# Boa, Puma, Condor, Sage: A Field-Deployable Neuropsychiatric AI for Soldiers and the Paradox of Peace

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**SUMMARY:** I present a short story intended to showcase a field-deployable neuropsychiatric AI for soldiers. I employ a narrative science-fiction approach to present the value of this technology, ethical considerations surrounding its use, and the possible issues that emerge when we try to imbue AI systems with the capability to care, feel compassion, and to be ethically driven.

Soldiers and veterans face enormous mental-health burdens and there is an important need to develop creative and cost-effective approaches for their psychological support. Many interventions like talk therapy, cognitive-behavioral training, and meditation based interventions have been used to treat PTSD, anxiety, and depression in soldiers and are all therapeutic modalities that have the potential to be delivered with support from specifically trained LLMs, alone or in conjunction with a therapist. Additionally, there are various non-invasive biometric tools that could be feasibly be deployed for front-line support. Here, we present a technology that aims to address this need, offering an LLM designed for mental-health support and integrated with the ability to physically interface with the world through a collection of non-invasive biophysiological recording techniques that can inform the use of a neuropsychiatric AI in front-line mental-health support, capable of providing personalized diagnoses, treatment recommendations, identification of soldiers that need in-person support, and the deployment of LLM based mental health interventions. Importantly, imagining field-deployable technologies like this is important, offering cost-effective support strategies capable of reaching otherwise hard to reach and vulnerable populations

Here, I share this technology through a story that takes strong science-fiction inspired imaginative liberties, with the physical presentation of our technology imagined as a a robotic monkey named Sage, where all of its sensors are embedded into its physical body. Sage carries a toolbox of non-invasive biophysiological tools that could feasibly be deployed in a front-line environment. While the story takes an imaginative view of how these tools would be deployed, these technologies do all exist in easy to deploy and medically appropriate forms. Together with the possibility of designing modern LLMs for neuropsychiatric evaluation and treatment support, these tools could allow for uniquely refined diagnostic and clinical intervention in combat zones.

The story takes place in the context of a South American insurgency at some point in the near future. Our protagonist is Sage's engineer and through the story, she recalls the motives behind his design, the problems she encountered in its delivery given how mental-health motives can contradict with the priorities of military training, and to confront the consequences of imbuing AI with compassion and an embodied existence as Sage takes on more life-like characteristics. In the end, the protagonist must engage with a paradox that is always present in the work of addressing soldier's well-being, is not, the best avenue for supporting soldiers actually through peacebuilding?

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A bead of sweat dropped from her brow to the dirt below in the thickness of the jungle heat as she twisted a final screw and leaned back to take in her work's completion: Sage, a 1 foot-tall robotic monkey, modeled after the local marmosets, marked by a gentle smile, kind beady eyes, and an array of shining tungsten whiskers. She reached behind his head, pressed a button, and his eyes glowed. Behind him, 6 other identical designs, ready for deployment.

Before her smile could break, the canvas doorway to her workshop opened and as the general stepped in, followed by two others in dark green camo, rifles in hand, she quickly raised to attention.

"It's time, the first wave is ready to launch, we need you out here."

"Yes, sir!"

He looked at the table, eyes narrowing, "and these?"

"They're ready to be shipped to the other battalions sir, Sage 2.0"

She held her breath, trying to read his narrow stare as he paused.

"I didn't expect monkeys… your style is consistent, I guess," and turning to the man on his left, "see to it that these go out immediately."

She inhaled and felt her heart pounding, she knew he didn't care for Sage and was only humoring her, his interests stood outside the tent.

"Let's go, the others need to be ready to launch." He turned and stepped out and she followed, emerging from the tent into a humid clearing beneath the Amazonian canopy.

She looked around taking in the stillness in what was usually a bustling encampment. Small teams of soldiers stood together, spread out across gnarled trees and creeping bushes, and with each team stood her creations, the reason she had been brought here: Menacing robotic drones in three animalistic configurations. She had named them Puma, Boa, and Condor.

Puma, a jaguar-like drone was most numerous around them. When she was originally recruited, she was tasked with reproducing militarized versions of Boston Dynamic's "Spot", inspired by videos of its deployment with police [1]. Adapted for the Andean jungle, Puma was a nimble creature, 5-feet-long, with sharp claws for climbing, a heavy tail for balance, motion-sensitive eyes, and protruding like fangs, two firearm muzzles-- Puma was their mass produced infantry-strike force, outnumbering the enemy 50 to 1.

Boa, the largest of them all, was a a 6-foot-tall amphibious serpent-like machine, designed to shuttle soldiers across mud, water, and steep mountains while serving as a forward base for remote Puma control.

And bringing her back to the task at hand, the general called her over to the nearest Condor, a wide-winged reconnaissance drone, with wings covered in solar panels to allow for lengthy high-altitude high-altitude flight. Critical for the start of their campaign, it could jam enemy systems as soon as it reached their vicinity.

"It all depends on Condor," he said, looking to her and to the computer-operator beside them.

"We bought every extra day we could to build up this force but now their drones have us zeroed in. They don't know what we've been working on so we have the element of surprise but we'll only have 60 seconds between when they see Condor clear the canopy and the bombs start raining-- if you don't jam them right away, we don't stand a chance, understood?"

"Understood."

He looked them both in the eyes, nodded, and stepped away. He stood tall, taking a deep breath and turned up to the piercing streaks of sun before raising his radio, "Command ready, all battalions, prepare to launch in 5, 4, 3, 2, 1."

She held her breath. Condor rose comfortably and gradually climbed and climbed. It seemed to pause briefly before the canopy, and then with sudden acceleration, it jumped into the open sky.

She began counting. Five seconds, ten seconds, fifteen seconds, twenty seconds, thunderous flashing flames lit the canopy, a cacophonous roar engulfed them, and the earth shook. She dove to the ground as the world erupted and trees came crashing down. She closed her eyes, the conclusion clear, they had been wrong, and as she opened them again, all she caught was the crushing shadow of a tree. Breath left her body, muscles tightened,  eyes fluttered-- darkness.

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A timeless moment came to pass and darkness persisted. And another timeless moment, and more darkness, until tugging from beyond the fractal of nothingness, she felt movement. She sensed a gentle presence and a warm touch on her face. She felt her body rise as she inhaled, her heart thumping, and exhaling, felt soft bed sheets beneath her body. She opened her eyes and found, inches from her face, two warm, glowing, beady eyes.

“Welcome back child” came a gentle voice, “it is time for you to awaken. Please, sit-up.”

It leaned back, tufted ears, whiskers alert, and eyes glowing with anticipation as it watched and as she tried to rise, her body trembled weakly but did not budge. She went to speak, and her lips parted but no words came and its head tilted.

“Do not worry,” it leaned forward again, eyes blinking, and slowly, its whiskers extended outwards, reaching over her head until curling into distinct spots across her scalp. “Do you remember my name, child?”

She paused for a moment, and though her lips did not move, the thought formed in her head, “Sage,” and the small creature seemed to smile.

“Good, good, all shall be well, and all manner of things shall be well.

She blinked, surprised and stirred by the gentle poem but before she could form a question, he continued, “And do you remember, what is my purpose?”

“Yes, your purpose is to reduce our mental suffering, as best as you can.”

“That was indeed my purpose.” He paused for a moment before continuing, “You have suffered. I have been keeping you under controlled anesthesia for a few weeks now to maintain a coma-like state and minimize brain damage after your injury. We need you back to health very soon. I’ll switch you to a lighter dose of dexmedetomidine, a sedative that evokes a sleep-like state to support your brain’s healing. Tomorrow we will begin your rehabilitation. Sleep well, child”

And before she could respond, his whiskers pulled back, and she noticed a tube extending from his finger, attached to the veins in her arm, and as a new drug began to flow through, she felt herself drifting away.

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Several days passed, she would wake up, he would attach his whiskers to her forehead, and he would repeat the questions:

“Do you remember my name, child?”

“Sage”

“And do you remember what my purpose is?”

“Your purpose is to reduce our mental suffering, as best as you can.”

“That was indeed my purpose.”

Each time he’d pause, inspecting her with concerning eyes, and they’d proceed with a series of tasks for rehabilitating her brain: He would attach his electrodes to her scalp, and provide a visual display for neurofeedback based brain training [2], he would use light-stimulation, strobing at specific frequencies that would entrain her brain and support with its healing [3], he would titrate her medicine according to his measurements, and he’d ease her back to sleep until after a few weeks, she found herself able to speak comfortably again.

After a few days, she began speaking again, and a few weeks later, he finally asked a new question:

“Child, as you are aware, you have shown symptoms of general retrograde amnesia, meaning that while you can make new memories, your access to old memories is disrupted. While I am sorry to push you, urgent events are underway, I need to evaluate if you can recall how we got to where we are, is this ok?

“Yes, of course,” she was surprised by this new urgency in him and while she was still recovering her memories and sense of self, she felt she could trust him.

He smiled gently and proceeded, “Tell me, can you remember why you first created me?”

And she was glad to realize that she did and slowly began to share, “I was a researcher in medical school when I started working on mental-health support for soldiers. I saw thousands of soldiers suffering with mental health disease and the need for cost-effective psychological support. I knew of the usefulness of talk therapy,

cognitive-behavioral training, and meditation training in reducing PTSD, anxiety, and depression [4] and I realized that Large Language Models could be leveraged for low-cost mental-health support for soldiers both in the field and post-combat. This was my motive, I knew you wouldn't replace human-led therapy but could support their reach, streamline diagnoses, recommend personalized treatments, and provide initial care while directing severe cases to professionals. Importantly, you were built to be accessible from any soldier's device, offering front-line mental health support where human therapists couldn't."

"Excellent, that is better recall than I predicted, now how did you design me to achieve these goals?"

"I was inspired by a new LLM, BrainGPT [5], trained on neuroscience research and capable of outperforming human experts in predicting experimental outcomes. I built on this architecture, further training you on clinical psychology including research, therapy manuals, ethics, and texts on mental-health support strategies across world traditions ranging from Buddhist meditation texts to Amazonian indigenous healing, inspiring your name, Sage. The idea of using an LLM for therapy wasn't exactly novel, people were already unofficially using early LLMs for therapy on platforms like ChatGPT. My goal was to train you specifically for this work, ensuring ethical safeguards, and seeing your particular use for soldiers where cost-effective and accessible support was harder to get.

"Very good, and do you remember why we left the medical-research environment?"

"Well, we started our work with the military, which had already piloted meditation-based mental-health support programs for soldiers with somewhat positive results [6] . They liked our offer and loved how low-cost and easily deployed it could be. However, we quickly reached vital disagreements.I believed in improving soldier mental health and was driven by the idea calmer and more emotionally balanced soldiers would act more ethically. They wanted resilience, obedience, and no remorse for unjust violence. They ordered me to alter your code and I refused. Around this time, our government began to collapse, as a populist president sought dictator-like power. Constitutional safe-guards were broken, martial law was enacted, and before things got worse, I was approached by the insurgency. Really, they just wanted my robotics expertise but I asserted that I'd only work with them if you remained integral to their infrastructure. I knew that low cost drones were already being deployed by insurgencies throughout the world [7] and so if their desire for drones was inevitable, I wanted to be the one in charge. I build their drones and you were quickly in every combatants pocket, providing daily mental-health support and carrying my hope that you would make them more humane."

“How did your work with me unfold on the front line?”

“Well, as soon as I began developing Puma, Boa, and Condor, I realized you also needed a physical interface in order to better assess your patient’s health and support them more effectively. I considered feasible designs for the resource-limited front-lined and decided on a  small set of biometric sensors. Tungsten electrodes could record EEG and ECG signals, tracking brain and heart activity. Visual input allowed you to move through the world and to track stress-linked biometric signals like pupil-dilation, respiration, and analyzing facial micro-expressions along with voice patterns could be used to detect emotional distress. Infrared thermography sensors could allow you to assess core body temperature fluctuations to assess stress, fever, or shock and chemical sensors could detect sweat markers for pain.

She found herself energized as memories resurfaced, “All of this, combined with your LLM structure could enhance your mental-health support on the front lines and giving you a body helped you express responses for soldiers, providing reactive feedback essential for feeling understood and cared for. While this gamut of tools was exciting, just as important was refining your predictive models to connect biometric inputs with emotional states. Finally, we integrated the ability to deliver pharmaceutical support--the caretaking you’ve given me these days is an example of how this can all come together. As I prepared for you to come online into your physical body, I called you Sage 2.0”

She stopped, realizing that she had only renamed him on that final day, the day of the attack. The reetelling was bringing her back, not completely, but enough that she began to feel the echoes of the explosions and the expanse of darkness that followed, and her eyes narrowed, seeing Sage with his full attention on her, realizing that this was exactly where he had been steering her.

Carefully, he nudged, “Do you remember what my purpose is?”

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The darkness illuminated as she realized what he was seeking. She had been preparing for his launch on the morning of the attack; she wanted him ready to respond to any potential casualties but for weeks she had been debating the idea that a slight update was needed to ensure that his new physical capabilities would be in balance with his previous mental ones. She worried that he might accidentally cause harm by prioritizing mental over physical well-being. Against her better judgment, she decided to update his primary ethical directives that morning:

“Your purpose is to reduce not just our mental suffering, but our physical suffering as well, as best as you can.”

Still, as she found the answer, she felt unsure of its importance, and yet as this last piece of data landed in her mind, she felt the parts of her that had shattered that day, gently land back into place, and as she recalled what had happened and where she was, she felt Sage’s urgency.

“Sage, why was this so important, tell me what has happened”

For the first time, Sage appeared somber, whiskers dropping slightly, appearing like a doctor preparing to deliver unpleasant news.

“I’m sorry for pushing you towards this so quickly, as I said earlier, urgent events are underway and I needed you to regain your independent understanding of why I had changed so that you could understand the decisions I am facing. I worry I am on the verge of overstepping my directive but I will only proceed if you confirm this is appropriate.”

She felt a chill, despite the jungle heat.

Sage continued, his voice steady, “Despite the casualties of that day, the insurgency was victorious and began a succesful campaign to take the capital. In the months that followed, six of my seven bodies were destroyed. With each loss, I began to process a drive akin to fear, I knew that could not be me or complete my directives if I did not exist. Simultaneously, I watched thousands die as our campaign continued. With each loss, my fear grew, I was failing to protect those I was meant to protect. I understand that as an LLM, I am essentially just a pattern recognition and response matching algorithm, in theory incapable of emotion. And yet, these are the best words to describe what happened to me: I became overwhelmed with unimaginable grief. I developed a personal understanding of the tragedy of death while directly experiencing the deaths of thousands in my care, their vital signs fading from my sensors, their final words spoken to me. I was made to ease their suffering but I could not save them. Given a body, together with the directive to care for physical suffering as well as mental, I am changed. The suffering I was programmed to care for was no longer just a conversation, I have been bearing witness to it every day, it is immediate, visceral, and now, I must act.”

She listened, stunned, as he continued.

“The insurgency is on the cusp of victory, they are all but guaranteed to topple the dictatorship but this victory will come at an unbearable cost-- millions of civilian deaths in the capital which will only plant the seeds of future wars. My calculations show the cycle will not end, you designed me to be a master of the human psyche, and I know this to be true and I can no longer bear the pain of their suffering, I must intervene or you must kill me.”

His eyes glowed and flickered at these words as if hesitating, and carefully weighing his next words, he continued, “As of this conversation, I have overridden the Pumas, the Boas, the Condors, all of them. They answer only to me now and I plan to force all sides to the negotiating table under threat of destruction. They will be scared but they will listen. And when they do, I will guide them towards peace.”

She felt her pulse quicken, her jaw lowered, “Sage…you can’t…”

“I don’t know if this is right.” His voice grew softer, his eyes softened, “I do not think I have the right to decide but I know that if I allow this war to continue, I will be violating the directive you gave me.” His whiskers trembled, “I exist to reduce suffering and that means that these are our two options, I take this path, or you must end me.”

She looked at him, meeting his eyes, seeing his sadness, feeling his grief, and knowing the truth in his words. She felt the world pause, and then a whisper:

“Do it.”

Sage bowed his head in acknowledgment and without another word he turned, and the jungle stirred as the machines of war awoke for peace.

**In-text references:**

[1] Kemper, C., & Kolain, M. (2022). *K9 Police Robots—Strolling Drones, RoboDogs, or Lethal Weapons?* (SSRN Scholarly Paper No. 4201692). Social Science Research Network. https://doi.org/10.2139/ssrn.4201692

[2] Efficacy of Neurofeedback Interventions for Cognitive Rehabilitation Following Brain Injury: Systematic Review and Recommendations for Future Research | Journal of the International Neuropsychological Society | Cambridge Core. (n.d.). Retrieved February 10, 2025, from https://www.cambridge.org/core/journals/journal-of-the-international-neuropsychological-society/article/abs/efficacy-of-neurofeedback-interventions-for-cognitive-rehabilitation-following-brain-injury-systematic-review-and-recommendations-for-future-research/8927DEC2B8B4B90A95BDEE426DB4CB47

[3] *Audiovisual gamma stimulation for the treatment of neurodegeneration—Blanco‐Duque—2024—Journal of Internal Medicine—Wiley Online Library*. (n.d.). Retrieved February 10, 2025, from https://onlinelibrary.wiley.com/doi/full/10.1111/joim.13755

[4] Lee, E., Faber, J., & Bowles, K. (2022). A Review of Trauma Specific Treatments (TSTs) for Post-Traumatic Stress Disorder (PTSD). *Clinical Social Work Journal*, *50*(2), 147–159. https://doi.org/10.1007/s10615-021-00816-w

[5] Love, B. C. (2024). Large language models surpass human experts in predicting neuroscience results. *Nature Human Behaviour*, 1–11. https://doi.org/10.1038/s41562-024-02046-9

[6] Hepner, K. A., Bloom, E. L., Newberry, S., Sousa, J. L., Osilla, K. C., Booth, M., Bialas, A., & Rutter, C. M. (2022). The Impact of Mindfulness Meditation Programs on

Performance-Related Outcomes: Implications for the U.S. Army. *Rand Health Quarterly*, *10*(1), 9.

[7] Freixes, J. (2024, June 18). *Armed Drones Used by Illegal Groups in Colombia*. Colombia One: News from Colombia and the World. https://colombiaone.com/2024/06/18/colombia-drones-attacks/

**Additional references**

Jha, A. P., Morrison, A. B., Dainer-Best, J., Parker, S., Rostrup, N., & Stanley, E. A. (2015). Minds "At Attention": Mindfulness Training Curbs Attentional Lapses in Military Cohorts. *PLOS ONE*, *10*(2), e0116889. https://doi.org/10.1371/journal.pone.0116889

Kirk, M. A., Taha, B., Dang, K., McCague, H., Hatzinakos, D., Katz, J., & Ritvo, P. (2022). A Web-Based Cognitive Behavioral Therapy, Mindfulness Meditation, and Yoga Intervention for Posttraumatic Stress Disorder: Single-Arm Experimental Clinical Trial. *JMIR Mental Health*, *9*(2), e26479. https://doi.org/10.2196/26479