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On the Human-Machine Embodiment of Knowledge

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This discussion focuses on the intersection of human movement, mechanics, and innovation. Questions such as whether or not robots can one day untether humans from their cultural biases, what are the gendered notions that accompany safety, and how can one highlight or hinder specific aspects of a body based on artistic expression rather than functionality in a performance space were posed. Wesleigh utilizes the response from the audience as feedback for his performance similar to an input for a robot. While robots have been tasked with very binary labor, Veronica notes that they have also been subjected to reflect the gender roles of those who create them. Through a gendered lens, one can see this with the naming of robots tending to be masculine names. The uncanny valley theory of a robot being too close to humans for comfort, phenomenology, how one perceives the world, and the robotic extension of a human was also discussed. In addition, the intersectionality of neuroplasticity and trans embodiment was also highlighted during this seminar.

Introduction

This discussion was held on Thursday, February 23, 2023, at the University of California Los Angeles. Panel 5 conversation for winter 2023 Fiat Lux[1] Freshman Seminar Upending Hard Sciences: Queering Science and Technology taught and moderated by Sergio Carbajo included panelists Veronica Santos and Wesleigh Gates.

Moderator Sergio Carbajo (he/him) is an equity, diversity, and inclusion officer and professor of electrical and computer engineering at UCLA and created this Fiat Lux seminar.

Panellist Veronica Santos (she/her) earned a B.S. from the University of California, at Berkeley and Ph.D. from Cornell University. She currently works as a Professor of Mechanical and Aerospace engineering and bioengineering and Associate Dean of Equity, Diversity, and Inclusion and Faculty Affairs at UCLA. Her focus includes hand biomechanics and machine learning.

Panellist Wesliegh Gates (they/them) is an artist, an academic, and a Ph.D. student in the Department of Arts and Culture at UCLA. Their work focuses on trans embodiment in artistic performances and questioning how constructions of race, gender, and sexuality coincide with politics and the logics of capitalism in their choreography. They have been published by *Gulf Coast Journal*, *PARtake: The Journal of Performance as Research*, *Contemporary Performance*, and were writer-in-residence at the 2019 Zürich Moves festival.

Discussion

Carbajo - Panelists, please speak a little about your research.

Gates - I have a background in theatre. I used to act and direct, but now I am about to have a Ph.D. I like to think about performance as something that can bring new possibilities, provide a safe space and act as a different purpose depending on the individual. I recall that performing is a tactic by minority communities, like the trans and queer community, to reclaim spaces in which people might not be welcomed or seen or properly occupying that space. These performances and everyday acts of taking up public space make a claim for trans existence. While performative acts like such make space for trans people, the US legislation is more topical, as they look to legislate trans people out of existence, restrict medical care to trans people and make it taboo to talk about in school.

Santos - The purpose of a biomechanical lab mission is to improve quality of life. My specialties include giving hand prosthetics a sense of touch, robotics that is used in collaborative manufacturing spaces, and creating machines that can do jobs that are ethically too dangerous for humans to do.

Carbajo - Space/design parameters, how does one design a machine to exist in a space?

Santos - The application, thinking about who will be interacting with the machine, is the first and foremost consideration when designing a machine. This includes who the operators will be, what other

machines it will be working with, and who is going to interact with it within its use. In the past robotics have had a history of being too utilitarian-centred. Additionally, the task that the machine needs to perform will dictate size, format, components, and use.

Carbajo - What are the bread and butter of robotics?

Santos - Electrically driven motors as well as both human and non-human sensors are the bread and butter of robotics. Human-like traits of vision are emulated through cameras and tactile sensors while computations are also valued through drawing inferences that emulate human thought.

Carbajo - We perceive something like color, movement, and specific body posture. What is it that we are looking for? For what sense/purpose? In a performance space, how can we highlight or hinder specific aspects of a body that may not be based on functionality but based on artistic expression?

Gates - As a performer and human, you receive different inputs. They pose the questions: "How do I accumulate sensory information that answers questions like 'do I feel safe here?'" and "Am I around other people like me, or not?" "Is that shutting me down or useful?" This information can be visual or a feeling (sense). As a performer, there's data coming from the audience (source of input). Thus performers must stay sensorily attuned to the presence of the audience. Practicing a performance by yourself is much different than in front of an audience.

Carbajo - There is a lack of common language between different disciplines about what safety is. Safety for the human body versus social safety, and gendered notions.

Santos - Labor has always had a connection to gender. Robots doing industrial things don't need to be "pretty." They have had a history of taking on traditionally masculine designs. Sharp and rough and serious. However, robots created to work with the public or care, have been feminized to be considered more appealing speaking to how women and fems have to be physically appealing while providing services, a standard that men and masks have not been subject to. Industry robots are bulky and blocky and not aesthetically motivated while ones within a social setting (doctor, restaurant, etc...) are designed to be more streamlined and organic. Most robots have historically had masculine names, to the point that NASA has consciously started switching the gender connotation of their machine's names. Roboticists are attempting fluidity within their creations to make them more human-like and less "scary." But with this comes a new issue known as *Uncanny Valley*: too close to human-like for comfort.

Carbajo - Why do we react this way?

Gates - Phenomenology, a philosophical subfield, is the way we think about the conscious experience and the relationship between our own bodies and the people around us. One cannot hyperfocus on everything because people's consciousness picks out the needed information. Also, we view prosthetics as being an extension of one's body.

Santos - We put things into categories of "normal" and "not normal" and decide based on if we are comfortable or not. Perception is unique and can be seen as a sustained hallucination.

Carbajo - Robots that are too close to humans trigger us. What if we flip the narrative? Unconsciously, we perpetuate patterns of ways of being. This coupled with identity politics leads to a narrow set of options to live by. Could robots one day untether from these cultural biases, i.e. move in ways to adopt new identities?

Gates - I believe that through repetition and learning, gender and embodiment become themselves.

Santos - There is a subfield of robotics called choreo robotics where they incorporate dancerly mannerisms. This will make robots less industrial and more 'trustworthy.' It could open up an entirely new form of gendered robotics, between the movement and appearance of the machines. You can even mimic voice and tone through robotics (ie. deep fakes).

Carbajo - How does a robot learn?

Santos - Learning in robotics is not multisensory or cumulative, but rather it is tuning parameters (very inhuman and mathematical). There is a reward function where we quantify movement through classes and have different stages of movement. Scientists fine-tune the parameters to maximize effectivity.

Gates - The way a robot learns can be connected to trans embodiment by comparing hormones to a protocol shift. Hormones give your body an order to do something and the body listens. We are plastic with all of it. This concept is called neuroplasticity. You can teach your body to rewire how it works (ex: introducing new hormones into your body).

Open Question Portion - the panel opened up for students to ask questions.

Student 1 - Robots are going to take over the world - is it ethical to give human aspects to machines? Names, feelings, etc. Why do we do this?

Santos - We name our computers but not our robots because it puts too much on the robot (think of it as an independent agent; assign gender to it). A robot was once designed as a guide for a museum. Curious children bullied the robot. This shows how it's hard not to ascribe personalities/feelings to agents that may not look human-like but act human-like.

Gates - This is like the movie *M3GAN*[2] about an AI doll.

Carbajo - There are ways in which we perpetuate a hierarchy of personhood. Will robots start joining those ranks? Where is the limit of humanity? For example, imagine a country where a robot can have citizenship but a woman can't drive.

Student 2 - Do you think humans are responsible for corrupting robots?

Gates - It's difficult to turn things we do naturally into statements. Robots do what we tell them to do.

Student 3 - If a robot plays itself versus a person or other AI in chess, which is better?

Santos - Neither is better. Machine learning is just one gigantic black box. If it doesn't categorize them correctly, it doesn't work.

Carbajo - In a story-based performance, a watcher doesn't get the entire story because they weren't there in the production and aren't directly fed what they are supposed to get from it. How do you convey what you need?

Gates - You have to compartmentalize and be two people. They ask themselves, "How can I approach this from a neutral perspective?" and don't hold assumptions.

Carbajo - Let me mention entropy and ask, "Am I conveying the message I want?"

Gates - Let's compare repeatability and consistency (control freaks) versus responsiveness and liveness (actors respond to the audience). In Shakespeare, the clown has the license to rift and have live interaction. Meaning has a balance of being sensitive and delicate. "Can humans be inspired by robotic art? Not tethered to humanity or functionality, can robots teach us about new genders and bypass different biases?"

In regards to the potential of robot performance, a robot ballet would be amazing due to *their* extreme precision and sharp timing pushing human capacity. "Could a robot move in a way that really feels novel or unfamiliar?" "Could I even perceive that?" and "What are the capabilities of the robot?"

Santos - It's funny to think of art with so much precision since art is free-flowing and each move is different (i.e. speed variability).

Carbajo - Can you program sloppiness (imperfection) to a robot? Can robots create their own art? Or is it uniquely human because it all comes from humans?

Gates - You can't program this quite yet for a robot's perfection and exactitude makes it currently impossible to mimic imperfection and sloppiness.

Santos - A robot painting lacks soul.

Carbajo - What happens when authorship is unknown or blurred? Let's discuss the correlation between the value of art and the amount of human effort given. We are used to consuming art in pre-prescribed ways.

Santos - In regards to usefulness and authorship it depends on the application, efficiency, and metric.

On Chat GPT
Santos - Chat GPT is driven by the data it was provided with. We don't teach algorithms empathy. Thus good questions to ask are "What was the purpose?" and "Who created this algorithm and why?"

Gates - Allow me to emphasize the importance of relationships and talking in groups. By deeding the machine, we cut off opportunities to build a relationship. A machine is a mediator that hinders the possibility of relationships.

Carbajo - A machine shortcuts empathy.

Santos - Using robotics to do jobs that are unsafe for humans and seeking comfort in the ability of human-like robots are things we will never get in robotics. I hope that we don't have robots like humans because that is what makes humans special (existential threat). We have to ask ourselves: "Where do you draw that line?" as I mention the idea of singularity. We are quite far away from this happening.

Student 4 - Why are people obsessed with making robots like humans?

Santos - People like the feeling of being a god and being in control. The temptation and excitement of doing something never done (explorative nature) are what drive people to create more human-like robots.

Student 5 - People put objects into human-like categories. How do we build things that won't inherit those biases?

Santos - The solution to this is to have as many different people as you can in the rooms where things are being created. For example, airbags were designed for men and not women or children.

Conclusions

Both robotics (especially biomechanics) and performance art (especially dance) aim to observe human movement and push it to new limits. Historically, dance has been tethered to gender in one way or another. It has been known to defy the norms of socially gendered movement and roles, but there is also a history of enforcing the binary within certain spaces. Wesliegh's work aims to use dance for the former. The true power of the binary can be seen through the development of robotics. The nature of robotics, with a lack of organic thought, human biology, or feelings, should lead to a distinct lack of gender dynamics in the innovations. However, biomechanics and robots in general have a history of being given gendered traits, displaying the full extent of the hold of a gender binary in society. Additionally, both fields use input and output to fuel innovation. Dancers use a culmination of the input of feedback their body gives them and the sensory input that comes from an audience. Innovation of robotics uses the more common definition of input with data gained from sensors, trials, and feedback. The purpose of both of these disciplines is to improve human life in one way or another, so if we know that the reinforcement of a gender binary disrupts this goal, is there a possibility to use these to combat it? Both Wesliegh and Santos are optimistic that their respective fields can be weaponized against a harmful gender binary through targeted innovation.

Acknowledgments

Notes and references
1. Carbajo, Sergio. "Queered Science & Technology Center: Vol. 1." arXiv preprint arXiv:2304.12318 (2023)
2. Johnstone, Gerard. "M3GAN." [Motion picture]. Universal. (2022)