

AI and Essential Labor: Representing the invisible work of integration

With the onset of the COVID-19 pandemic in the United States, “essential work” became a calling card for the labor that kept the country running. But the activity of essential workers often occurs out of sight. For example, the products of waste workers are everywhere—clean floors, sanitized tables, objects made from recycled plastics—though workers themselves are often behind the scenes.

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The pandemic brought forward a new wave of media enthusiasm for innovations like UV disinfection technologies and recycling sorting robots. For example, one particularly conspicuous newspaper photo depicts a white machine gleaming against neon-streaked darkness. Its edges are smooth and luminous, its body carved like a race car. This image, published in a local newspaper, is a digital rendering of a self-driving, floor-cleaning “robot janitor” that was developed by a California-based

startup. In this depiction, the robot’s image is one of a singular hero, the pinnacle of innovation on an empty black background (see Figure 1).

One might ask, where are the people who must drive the robot to its daily route? Where are those who clean the robot, maintain its circuits? Where are those who continue to perform the janitorial duties this robot hasn’t mastered?

Newspaper photographs play an important role in molding public conception around essential work. In

particular, they have the potential to distract from the realities of essential work by glossing over the labor of sorting, maintenance, and repair carried out by people in favor of representing the benefits of machines. To critically examine how waste labor and artificial intelligence (AI) technologies are being represented in the media, we sourced images from an exhaustive list of news articles on this topic published in the United States over the last five years. We focused on the fields of airport sanitation and recy-

cling sorting, and hand-coded each image for relevance.

In our resulting collection of news photos, we identified a few patterns. Images of disembodied hands were recurrent and prominent in our data set. As a trope, these images use the visual language of advertisements to center the product (in this case, always a technological artifact) while eliminating most identifying characteristics of who is performing the action. We also found executives were commonly the subject of portraits. Rather than in-

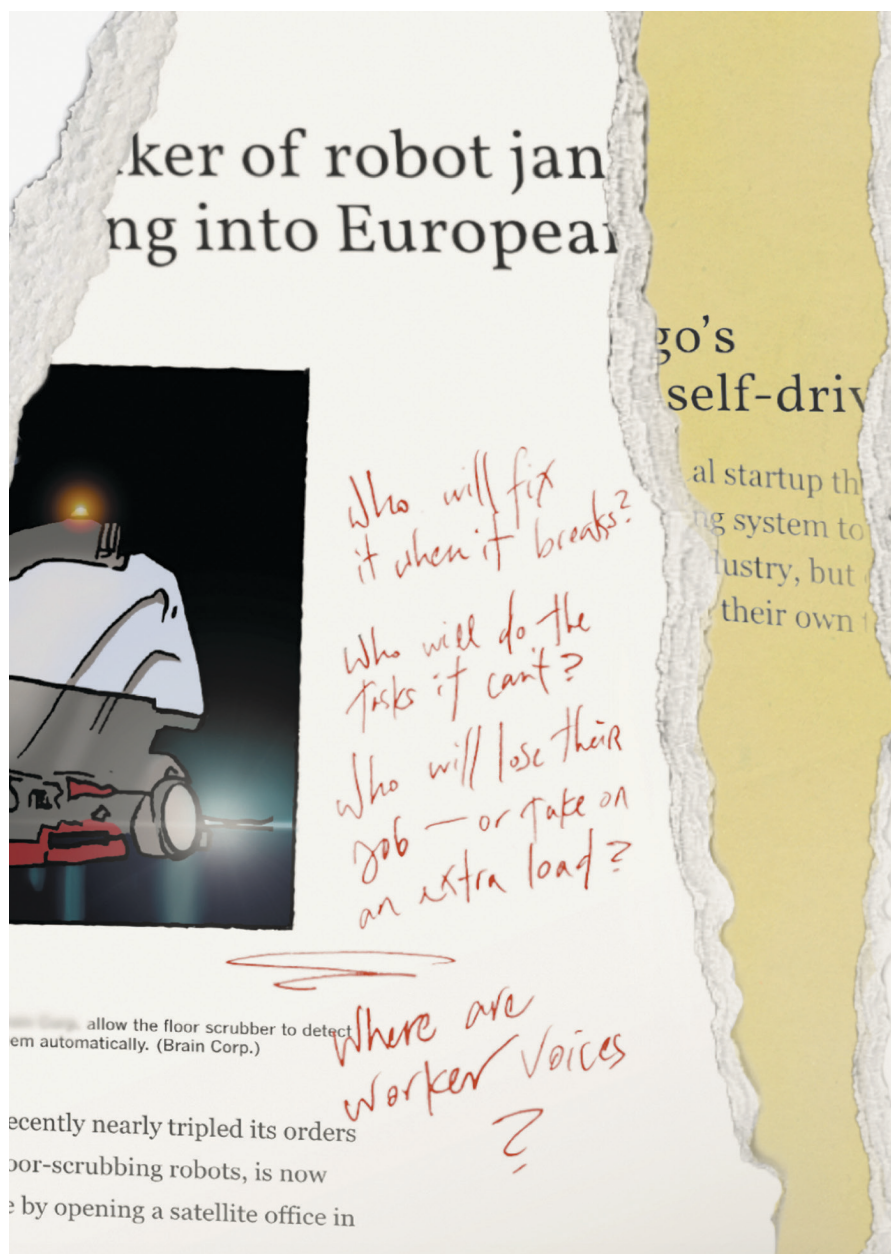
teracting directly with waste, they're depicted as overseers. The images of executives stand in stark contrast to those of workers in action, suited up in protective gear such as gloves and hardhats as they sort through trash or sanitize surfaces. Workers' activity is contextualized—and, to some extent, humbled—by expansive spaces waiting to be cleaned and oncoming piles of trash to be sorted. Finally, we see robot profile images which feature machines as the solo, central figure. Photojournalism customarily shies away from shots where people are not present, as they're often what makes an image visually engaging. These photographs of the machinery and robots alone are thus somewhat of an anomaly, a deliberate choice to present the robot as the main character of these articles.

COUNTERVISUALITIES

To start to tell a different story, we draw on the technique of countervisualities from the interdisciplinary fields of visual culture, sociology, and media studies. In *The Right to Look*, visual culture scholar Nicholas Mirzoeff argues for countering dominant historical depictions with critical realism, shifting the perspective from which narratives are told [1]. For example, literary scholar and historian Saidiya Hartman cuts through the criminalized depictions of “wayward” Black women in the cities of New York and Philadelphia at the turn of the 20th century to show how they experimented with agency and personhood [2]. In her retelling of Black lives in the wake of slavery, she recuperates histories that are unaccounted for in the archive. Using our own illustrated countervisualities, we extend the repertoire of critical and speculative design within human-computer interaction (HCI) by reviving narratives in AI reporting that were never accounted for at all.

Our countervisualities build upon ongoing interviews and observations we've conducted over a seventh-month period in two field sites integrating new technologies in response to COVID-19: an airport in the mid-Atlantic region of the U.S. and a recycling facility in the American South.

Figure 1. An illustrated rendering of a newspaper article featuring an image of a floor-cleaning robot.



Across these conversations and observations, we've collected rich information about acts of calibration, repair, and resistance, which run counter to the well-tread narratives we saw in our news media analysis.

THE CENTRALITY OF MAINTENANCE AND REPAIR

Our first countervisual shows a floor cleaning robot that has spilled water all over the floor. A mechanic with a toolbox kneels next to the machine. In the foreground stands a custodian

with a mop, making eye contact with the viewer and looking exasperated (see Figure 2.)

Design is only one moment within a lifecycle of a computational artifact. In fact, repair is so frequent in our recycling field site that the facility runs an average of one additional day every month to account for the time it takes to address problems with the machines. At the airport, a dedicated staff member is tasked with following the floor cleaning robots throughout the day, restarting

Figure 2. A floor cleaning robot leaking water, with a janitorial staff member mopping and technician repairing the device.



Figure 3. Human workers pre-sorting and reviewing a waste-sorting machine's work.



Figure 4. A supervisor surveilling janitorial workers on the job.



Figure 5. Sanitation workers on strike.



them when they stall out, and mopping up the excess trail of water they leave behind. Innovative technologies are deeply reliant on the maintainers who keep them running, though this work remains invisibilized in the public understanding.

“The algorithm that [the robots] use—with the continuous fill—creates a lot of turns that seem unnecessary and the mechanics of the machine itself are such that the more times the squeegee moves in a circle it loses its tension and leaves water behind, which is a slip and fall hazard. It causes [janitorial staff members] to have to attend to that unnecessarily.”

—FACILITIES MAINTENANCE SUPERVISOR, AIRPORT

SEQUENTIAL WORK

Our second countervisual shows two workers on either side of a waste-sorting machine: one prepares garbage for the machine's conveyor belt, while the other removes items the machine has missed, among these a broken part from the floor cleaning robot we saw previously (see Figure 3).

Press photographs revealed an either/or approach to HCI. They depict either the efforts of workers or high-tech machines, but rarely both. Yet, our interviews with waste labor professionals indicate that a considerable amount of hand work is required to clean waste streams before they reach robots and sort miscategorized items after. Failing to give credit to

this type of sequential labor contributes to devaluing this work, as our economic system only rewards the products we can see [3]. Though we illustrate sequential work here, we argue for broader efforts to recognize and value this labor regardless of its immediate visibility.

“We call them sorters, but they're really more quality-control people. For example, after the paper has run through the system you have a 90% paper stream, but you have people on those lines pulling out bags and flattened containers that act like paper and are contaminating the stream.”

—GENERAL MANAGER, RECYCLING FACILITY

SURFACING SURVEILLANCE

While repair and sequential labor are made invisible in automated systems, our third countervisual explores the potential to render other aspects of work more visible. We show an executive peering into a performance dashboard on a monitor. In the background are the workers seen in previous images, with performance indicators floating above their heads (see Figure 4.)

Our observations at the airport have shown how AI and robotics technologies generate data about every move they make. Though this information may be used mostly for localization and path planning, this data could also serve as a trace to prove that every crevice has been sanitized as per pandemic protocol—something that could subject individual workers to further oversight and scrutiny. In order to avoid such applications, any in-

novation project must anticipate compromises to workplace privacy and institute policies that protect workers in advance.

WASTE WORKERS RISING

In our last countervisual, we show a uniformed sanitation worker on strike. The worker holds up a fist and a sign which reads, “Essential NOT Disposable” in graffiti lettering (see Figure 5).

In March 2020, local and national media covered sanitation workers in Pittsburgh, PA who blocked the entrance of the city’s Bureau of Environmental Services, demanding personal protective gear and hazard pay [4]. Amazon warehouse workers in Staten Island, NY threatened to walk out over uneven safety precautions and a lack of notice around the more than 20,000 reported employees who contracted COVID-19 [5]. These acts of refusal show an alternate representation of waste labor—not overwhelmed (as depicted in news reporting) but agitated. Despite numerous accounts in the popular press praising employers for adopting cutting edge sanitation, in these worker-led campaigns, we see the continued need for media coverage to center workers and their experiences in discussions of safety precautions and technical innovation. It is not a coincidence that the interweaving consequences of workplace technologization, sparse media coverage, and the pandemic fall along clear hierarchies of waged labor.

While underreporting may lead us to imagine that these sharp inequities exist solely in industries associated with low-wage labor (such as sanitation) hierarchies of labor are also evident in technology companies: at Google, for instance, where contract workers wear the red-letter C on their badges for key card access. In academia, janitors and custodians remained essential workers disinfecting and sanitizing campus buildings, even as many students and faculty worked from home. As we present countervisualities of workers agitating and organizing, we surface the importance for class solidarity between traditionally divided industries. With this work, we open space for united

workers to exist in their dignity, rather than in their absence, fragmentation, or overwhelm.

CONCLUSION

Though essential, sanitation work often occurs out of sight. Bathrooms are cleaned behind yellow “wet floor” signs and empty bottles disappear from curbside recycling bins overnight. In the news stories meant to explore these processes, workers are again made invisible when the spotlight is put on the development of waste labor technologies. AI and automation technologies are framed as technological fixes to the problems of dirt and disposal—only further obscuring the work required to maintain and operate them.

Through this work, we explore what an alternate framework for representation may look like through a series of countervisuals that surface the labor necessary to make AI function. This is a call for justice for waste workers who stand at the front lines (even if behind the scenes). At the heart of this work is a commitment to rewriting narratives as part of design justice: “attribution and attention are important benefits of design processes, and they should be equitably distributed” [6].

As engineers, designers, and builders of future technologies, we invite you to consider how you tell the story of innovation. In order to develop human-centered products and processes, it is vital to do field research on the needs of workers on the ground—rather than relying on managers and facility owners who have their own set of priorities and values. It is important to talk with workers who are responsible for the lifecycle of a machine, such as those who perform repair, those who are responsible for cleaning and sorting, and those who conduct quality assurance.

Furthermore, avoid using industry materials as your only (or even main) source when understanding a product that might promise “labor savings.” Be careful to think through questions of technology implementation, operation, and maintenance on a longer timeline. You might inquire about the training and challenges present at the introduction of a technology or ask what happens when a machine mal-

functions in its duties.

Finally, don’t leave workers out of the picture. The images of disembodied hands and executive profile shots that appear in press photos are also common in research publications. These kinds of images reinforce narratives about the benefits and the necessity of robotics, all while continuing to push workers to the peripheries. As you report on your process or publicize your results, be sure to center stories and visual representations of workers for a more realistic interpretation of how machinery functions.

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References

- [1] Mirzoeff, N. *The Right to Look: A Counterhistory of Visuality*. Duke University Press, 2011.
- [2] Hartman, S. *Wayward Lives, Beautiful Experiments: Intimate Histories of Riotous Black Girls, Troublesome Women, and Queer Radicals*. W. W. Norton & Company, 2019.
- [3] D’Ignazio, C. and Klein, L. F. *Data Feminism*. The MIT Press, Cambridge, 2020.
- [4] Johnson, A., Wimbley, L., and Murray, A. City sanitation workers demand better protective gear—union president says gathering was “not a strike.” *Pittsburgh Post-Gazette*. March 25, 2020; <https://www.post-gazette.com/local/city/2020/03/25/Pittsburgh-sanitation-workers-refusing-to-pick-up-trash-rally-protective-gear-coronavirus/stories/202003250077>
- [5] Peters, J. Amazon says 19,816 workers have contracted COVID-19. *The Verge*. Oct. 1, 2020; <https://www.theverge.com/2020/10/1/21497941/amazon-disclose-workers-contract-covid-19>
- [6] Costanza-Chock, S. *Design Justice: Community-led practices to build the worlds we need*. The MIT Press, Cambridge, 2020.

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