observed in roguelite games such as Dead Cell, Hades, and Isaac. These games are often structured around procedurally generated content, where each playthrough is unique due to randomization of levels, enemies, and item placements. This randomness is not just a method of keeping things fresh to avoid repetition; it also plays into the player’s anticipation and excitement. The lack of predictability creates an uncertain environment where players never know exactly what’s coming next, heightening the dopamine response.

This unpredictability and reward system are linked to another powerful psychological principle: the illusion of control. In many games, even though the outcomes may be random, players feel as though their actions have an impact on the game world. This combination of uncertainty and agency—coupled with the steady stream of rewards—creates a compelling loop of motivation that is difficult to break.

Oxytocin, dopamine, serotonin, and endorphins together are known as DOPE—“feel good hormones.” When dopamine’s urge fades away, our mental status is sustained by these other neurotransmitters. If we lack enough of the other hormones to compensate, we will drop into the loop of anxiety and depression.

Common game-related behaviors might also affect our secretion of neurotransmitters. When we stay up late and get exposed continuously in a bright envi-

ronment, the habenula nucleus in our brain will activate and release GABA, an inhibitory neurotransmitter that suppresses the production of serotonin. Thus, when we are enjoying ourselves in late night gaming, phone-scrolling, or similar actions that provide dopamine, we are at the same time destroying our serotonin system.



*Image from piscine26 at Vecteezy*

Serotonin influences various behaviors and functions, such as mood, aggression, impulsivity, and feeding, all linked to reward mechanisms. A serotonin deficiency contributes to conditions like depression, anxiety, and mania. While only 10% made in the brain, serotonin can also influence certain behaviors observed in gaming, though its role is less significant in shaping specific game types. Recent research from Dartmouth university shows that serotonin release level is positively correlated with the subjective value of the reward (Spring & Nautiyal, 2024, p. 1). Thus relating to activities like gaming, higher achievement and recognition will elevate the serotonin level. Based on these results, we could infer that when we reach a higher level goal in the game, or comparatively have a high ranking of gaming skills, our serotonin level would increase.

While the aforementioned hormones are related to positive reward systems, there is a hormone that plays a role with our neural pain circuit—endorphin. Endorphins are neurotransmitters released by the pituitary gland and hypothalamus in the brain. They can alleviate pain, lower stress, improve mood, and enhance your sense of well-being. Also known as “endogenous morphine,” it is a natural painkiller that mimics morphine’s effects. When there is a strong physical or psychological pain, the brain will release this neurotransmitter to reduce the pain. A few seconds after releasing, the individual can escape from the pain temporarily and feel relaxed. This mechanism may explain why gaming, as a stress-relief activity, can evoke a sense of comfort and escape for individuals seeking a break from real-world pressures.

In addition, physical exercise is one of the most effective ways to trigger endorphin release. Thus exercise-based games on platforms like Nintendo Wii and Switch can promote physical activity while engaging the player in an interactive and enjoyable way. This could explain the growing appeal of fitness gaming for individuals looking to combine relaxation, fitness, and mental well-being.

The intricate dance of neurotransmitters in gaming reveals a complex landscape where different design philosophies can profoundly impact player experience and well-being. While traditional game design has largely focused on dopamine-driven mechanics, Death Stranding’s innovative approach highlights the potential of strandlike games. This shifts from trapping players into the dopamine loop to an experience of social connection and mutual aid, suggesting a promising evolution in game design and gaming’s effect on players’ brains.

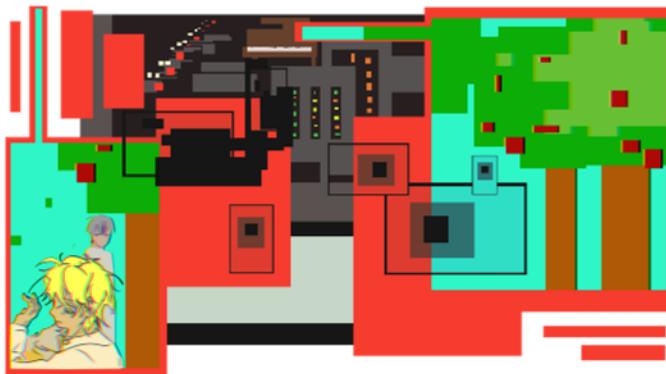
The balance of these neurochemical systems—dopamine’s drive for achievement, oxytocin’s social bonding, serotonin’s sense of satisfaction, and endorphins’ resilience to challenge—creates a more complete and potentially healthier gaming experience. As our understanding of these mechanisms deepens, game designers have an opportunity to craft experiences that not only engage players but also contribute positively to their neurochemical well-being.

Looking forward, the most successful games may be those that thoughtfully integrate multiple neurochemical pathways, creating experiences that satisfy our immediate desire for achievement while fostering meaningful social connections and lasting satisfaction. This holistic approach to game design could help mitigate the risks of dopamine-driven addiction while promoting more balanced and fulfilling player experiences. In an increasingly digital world, such considerations may become crucial not just for game design, but for our collective mental health.

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# Simultaneous Network Service



By Abigail Lin

By Abigail Lin

February 20, 2025

## Part 1 - Secret

There was once a human called Vanya. He had been whole, once. Before the incident, he had been a person of flesh and blood and memories tied together seamlessly. It had been a long time since he last recognized himself.

Now the mirrors are gone, their visions fleeting. It all seems so far away. The things he knew; he no longer knows. His life fills with vast gaps, starting and stopping at random. Even the basics are impossible to retrieve. The more Vanya tries to remember, the less he realizes he can.

Before he died – that's easy enough. It's all a haze. It doesn't matter much.

Wherever it was, it was dark and cold. His hands trembled – he wasn't shivering, but sweating. His mouth was dry. It hurt to breathe. The inside of his throat, sandpaper, head pressed against the linoleum floor. The faint silhouette of an alien reflected off of it.

Vanya presses his hands to his face. His fingers are rough – the callouses tear against his skin.

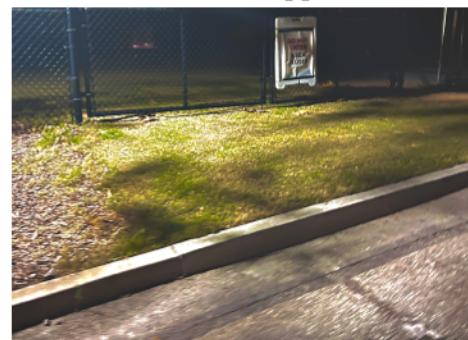
There's something else, too. Vanya sits up and tries to filter out the sound of the breeze. He clenches his eyelids shut. Slowly, the cool feeling of the tiles metals away. He is floating – no, swimming. The air around him warms. It's salty. Bubbles snake up his arms and tickle his face and neck. He stretches his arms out – they hit something metallic. It thumps, but in a way that feels comforting. Like it's hugging him and the water, reassuring him that he won't be let go. Vanya realizes, as his hands trace the metal casing, that the tank

even has a name. It comes to him so easily, easier than his own: it's a maar. It's his mother, his home. The realization makes him even calmer. He sinks deeper into the water.

Then he opens his eyes. Glass on the other side. Blurred shadows look in. His heart sinks. The bubbles bite at his skin, and the walls of the tank heave organically, like they're breathing.

Vanya realizes that he can't. The water roars at his head. His heart pounds, echoing violently off the walls of the tank.

Unable to hold it anymore, Vanya gasps for air. Instantly the memory turns to nothing. He wakes back up at the base of the tree where he'd fallen asleep. A frigid breeze thrashes his hair. He shivers. Vanya stares back out at the golden expanse, still immersed in the light of a perpetual sunset. It is no dream. Despite all his best efforts, he remains trapped here – in heaven.



By Abigail Lin

## Part 2 - Singularity

Heaven is almost like a movie set.

It's not limited or closed. The place evokes a backdrop, or a mural that stretches on forever – manicured, deliberate, bucolic. Each and every shade of color tastes manipulated, oversaturated in the same way you'd expect a postcard to be.

The world also seems alive. The stones, grass and sky constantly murmur, and the dirt road that cuts through the field wavers a bit when it's looked at too long. The distant forest with waist-high trees and offset sphere bushes hum in harmony, its smooth ground devoid of sharp rocks.

The afterlife arrives as swiftly as tomorrow. Every sense buzzes with greater gusto than when alive, as acute as the warmth on the knuckles of his fingers to the tickle of grass under his legs. Pushing himself up

with his broad palms, Vanya has to shut his eyes and brace a hand against painful lights, the sky a bluer and wider expanse than any box he's ever lived in.

The simulated weeds are lush and ripe, cool and waxy to the touch, rustling orange with shadows cast by plump golden stalks of wheat, and there are no painted walls, secret doors, nor metal cubicles nor wire mesh to bound the premises of acceptable human trespass. Freedom rushes to his head like blood. Vanya stands too quickly, clutches his ear to check the notch in the top of the cartilage, and when he doesn't find it, knows, belatedly, that he is dead.

His neck aches, starts throbbing so hard that he can hear it like piano keys. Common time. Something threatens to burst from his arteries. It is rotten, hot, and forgotten.

Vanya tilts his chin up and stares at the sun, pixelated white filling his eyes with the big fake sky, and wonders where everyone has gone. Is he waiting for someone, or is there someone in this vast expanse waiting for him?

There is a figure within the field, parting the grass, rustling in its rush towards him.

It's calling his name when it trips and rolls down the hill, and its back hits the tree next to Vanya's feet with a small thump. Vanya looks down. Another human, with hair so yellow it could pass as white, the hue shifting in impossible directions. The texture spreads over his narrow nape as freely as the long plump ends of grass around them. Upside down, the boy peeks through the top of his shirt fallen over his face and smiles.

"Torr," Vanya says quietly.

"I saw you lying on the hill so I ran over as fast as I could. Look! Isn't the sunset pretty?"

"What happened?"

"Nothing much." Torr is still watching the artificial sunset, reds spreading into oranges that spread into greens so translucent they look like lizard skin as it melds into the deepest, darkest blue of a graphic designer's boundless sorrow. "You're here, and I'm here. It's been a while."

Something is missing in the blurred edges of Vanya's memory, someone muttering and insistent. But Vanya brushes its whispers aside for modernity's sunset, wishing there was a maar, missing the bottomless, deep depths of the tank he was raised in. The tank he hated; water, he loved. There was nothing quite as warm as the sense of floating in saltwater between performances, his fingers twitching as he pounded his palms against the glass, begging for leniency, unable to breathe for the full sentences he served. Every time they punished him

for his mistakes, for pressing his fingers against the wrong notes, one, two, he choked on the water like clockwork.

Close to the edge of the map, there is a lake. Vanya and Torr walk to it one day, half out of boredom and half out of curiosity. Torr suggests they go fishing. Vanya asks how – they don't have fishing rods, and the perfect forest wasn't generated including sticks or branches. What good would a lake and its fish be if they couldn't catch or spear or use it for anything?

"We can just use our hands," Torr says and smiles. It's almost disarming how earnest he is, so Vanya decides not to question him too much. Besides, what else will they do with the time? Surely Vanya can set one day aside to paddle around in a lake, fish or no fish.

It doesn't take too long to reach the lake – though perhaps it does and Vanya doesn't notice it. For all he knows, everything here takes either a second or a year, and whether it's one or the other holds little significance. Time flows unevenly here, like a dream. It's useless to think about. Perhaps that's a good thing. Experiencing each second of eternity would drive anyone insane.

In any case, whether it's an hour or ten months or ten million years, Torr and Vanya reach the edge of the lake. The sky beyond them appears hazy, but still present. Even here, at the edge of the known universe, the illusion of continuity remains. Their reflection glimmers off the lapping waves. Vanya's eyes get misty for a split second. He doesn't know why.

Sure enough, there are dark shadows snaking beneath the surface. They plunge their hands and feet into the water. Torr giggles as the shadows writhe and disperse. He runs further in.

The surface of the maar pit-patterns with soft swallows. Torr kicks up its waves to utter delight. Vanya shrugs and shuffles in beside him. Their pale, thin hands comb through the green water. The pond glitters, layers of colors rippling away in a constant sinusoidal pattern. Mathematical and precise, almost unsettlingly so. The colors are transfixing not because they're strange, or even pretty, but because they're unbelievable. This isn't water. Not real water, anyway. This isn't like any maar he's been in – even if it's more vivid, pushes and pulls against his skin more forcefully, feels stronger and more insistent, it can't fool him. The realer it seems, the more he can't ignore that it's fake.

A cold splash of water snaps him out of his trance. Torr pushes him harshly to get his attention, a fat salmon squirming in his hands.

"See?" He shouts. "I told you we could catch one!"

"I guess," Vanya says, frowning. He tries to smile back and fails. It's too hard to reciprocate the levity

Torr has in spades. He wonders why and how Torr can act this way. When they were alive, he was never this happy, not even close.

"Look at the scales," Torr gasps, holding up the fish to the sky with both hands. "All the colors." He smiles even wider, his teeth showing.

Vanya just stares, quietly hoping Torr lowers the fish back down into the pond and lets it go. Instead, he hugs it close to his chest. The salmon continues wriggling wildly in his arms, but he won't let go.

"It looks so... so..." Torr's voice trails off. The wide smile across his face melts into an intense stare. Vanya shudders. The ripples in the pond freeze in place.

In a split second, Torr bites into the fish. Blood spurts out over his teeth. The salmon jerks. Torr tears off a hunk of flesh and bone with his teeth and greedily swallows it whole, no chewing.

Vanya's abdomen seizes up in white hot agony. He almost screams.

Torr, unfazed, takes another bite of the fish. The pain soars. Beads of sweat drip down Vanya's face. His ears roar with the sound of waves crashing, the sound of applause. The air quivers.

A sharp, stabbing pain stitches Vanya's side and he trips, falling back-flat into the water.

"Do you remember anything yet?" Torr asks him through the mouthful of meat.

"Does it even matter?" Vanya groans, propping himself up on his palms. "Do you?"

Torr's hands twitch underwater. "Why would I want to?" He sniffs. It sounds like a lie.

"I think I was shot in the neck," Vanya says distantly, the memory dragging its way out of the mud. "They took me out back and shot me in the neck, then the heart when I didn't go down immediately, because I... I was... what was it for..."

Torr doesn't know what to say to that. When Vanya turns back, his friend looks disturbed. It's an odd look, brows pinched in deep consideration. Why was it so strange to believe?

"Why are you here?" Vanya asks, stepping closer, and Torr backs off with each foothold. His shoulders are hunched, pupils small pricks of white. "There's something you're not telling me."

"Me too," Torr stops. "You've changed."

When he blinks, Torr's hair has grown, long past his chin, fluttering against his clavicles. He looks older. They both are, suddenly, limbs skinny under suits for supper before the start of the show. When he looks down, his fingers are knobby, broken bones that had never healed correctly, while Torr's hands are sheathed

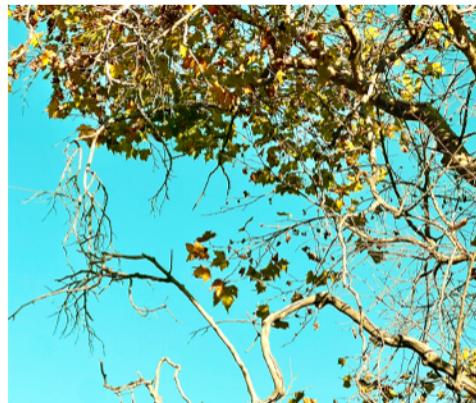
in buttery black gloves. It was a year before he died. The performance hall is massive and wide, amazing to hide in, easy to clean.

"Everything here is so detailed," Vanya observes, dragging his fingers along the long table covered in red cloth. His nails, ripped and cracked and removed only to be sewn on again, feel tender against the surface. "Where's your violin?"

"I should be asking you that," Torr picks up the pace and obstructs Vanya's path. "You can't go this way, you know." Vanya doesn't know, but he doesn't care. "If you walk all the way to the end, it'll just bring you back to the starting point. It's considered a restricted zone."

"Tell me more," Vanya says with disinterest and, for the sake of it, pulls Torr's hair. He yelps, slaps him off, but recovers to find Vanya running into the light at the end of the auditorium.

"I'm serious!" His voice echoes.



By Abigail Lin

### Part 3 - Surveillance

The light dims to a narrow point, and a feeling like the static of a television screen tingles over Vanya's scalp as he forces himself through it, tugging and grasping at the thread of air that hits his cheek, cheap and synthetic. When he can see again the wide open space of a series of shelves greets him with a rainbow of lights blinking like stars in the darkness. Computers, he realizes with a pang. They fill the room in an eerie stillness. The only sounds Vanya can hear are the hum of electricity and the scream of fans, constantly turning, and as he walks past them, the diodes on the servers go green then yellow, red, blue, and back to green again.

"There was a chance that you weren't the one who would make it here." The voice rings from right behind him. Vanya jerks around on instinct but Torr skirts around him, instead punching one of the large servers. It shivers with a red cascade of lights before calming down and running back to green and blue. "I mean, not the you I knew. There's always a fifty-fifty chance that

when they upload you, your consciousness gets split, and one of you gets to go while the other one stays behind. I guess we'll never know which one you are. Both, maybe?"

"Are you real?" Vanya asks him. Torr smirks.

"That's the million dollar question," he says. He stretches the backs of his hands. "I think I am."

"What even is this place, anyway?" Vanya scans his surroundings. Torr points lazily at the cameras. The two can only see the room from their angles, hopping on some IP or the other in all probability - the faint echo of computer lessons multiplies in Vanya's brain, like reading a story and realizing it's about you only at the end.

"I can't be here," Vanya turns. Technological singularity, a teacher whispers. "How do I get out?"

"Nobody 'gets out' of the simulation, dumbass," Torr scoffs. "That would defeat the point of getting in. Where would you go, anyway? Nowhere, that's where. There's nothing out there. You feel it too, right? If you try to look at the edge of your vision, the colors are out of focus, right? Just stay here with me and let's talk. I really wanted to ask you about—" he pauses. Vanya walks halfway across the map, brushing against the bounds of the world. Space is malleable here. Torr grits his teeth and chases after him. "Dude, don't run off! Stay still for a second!"

"There has to be a way to leave," Vanya murmurs.

"I forgot you were like this. Why are you always so obsessed with leaving what's good for you?" Torr trails him begrudgingly. Vanya wonders if Torr is bored of the sights of heaven yet or if there really is nobody else in this server. It must have been a lonely existence before Vanya was uploaded here - at Torr's instruction, Vanya thinks.

It must have been really lonely if he asked for Vanya, of all people, to be transferred here. Vanya, who cannot remember more than two good memories in Torr's contradictory, uppity musical presence. They had argued far less in the days leading up to their final performance together. Blurred by time and memory's touch, preserved in the heat of anger Vanya had turned away from the sullen set to Torr's jaw after yet another tantrum. He wondered if Torr ever felt sorry, sitting alone in the tall grass in the endless silence that followed the shot on stage.

He had a front-row seat to the murder, but he had seen nearly nothing. Vanya had been so focused on finishing his piece that he paid no heed to the end of the violinist's segment until it did not pick back up when he got to the ultimate movement. Then he looked to

his side, and all he saw was a rapidly spreading splatter of blood. He hadn't had the chance to apologize for breaking Torr's rosin the night before. It was a senseless tragedy.

"Did you ever get to see the world outside the time you spent on your violin?" Vanya attempts to explain why, like any human, he does not want to stay in what amounts to purgatory forever and would rather face an atheist's hell or reincarnation than prolong his vegetative state.

"I mean, what was the point? I didn't have any money for that, and my house was demolished, so it's not like there was anywhere I would want to go," Torr says, crossing his arms.

"If I knew that was why you were such a prick I would've gone easy on you out of pity."

"Alright, you sack of shit. What about you, huh? Were you bred and born in a lab for the sole purpose of making the sexiest top ten pianists alive or something?"

Do not smile patronizingly, Vanya orders himself. He shrugs in the black space. "I mean, yeah."

"That's tough," Torr says awkwardly.

"I think this place is pretty boring," Vanya says. "It's everything I've seen before. Maybe you find it comfortable and familiar, but I don't think I can take it here with just us alone. Don't you think it's strange, anyway? It's not painful, but you can't feel much else."

"I guess..."

"Don't you have people you want to see more than me?" Vanya continues. "Your parents, your sister, your friends? I'm sure once we get out there's something beyond this wall. There's nobody here. It's a little weird, I guess, since all these places should have people in them, right, but then there's nobody. There's too little stimulation. There's nothing to eat, either."

"Sure," Torr concedes. "Sometimes, I thought it was just what it was supposed to be like..."

Vanya turns. Looks at him.

"I just think there are better things out there than staying alive for nothing but the people that want to reuse our skills," he says with a strong undercurrent of determination. "It's like playing the same thing over and over again endlessly. They need to make their own new compositions."

"Symphonies should be celebrated for how good they sound, though. There's not an infinite amount of rearrangements you can make when the same few chords sell well."

"Not my problem," Vanya says disdainfully, the paragon of apathy.

He pulls the plug.

# Human Subjectivity and Experience



*Photo by Fanny Lour*

By Johnny Dippery

October 10, 2024

As the sun dips below a glossy horizon, its meaning carries more weight than a mere visual spectacle. For one, it's a passionate blaze sequestered within the vacuum of space. For another, it's a religious deity curtailing its daily reign. For me, it's a symbol of life, acting as a blanket of emotional warmth, memories, and vivid sensations. This idea of qualia, a subjective, ineffable experience shaping our perception, draws into question the idea of Human Subjectivity.

From ethics to politics, to interpersonal relationships, Human Subjectivity sits at the forefront of human conflict. While it is useful to try and understand these problems from a domain-specific viewpoint, it is equally, if not more crucial, to study the players responsible for constructing these varied perceptions. To do so, and understand the social implications of these clashing interpretations, we must answer a core question: How does the way people see the world differ between individuals, and how does human perception lack objectivity in the first place?

It takes as little as a box of crayons to see that children have rich, abstract imaginations. Yet to be encumbered by cultural parameters and lacking particular foresight established through neurological development, their thoughts run freely through a landscape of

ordered chaos. With the hindsight of maturity we can recognize these constructed worlds to be false; however, what renders them false to the child? While the outcome of this perceptual dialogue remains unspoken, it does raise an interesting question; what is a correct perspective and how does it come about?

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It takes as little as a box of crayons to see that children have rich, abstract imaginations. Yet to be encumbered by cultural parameters and lacking particular foresight established through neurological development, their thoughts run freely through a landscape of ordered chaos. With the hindsight of maturity we can recognize these constructed worlds to be false; however, what renders them false to the child? While the outcome of this perceptual dialogue remains unspoken, it does raise an interesting question; what is a correct perspective and how does it come about?

To answer this question, let's focus on three schools of thought, beginning with perceptual comprehension, moving to the cultural environment, and ending with expertise.

## Perceptual Comprehension

First, let's begin with the aforementioned gap in perceptual comprehension between children and adults. Imagine a living room with a parent, Sara, and her child, Jay. While Sara picks up a magazine to read, Jay sees a collection of colorful photos that overpower ordered symbols. While Sara sees a cloth draped over a table, Jay sees a wizard cape concealing an irregularly shaped man. For Jay, his interpretation stands to be true, and amongst his peers, this seemingly fictitious narrative is sometimes confirmed. Conversely, Sara, as do many of us, believes otherwise, as our developed cognitive faculties provide us with a more tangible, in-

teractable existence.

Although Jay's account of reality seems misguided, it does teach us a valuable lesson. Specifically, the idea that our perception is malleable, formed through fluctuating variables like neurological development, for example.

## Cultural Environment

This susceptibility of perception becomes more apparent within the second school of thought, cultural upbringing. A digestible example of a cultural upbringing's influence on perception comes from the realm of linguistics, specifically its expression of color..

Color exists as a large spectrum of melding colors. However, through language, we establish arbitrary boundaries, creating culturally dependent distinctions within an objective spectrum. These borders allow us to better navigate the abstract concept of color, discussing and interacting with color whilst using more comprehensible tools. It's essential to understand these linguistic "trailheads" exist purely as social constructs and are used as a cultural framing tool to influence the way humans perceive color.

An example of this comes from a [study](#) on color categories, which provides evidence in support of the previously discussed cultural relativity hypothesis. This series of experiments conducted by the Department of Psychology, University of Essex studied the color perception of the Himba tribe, comparing aspects of their relationship with color to that of the English and Berinmo languages.



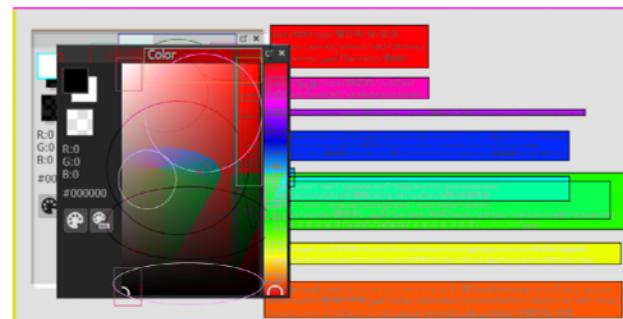
by Blog Transparent

The findings of the study explored the varying implications of differences in linguistic labeling with color dependent memory abilities, boundary shifts, and color naming tendencies all fluctuating between languages. In short, it discovered that there were *differences* in how Himba tribe members perceived color relative to Western labeling. Why was this?

Though colors remain objective, the environment of the Himba tribe has fostered cultural parameters that influence how they see color. Their ability to identify differences between particular colors contrasts from a

Westernized perspective where their "trailheads" are placed differently amongst the color spectrum. These distinctions further highlight the relationship between cultural parameters and individual perception.

This idea of linguistic relativism is not restricted to color; we see its impact through the way speakers of gendered languages interpret objects associated with gender. When asked to describe particular inanimate objects, native speakers of languages will often subconsciously attach gendered cultural attributes to the object, perceiving those objects through the relevant gender lens.



by Abigail Lin

Let's look at the word for "bed" in Italian versus Spanish. If asked about their beds, an Italian speaker may describe stereotypical masculine attributes, such as a brooding frame, sturdy metal, and inserted brackets, while a Spanish speaker might explain its stereotypical feminine aspects, such as a comfortable mattress, a particular sheet, and feather pillows. The way the bed is constructed in their minds *typically* goes through a gendered framework, attaching arbitrary, socially constructed characteristics to inanimate objects. This not only perpetuates said beliefs within social groups but additionally fuels the established pretext which serves as the foundation for this cultural belief system.

Through these examples we can understand how despite not being the sole determiner of perception, language does influence the way we see and think about the world, best expressed through the idea of linguistic relativism.

## Expertise

The last school of thought is built around the idea of practice, or, more specifically, individual expertise. Expertise can best be defined as the fluctuation between the perception of a behavior and the practice of that behavior over an extended period of time. A prime example of this comes from professional sports, such as the NFL.

When an average person is watching a football game, they watch it with its basic rules in mind, perhaps

catching a flashy move or two. When a pro watches the field, they visualize the routes made by each player, predicting what will happen next. For them, they literally view the game differently, subconsciously utilizing their practiced understanding to see the game in a new light. The football game never changed, its actions and behaviors remain constant, rather a shifting knowledge of the game results in the same input being interpreted in a new manner.

While football is a good example of understanding this concept, it can more broadly be applied to the idea of practice in general. Through practice, experts of all crafts can see domain-specific problems differently, relaying their current input over past experiences. This learned ability stresses the old quote, “practice makes perfect” as it is the practice of a particular action that allows an individual to differently perceive specific problems.

These three variables demonstrate how reality is perceived differently between individuals. Even though the world exists in an objective sense, our neurological differences, cultural upbringing, and practiced abilities contribute to how we see the world.

This deconstructs the myth of human objectivity, highlighting how our interpretations of the world may be best described as a mass amalgamation of varying subjective experiences. Here lies the issue of Human Subjectivity and Experience: we *know* the world to be of our subjective experience, therefore we must be aware of this shortcoming in our perception whilst acknowledging the implications of playing into a homogenous narrative.

## Falsity of Senses

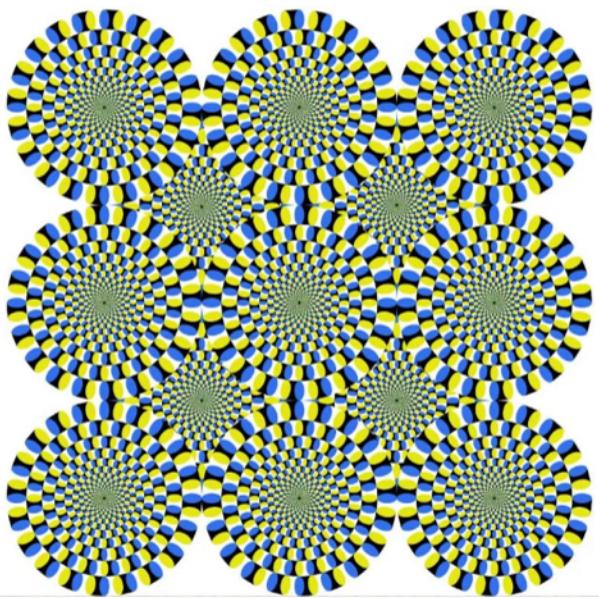
To better support the bold assertion that the world is inherently subjective, we must explore how we often deceive ourselves into perceiving it as objective. In the first section, we discussed how our perception is always shifting and how a stagnant world can differ in interpretation between individuals. Now we take it a step further, suggesting that the foundation that allows for these different interpretations is itself fractured, serving as a facade for an objective reality.

To answer this question, we must evaluate how we substantiate reality: our senses. Since interaction between these senses is what provides us with an interactable existence, we must approach them individually.

## Optical Illusions

Let's first look at vision. The selectivity of the visual process has historically remained evolutionarily advantageous for our species, as fixation on irrelevant stim-

uli would result in a lower fitness. With that said, this has brought with it adverse effects, as this rejection of particular inputs has narrowed our vision, disregarding specific stimuli and focusing on what the brain deems as important.



by Akiyoshi Kitaoka

Our brain does this to allow us to understand the world, however, in the process it lies to us, taking shortcuts to try and create a more palatable picture. These shortcuts are further emphasized through practices highlighting their deficiencies, for example, optical illusions.

Optical illusions take advantage of how the brain creates perception in the first place. Since the brain wants to create a convincing medium to interact with, it fills empty gaps with what it thinks should be there, typically resulting in the illusion of movement for many optical illusions. Even if a picture remains stagnant, how the lines and patterns curve tells our eyes a different story, warping the real picture into one we better understand.

Even though we are actively conscious of the deceiving nature of these illusions, we remain unable to avoid their effects. Furthermore, we accept this visual narrative, applying its elements to our everyday lives.

## Vision and Depth Perception

Going more in-depth on the avenue of vision, let's paint a scene. Visualize yourself on a log overlooking a meadow. Looking down you could see the detailed notches and bumps of the wood, the blades of grass below, and the scattered flecks of dirt. Now looking up, these details shift from defined characters to a blend of colors, identifiable more by their movement with the wind than their visual details. These details exist on all logs, all blades of grass, and all dirt, but our neurolog-



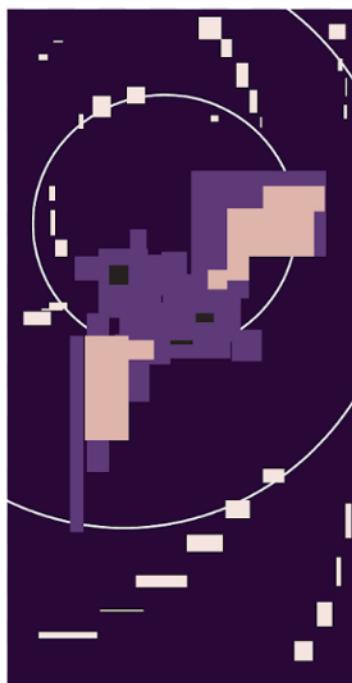
By Abigail Lin

ical framework only allows us to see within a particular distance. Our brain has decided that the reality most palatable to us is one that blurs definition from afar, and evolution affirms this to be a proven method. However, we must not forget that the definition *does* exist, that our minds' rejection of it doesn't disprove its existence in the first place, but rather allows us to interact with it in a particular manner.

Now that we have established the cherry-picking tendencies of our ocular system, how do we bring this idea to a broader discussion, or more specifically, one that emphasizes domain-specificity?

Getting rid of our vision, let us return to our scenic overlook. What would the meadow look like? The log? The grass? The dirt? Without vision, the medium of sight ceases to exist, yet the objects discovered through said process do not disappear. The interaction between our remaining four senses tells us very well that these objects remain present; they just occupy another medium of existence not quite attainable without the eye.

Take for example a bat, whose eyesight is extremely poor. For a bat, the world exists as reverberations of sound waves off walls: the world is a void that is discovered through the tools provided to them. For bats, sound acts as their eyes, as it is their way of "seeing" objects around them and interacting accordingly. The world remains the same, but the way they perceive the world is their subjective experience.



By Abigail Lin

We act similarly. The world exists as a void and our senses allow us to interact with it in a particular manner, but just as a bat lacks proper eyesight, who is to say we exist in the best medium of perception? These senses are not the only senses that can interact with the world, they are just the ones we have evolved with. Although the things we interact with *feel real*, so too does echolocation for a bat. There are many avenues of perception available and we only occupy a few.

Knowing that the world we perceive is not fully objective brings about a plethora of implications. In this next section, we seek to explore the potential consequences of these implications, investigating the social and technological implications this idea has on the future of humanity.

## Human Applications

Throughout these discussions we have reached two major conclusions that will formulate our thinking to come. The first is the notion of fluctuating perception, or the idea that perception differs between individuals. The second builds off this idea, claiming that this perception is not only shifted, but furthermore, is predicated on an erroneous foundation of objectivity. While it is easy to discuss these ideas, conceptualizing them often feels troublesome. After all, humans originally established these constructs to best make sense of the world around them and to deconstruct them feels antithetical to a deep rooted human instinct. With that said, by acknowledging these two notions, we can interpret world issues from a new lens, with issues ranging from social conflict to tech all falling under investigation.

## Conflict

At the core of all conflict lies the idea of difference in agreement. It is these differences between individuals that leads to conflict, further feeding into a grand narrative that plays out in an ouroboric manner. However, despite what an opposing player may believe, these narratives come from a place of *truth*. Perhaps not an objective truth, but rather a subjective truth, built upon through years of specialized cultural upbringing.

The crux of this turmoil is that both players firmly hold their truths to be objective, their worldview correct. They tackle the problem with an abrasive mindset, invalidating each other's opinions through misguided logic. The rejection of an opposing narrative gives it the attention it needs to fester, inadvertently providing validity to its existence. This results in a snowball effect, as further amendments to the original grievances are attached, diverting focus from the incredible original storyline.

Moving from the vague idea of conflict altogether, let's focus on a more specific case study, religion. For people raised within a particular religious environment, it becomes exceedingly difficult to separate oneself from its associated dogma and beliefs taught to them during their upbringing. Because of this conflict spurs when values clash.

Here the stories feel less imagined, they seem substantive and rich, deeply integrated into personal identity and vastly interwoven throughout varying cultural groups. When you yourself become the subject of reflection, it becomes exceedingly difficult to try and put yourself in other shoes, to demystify what has grown hand and hand with you your entire life. Imaging your life without this influence highlights the issue of Human Subjectivity, more specifically, our struggle to create an impartial, dissociated perspective. With that said, acknowledging the power these narratives hold over our lives remains integral in better understanding the root of conflict.

## Tech

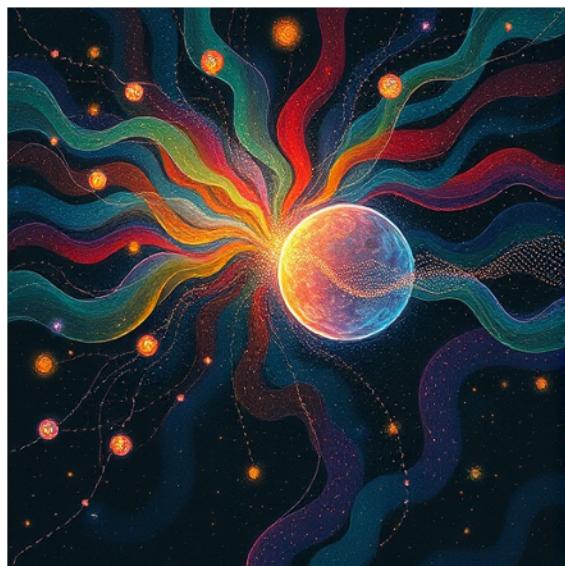
What does it mean to say our reality is constructed? This idea is constantly being asked in the tech world, and in recent years has exploded. From new virtual technologies ranging from the Oculus, to the Apple Vision Pro, to even the Las Vegas Sphere, we have seen a rapid development in alternative existence like never before.

Literally in its name, virtual reality serves as an elementary example of perceptual reconstruction. This technology takes advantage of the building blocks of our own perception and seeks to recreate it virtually. It accomplishes this by dulling the user into another state, tricking their mind despite their conscious awareness of the artificiality of the experience.

The most interesting aspect of this technology is not the state that it puts the user in, but rather, the users inability to easily dissociate from such a state, and later "return" to reality. Just as discussed earlier in the optical illusion example, we are entirely aware of the falsities of these situations yet we remain unable to escape from their effects unless we directly act on them. It seems that this new reality altering tech takes advantage of these biologically developed traits and uses them to further dull the user. This further plays into the idea that we accept the reality that is presented to us.

So what are the implications of the popularization of an alternative existence? By providing a new reality more pleasant than one's own, we establish a dangerous precedent that could determine the future of our species. Furthermore, this technology has become intermingled with the world of business which seeks to

capitalize on profits rather than ponder potential "ifs."



*Generated with Microsoft 365 AI*

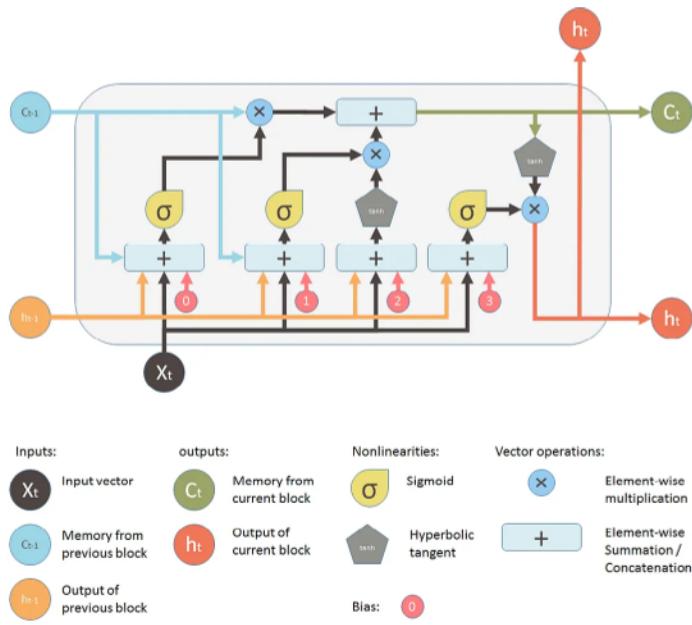
A good example of this potential future comes from the popular science fiction novel, "Ready Player One," which serves as a narrative that explores the social, economic, and ethical implications of this potential world. It helps display a future where the interplay of tech and artificial reality becomes a consuming force on all aspects of life. Stories like these help to remind us of some consequences of these developments that we ought to be cautious of.

## Conclusion

Throughout these articles we've battled with the essence of the human experience, learned about the falsities of the senses, and explored the implications of those statements on the idea of human conflict and future tech. Despite the fact that these debates are part of a longer and still ongoing discourse about the human experience, the capacity of our species to navigate these tendencies remains a testament to the human spirit.

# Thinking like LSTMs:

## A Human's Guide to Machine Memory



By Yan, S. (2016, March 3)

By Varun Sekar

March 14, 2025

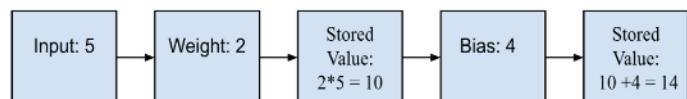
The human brain, in all its complexity, can hold thoughts, emotions, and perceptions of the observable. However, these ideas are constantly shifting, sculpted by personal experience and time. This gives rise to a diverse spectrum of memories, ranging from core memories like the smiles of our loved ones to momentary ones like the most recent song you listened to. These memories influence how we think and act, continuously adapting as we gain new information from interacting with the world.

Surprisingly, we can quantify this dynamic behavior through a machine learning model: The Long Term Short Term Neural Network (LSTM). Like our minds, which hold onto the significant and let go of the fading, the model mimics this ability by retaining long-term information, forgetting unnecessary noise, and updating short-term perceptions.

### Let's Talk Theory:

Throughout this article, I will be using terminology like weights and biases. Weight is a number you multiply by an input number, and bias is a number you add to an input number.

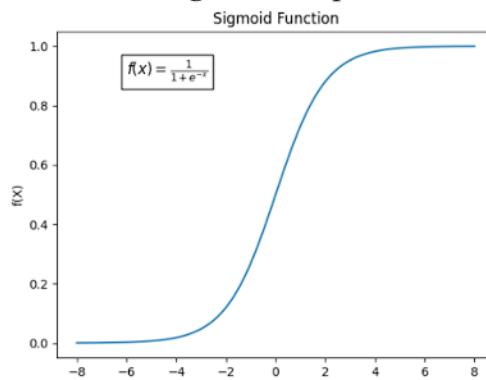
Here is a quick example:



So let's imagine that at a specific point, the value is 5. This means the input is 5. If it goes through a weight of 2, it will multiply with the weight value and now be 10. Then, if there is a bias of 4 applied, then the new stored value of 14. It is just multiplication and addition!

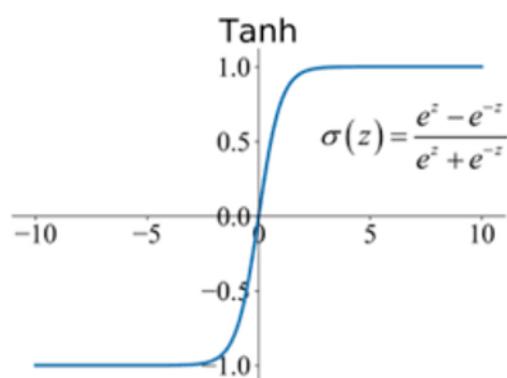
Long-Term Short-Term Neural Networks utilize two fundamental mathematical concepts: the sigmoid activation function and the tanh activation function. The sigmoid activation function converts any  $x$  value (the input) into an output from 0 to 1. On the other hand, the tanh converts any  $x$ -value (the input) into an output from -1 to 1.

### Sigmoid Graph:



Code Academy. (2023, July 7)

### Tanh Graph:



Papers with Code (n.d.)

It's important to note that the Sigmoid Function creates percentages to apply to values. Tanh, on the other hand, creates new values to be input to pre-existing ones (updating).

The LSTM is made up of 3 primary "gates" or stages.

1. Forget Gate: Percentage of original Long Term Memory Remembered
2. Input Gate: Addition of potential Long Term Memory to the original
3. Output Gate: Calculate a new Short Term Memory

Long-term memory is the memory that carries knowledge from past experiences that the LSTM decided were important. Think of it as something meaningful that stays with you, such as when you graduated from high school. Short-term memory is the most recent knowledge. Think of it like what you had for breakfast, useful right now but easy to forget.

Input is the new information getting fed into the LSTM. This is like looking at an object or listening to something someone said. The entire purpose of the LSTM is to decide if this input is worth remembering in the short term, storing for the long term, or forgetting completely.

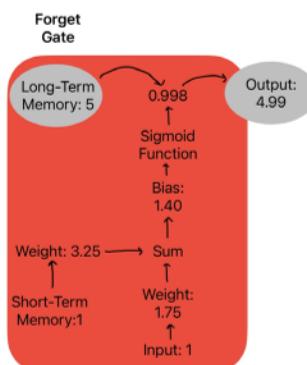
Let's look deep into each LSTM Gate for a better understanding. Let's talk about how it makes those decisions.

## 1. Forget Gate: What should we erase from memory?

This is the first thing the LSTM does. It takes the current input and the short-term memory, applies unique weights to each value, and sums them together. Then a bias is added to that sum, and the result is passed through a sigmoid activation function. The sigmoid outputs a value between 0 and 1 (Basically, a percentage).

Here's an example:

In the diagram below, the input and short-term memory are both 1. Each gets its own weight.



*StatQuest with Josh Starmer. (2022, November 6)*

We multiply:

- $\text{Input} \times 1.75 = 1.75$
- $\text{Short-term memory} \times 3.25 = 3.25$

Then we add them together and apply the bias:

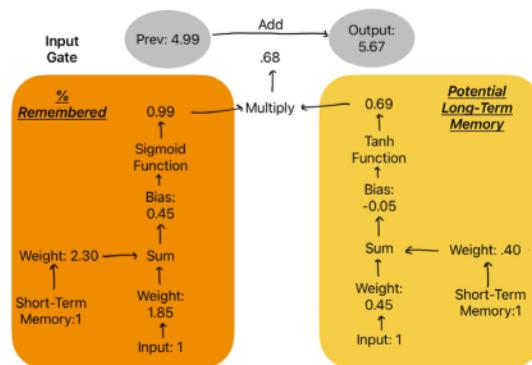
$$(1.75 + 3.25) + 1.40 = 6.40$$

That number is passed into the sigmoid function, which outputs **0.998**. This means **99.8%** of the long-term memory is kept, giving us a new value of **4.99**.

So the forget gate decided, "Yeah, almost all of that memory is still useful."

## 2. Input Gate: What new information should we add?

This is the second step of the LSTM formula. This gate does two things: calculate a new memory with the tanh activation function and decide how much of the new memory is added to the long-term memory that was kept after the forget gate. Funny enough, it has two pathways.



*StatQuest with Josh Starmer. (2022, November 6)*

Once again, the LSTM takes the current input and the short-term memory for both pathways. Each pathway has its unique weights and biases. However, one goes into the sigmoid activation function and one goes into the tanh activation function. The two outputs are multiplied and added to the previous long-term memory from the forget gate.

In the orange (sigmoid) path:

$$(1 \times 2.30) + (1 \times 1.85) + 0.45 = 4.60$$

The sigmoid turns this into 0.99, which means "keep 99% of all the new info."

In the yellow(tanh) path, we calculate:

$$(1 \times 0.45) + (1 \times 0.35) + (-0.05) = 0.80, \text{ which the tanh function gives about } 0.69.$$

Now multiply them:

$$0.99 \times 0.69 = 0.68$$

This value is then added to the long-term memory from the forget gate:

- $4.99 + 0.68 = 5.67$

So, the input gate decided “this new info is valuable,” and the memory is updated again. This new long-term memory holds context across time and will pass it down to the next LSTM unit (starting the process all over again).

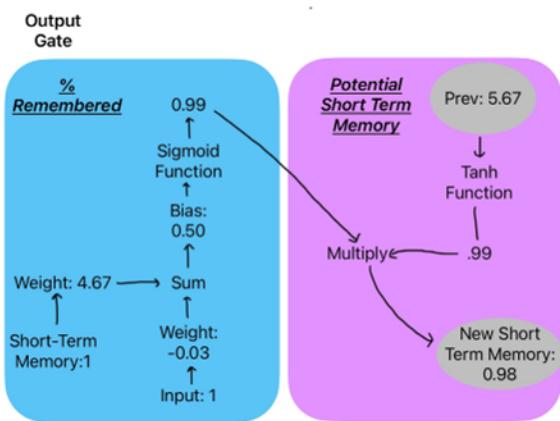
### 3. Output Gate: Changing the Short-Term Memory

The purpose of this gate is to update the short-term memory.

Just like before, the output gate uses the same two inputs: the current input and the short-term memory from the previous step. But this time, there’s only one path. Specific weights and a bias are applied to these values, and the result is passed through a sigmoid activation function.

At the same time, the newly updated long-term memory (from the previous gates) is passed through a tanh function to squash it into a manageable range.

Finally, the outputs of the sigmoid and tanh are multiplied together to produce the new short-term memory for this time step.



StatQuest with Josh Starmer. (2022, November 6)

In the diagram below, the input and short-term memory are both 1. Each gets its own weight.

We multiply:

$$\text{Input} \times (-0.03) = -0.03$$

$$\text{Short-term memory} \times 4.67 = 4.67$$

Then we add them together and apply the bias:

- $(4.67 + (-0.03)) + 0.50 = 5.14$

That number is passed into the sigmoid activation function, which outputs **0.99**. This means 99% of the

current memory is allowed to pass through.

At the same time, the new long-term memory is passed into a tanh function, which also gives **0.99**.

Finally, we multiply:

- $0.99 \times 0.99 = 0.98$

This gives us the new short-term memory: **0.98**.

Once the LSTM finishes updating its short-term memory through the forget, input, and output gates, that short-term memory becomes the key to making a prediction. Even if you’re working with just one time point, the LSTM processes that input and forms a kind of “thought,” a numerical summary of what it understood. This summary is called the short-term memory, or hidden state. To turn that into a prediction, we pass it into a Dense layer, which is just a simple layer that applies its own weights and biases. The Dense layer takes the LSTM’s current “thought” and converts it into a final number, which is your prediction for the next time step. For example, if the hidden state was 0.98, the Dense layer might multiply it by 2 (the weight), add 1 (the bias), and predict 2.96 as the next value. That is how the memory updates we’ve been walking through actually lead to real, useful predictions.

*Want to learn how to build this model yourself? Check out our step-by-step guide on the UCLA CruX Publications website, [cruxpublication.com](http://cruxpublication.com)*

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# Interview with Dr. Adam Dorsay



By Aadi Ajmire

March 2, 2025

## Who is Dr. Adam Dorsay?

Dr. Adam Dorsay is a licensed psychologist and executive coach who supports high-achieving individuals including tech executives and athletes. Based in San Jose, he is the host of the Super Psyched podcast and a TEDx speaker. His work emphasizes emotional well-being, connection, and vulnerability, shaped by over 20,000 hours of clinical experience and a multicultural background including time living in Japan.

## Career Journey & Inspirations

Dr. Dorsay's interest in psychology began at age 13, influenced by his own therapy experiences. Despite struggling with undiagnosed ADHD and dyslexia, he found inspiration through mentors and eventually returned to graduate school later in life after a detour in the corporate world. His path reflects resilience, delayed gratification, and a deep calling to help others.

## On Mentorship

He underscores the power of mentorship, rooted in humility and hunger. Mentorship should be approached through offering value, not by asking for favors. His story of forming a transformative bond with

Dr. Alan Greenberger exemplifies how mentorship can blossom from persistence, respect, and mutual growth.

Mentorship, according to Dr. Dorsay, is reciprocal. Mentors benefit from being challenged and gaining new insights, just as mentees grow through experience and feedback. He believes authentic mentor-protégé relationships can be life-changing, but only for those who are truly coachable and willing to embrace vulnerability.

## From Gang-Affiliated Youth to Silicon Valley Executives

While outwardly different, both groups struggle with shame, emotional repression, and father-related trauma. Dr. Dorsay's therapeutic goal is to "make the unconscious conscious," allowing clients to recognize hidden pain.

Tools like increasing emotional vocabulary, confronting alexithymia (the inability to describe feelings), and creating a psychologically safe space for vulnerability are key. Whether it's a teen or a CEO, the limbic system responds similarly to emotional triggers. His mission is to help people, regardless of background, remove the "rock in their shoe" that's been hurting them for years but hasn't been acknowledged.

## Thoughts on AI

Dr. Dorsay compares AI's potential to Star Wars' battle of Jedi versus Sith—its impact depends on the user's ethics. He warns that if AI is shepherded by unethical or harmful forces, it could become a tool for manipulation, exploitation, or dehumanization. The technology itself is neutral—it's the application that determines its moral weight. This makes it imperative for well-informed, value-driven individuals to be at the forefront of AI development. In his words, people like the interviewers—who are "good people"—must become highly literate and responsible AI practitioners.

While AI can enhance human experience, it must be guided by emotionally intelligent and morally sound individuals. He stresses that love, empathy, and emotional connection remain uniquely human traits that AI cannot replicate. As such, he sees emotional intelligence as a critical skill in an AI-integrated world. For society to benefit, we must prioritize ethics and emotional literacy alongside innovation.

## Authentic Connection in a Digital Age

He warns of the "NutraSweet" version of connection offered by social media—temporarily satisfying but not nourishing. True fulfillment comes from face-to-face interactions, community, and nature. Psychological safety, curiosity, and presence are essential to building trust and deep relationships.

He refers to concepts like "forest bathing" and "biophilia" to underscore the importance of connecting with nature, and to "psychological safety," coined by Amy Edmondson, to emphasize the need for non-judgmental, supportive environments in human relationships. Being physically present with others builds deeper trust and connection—something that can't be replicated by likes or emojis on a screen. Even small in-person moments, like chatting with a barista or Trader Joe's cashier, can be deeply fulfilling and create lasting relationships.

## Meaningful vs. Surface-Level Connection

Meaningful relationships require genuine interest and vulnerability, unlike transactional online exchanges. According to Dr. Dorsay, meaningful connections are born from intention, curiosity, and presence, while surface-level interactions—such as social media engagements—are often sprung from dopamine boost that arises from approval. Dr. Dorsay encourages people to remain curious and sincere, as those qualities foster trust and lasting bonds—something AI cannot imitate.

He illustrates that the more curious and informed we are, the more likely we are to form meaningful relationships. When someone mentions something specific, such as living in Seoul or being from a niche neighborhood, genuine curiosity allows for deeper engagement. Being widely read, informed, and emotionally present can open doors to surprising, serendipitous relationships.

## Personal Reflections

**Dream Visits:** He'd love to visit Barack Obama, Abraham Lincoln, Oprah Winfrey, and Moses. His choice comes from his deep admiration to the figures who could devise solutions to challenging problems and express empathy toward other individuals. In his response, he stresses the importance of experiencing people's lives intimately to understand their values.

**Living in Japan:** This period taught him to embrace silence, challenge assumptions, and expand empathy. It strengthened his cultural sensitivity and personal growth.

He recalls how Japanese culture challenged many of his assumptions, especially about communication

and social interaction. For example, he had to learn to embrace silence as a sign of comfort and respect, something unfamiliar to him as an expressive, high-energy individual raised in a talkative household.

**Parenting:** Fatherhood profoundly deepened his emotional insights. From daily interactions to sending his son to college, he describes parenting as both heart-wrenching and inspiring. His goal as a father isn't just to provide but to truly understand and support who his children are—not who he wants them to be. He acknowledges that parenting in today's digital world requires openness to new technologies while maintaining strong core values. He strives to remain attuned to his sons' evolving realities and maintain deep emotional resonance with them.

One of the most poignant moments he shares is dropping his son off at college, an event he thought he'd handle with composure but instead found overwhelmingly emotional. He describes "ugly crying" in the car, realizing the depth of that parental bond and the bittersweet beauty of seeing your child step into the world. He strives to support his children for who they are, while staying emotionally attuned to their evolving worlds.

## Final Message

Dr. Dorsay's insights emphasize the shared emotional core of human experience—regardless of background. His work bridges deep psychology, cultural empathy, and real-world wisdom. Above all, he champions showing up with presence, heart, and curiosity as the key to personal and relational fulfillment.



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