

In the Moment of Glitch: Engaging with Misalignments in Ethical Practice

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Abstract

Glitches – moments when technologies do not work as desired – will become increasingly common as industrially-designed robots move into complex contexts. Taking glitches to be potential sites of critical ethical reflection, we examine a glitch that occurred in the context of a collaborative research project where professional dancers with different disabilities improvised with a robotic arm. Through a first-person account, we analyse how the dancer, the robot, and the rest of the research team enacted ethics in the moment of glitch. Through this analysis, we discovered a deep and implicit ethical misalignment wherein our enactments of ethics in response to the glitch did not align with the values of the project. This prompted a critical re-engagement with our research process through which we forged a dialogue between different ethical perspectives that acted as an invitation to bring us back into ethical alignment with the project's values.

CCS Concepts

• **Human-centered computing** → **Interaction design theory, concepts and paradigms.**

*Both authors contributed equally to this research.

Keywords

ethics, felt ethics, research ethics, artist-led research, somabotics, robots, dance, disability, crip feminism, glitches, misalignment

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1 Introduction

“A glitch is an error, a mistake, a failure to function. Within technoculture, a glitch is part of machinic anxiety, an indicator of something having gone wrong.”
Glitch Feminism: A Manifesto by Legacy Russell [78].

Glitches are usually minor problems that can cause temporary setbacks [1]. They can be caused by underlying bugs or defects in a technical system, but often, glitches are contextual and arise when a system does not work as expected, intended, or desired. Glitches are also an inevitable outcome of our increasingly complex entanglements with technologies [34]. There is a growing migration of industrially-designed robotic systems into domestic and social contexts [7, 47]. As these machines come closer to our bodies [61], we will increasingly encounter glitches. Some glitches might be literal: moments of collision or similar mistakes [66, 74]. Other glitches might be more metaphorical: points at which our existing design and evaluation methods can no longer absorb the reality of our complex and dynamic relationships with machines [10, 99].



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Figure 1: Robots, Dance, Different Bodies: dancer Kat with a Franka Arm robot.

In the context of a project that explored proximate interaction with robots, we explore a glitch that consistently disrupted our research process, but when explored retroactively, reveals a deep misalignment between our stated ethical intentions and actual ethical practices. We demonstrate that glitches – if engaged deeply – are sites of ethical discovery that can generate new understandings and dialogues between practices.

Here, we draw on perspectives from felt ethics [39] to frame glitches as moments of disruption where our implicit ethical sensibilities are revealed [39]. We define ethical sensibilities as sensitivities deeply ingrained in our bodies which prompt us to act and guide the actions that we take in response to different situations [39]. Our pre-reflexive responses to moments of undesirable behaviour, such as glitches, are enactments of implicit ethical sensibilities. In other words, a moment of glitchiness can evoke somatic responses that are indicative of deeper underlying attitudes. Further, we argue that articulating the felt experiences elicited in such moments can foster explicit critical engagement with how our ethical sensibilities have been shaped by socio-cultural and political forces. This engagement can serve as a catalyst to challenge such sensibilities and as a process of cultivating more ethical research practices. In response to recent calls to render such processes visible for the purposes of

greater honesty and integrity in research reporting [39], we report on a glitch that occurred in the context of a research project where dancers with different disabilities improvised with a robotic arm.

1.1 Research Context

This glitch occurred in the context of the performance-led [9] collaboration *Robots, Dance, Different Bodies* (See Figure 1). This project engaged a team of professional dancers and dance researchers with different disabilities to explore physical contact with industrially-designed robotic arms with the support of an interdisciplinary research team. It adopted a crip¹ feminist position on disability [58, 72] – resisting conceptions of disability as “limiting” or “disempowering” – to embrace the expertise and experience of dancers with disabilities to imagine creative and generative understandings of ethics for Human-Robot Interaction (HRI). During this process, we encountered different difficulties as we attempted to use these robots for dancing. In particular, we encountered one pervasive behaviour: a safety mechanism where the robotic arm would lock its joints and freeze in place. In the context of dance, this behaviour was initially viewed as disruptive and became a reoccurring site of

¹The term “crip” has been reclaimed by disability activists and scholars to celebrate disabled experiences and forge political coalitions for justice (See [58, p.15])

breakdown and repair throughout the research process. We came to refer to this behaviour as *the glitch*.

1.2 Scope and Contribution

Here, we focus deeply on this glitch. The glitch evoked a powerful somatic response in Kat – a dancer and one first-author of this paper – which we explored intensively using a microphenomenologically-inspired interview [71]. This interview retroactively revealed a deep and implicit ethical misalignment wherein our embodied enactments of ethics in response to the glitch did *not* align with the stated crip feminist values of the project. This realisation prompted a critical re-examination of our research process as a whole. In turn, this critical engagement deepened our understanding of the different ways that ethics were being enacted within our research process and brought them into dialogue with each other. Ultimately, the glitch served as a site where the ethics and politics of our work could be contested, which enabled the emergence of discussions between ethical perspectives and supported research outcomes that were ethically aligned with the values of the project.

First, we present a brief overview of the research process during which we encountered the glitch. Second, through Kat’s perspective, we analyse how (i) the dancer, (ii) the robot, and (iii) the rest of the research team enacted ethics in the moment of glitch. We identify the implicit ethical misalignment between our team’s discussions around crip feminist values and our team’s embodied responses which are shaped by more normative socio-cultural sensibilities. Third, we demonstrate how our critical re-examination of the research process revealed other instances of ethical misalignment; (i) Conceptions of Vulnerability and Control, (ii) Dependence on Expectations, and (iii) Value of Autonomy. In each case, we elucidate how discussions concerning more traditional technological values implicitly clashed with enactments of crip feminist values expressed through embodied dance practice. Finally, we discuss how supporting the articulation of embodied and felt experiences – in response to glitches or similar moments of disruption – can serve to render such ethical misalignments visible for critical engagement.

We are motivated to render ethical misalignments visible for the purposes of cultivating more ethical research practices [39]. Conducting research in an ethical manner is difficult and characterised by a continuous process of better understanding our own work through engaging with each others perspectives and experiences [38]. As such, even as we might strive to avoid them, ethical misalignments or misunderstandings are an inevitable characteristic of trying to do better work. It has been noted how even methodologies intended to encourage ethical practice can reaffirm and reproduce existing structures of marginalisation [14, 44]. Whereas Bennett and Rosner examine how design values such as empathy can position people with disabilities as subjects of study [14], and Harrington and colleagues demonstrate the structural power inequalities within participatory design methods [44], we contribute an analysis of how felt and embodied enactments of ethics can inadvertently exacerbate the very ethical issues that we seek to curtail in the first place. However, we also emphasise that engaging with these misalignments is a productive means of cultivating more ethical research practices. We expect this contribution to interest practitioners exploring how felt, embodied, and crip perspectives

challenge our established technological and ethical practices. This contribution might also interest practitioners working with the body in design research or looking for ways that creative robotics and artistic-led research can contribute to conceptions of ethics in HCI.

2 Theory and Related Work

Here, we present related work in (i) felt ethics, (ii) crip theory, (iii) glitches, and (iv) performance-led research.

2.1 Felt Ethics: Enacting Ethical Sensibility

To analyse ethical misalignments in our research process, we adopt the perspective of felt ethics [39]. This is a non-dualistic position that views ethical action-taking as, not only a matter of rational decision-making, but also of pre-reflexive embodied and felt experience [92]. The term *ethical sensibilities* describes our capacity for ethical action-taking, or “*our sensitivities towards ourselves, others, and situations in which we find ourselves. These sensibilities prompt us to act and guide the actions that we take. They include our ability to recognise if some action is required from us and sensitivity towards how we can respond*” [39, p.1]. Such sensibilities can be enacted in multiple ways in research, such as in how we relate to one another when faced with a risk [28] or the fine-grained decisions that are made when responding to challenging situations [84]. For example, Popova and colleagues demonstrate how ethical sensibilities are enacted in response to a breakdown between a research team – a collision involving a drone – and the pre-reflexive ethical work that was enacted to repair the situation [74].

Inevitably, our ethical sensibilities are shaped by our socio-cultural and political contexts [89]. Garrett and colleagues point to different ways that broader power structures are enacted on and through the body, such as how we might habitually adhere to socio-cultural conventions [39]. Here, we are particularly interested in how our bodies have been politically shaped by notions that certain ways of living hold greater worth than others [32] – particularly those pertaining to disability [58] – and how we might inadvertently reinforce and reproduce these notions through our enactments of ethical sensibility. For example, Bennett and Rosner demonstrate how even well-intentioned designers can orientate disabled bodies as “disempowered” or “non-experts” within research spaces, or even as the ‘spectacles’ of such processes [14]. This is indicative of deeper socio-cultural conceptions of disability that have permeated how we practice ethics in these spaces. Garrett and colleagues also argue that ingrained ethical sensibilities can be made visible in ways that allows for them to be engaged [39]. As such, they advocate for attending somatically, analytically and critically to ethics as they are practised in research processes – a call to action that we take up here. Through proper engagement with ethical sensibilities, problematic sensibilities, such as ableism, can be identified, challenged and new ethical practices can be cultivated. To do so is ethically important as such sensibilities shape the socio-technical outcomes of our work – knowledge contributions and technologies [42, 93] – which in turn, can go on to perpetuate harmful structures.

Unlike formal ethics guidelines and approval procedures [21], critical sociological perspectives [83], value-based methods [36], or more abstract technological applications of moral frameworks [90],

felt ethics considers ethical action from a *processual* perspective, examining how ethical work is enacted in embodied practice [92]. This perspective relates to a growing body of HCI research that looks towards more fine-grained or practice based conceptions of ethics, such as situational ethics [69], In-Action ethics [35], and micro-ethics [84]. However, felt ethics differs in its focus on how somatic and felt experiences serve to access our sensibilities and conceptions of ethical action, in order to render them visible for critical engagement.

2.2 Crip Theory as a Critical Lens

In line with the overarching values of our project, we engage crip theory as our critical lens to analysis the deeper socio-cultural shaping of ethical sensibilities. Crip theory, which often intersects with experiences of race, class or gender [44, 59], seeks new ways of understanding lived experiences of disability, particularly how notions of “cure” prioritize some lives over others [24], and contesting harmful societal conceptions and essentialisations of people with disabilities [58]. Disability scholar Kafer argues for the category of disability to be contestable in relation to the social and political discrimination that people with disabilities face, such as inadequate levels of access, care, or other forms of social support [58]. The bioethicist Shew further demonstrates how such attitudes might permeate our work in HCI, where technology is often ethically framed as a “solution” for disability [82].

Disability justice – efforts to challenge these systems of oppression experienced by people with disabilities – is becoming increasingly prominent in HCI [49, 87], however, crip perspectives are also essential to cultivating more ethical research practices more broadly [85, 98]. Crip technoscience [43] and disability perspectives can reveal presumptions of able-bodiedness [64] or neurotypicality [86] that pervade our work. They can also render deeper insights into the values underlying our technologies; often technologically-driven values which work against the ways that many people live and experience the world [33, 55]. For example, Bennett and colleagues demonstrate that many assistive technologies are designed to prioritise task completion at the expense of supporting the care work needed to create access [15]. These perspectives are inherently valuable to the reconfiguration of ethical knowledge and practices, such rendering new paths towards accessibility [52], challenging social conceptions of bodies that experience pain [70], and new models of care and interdependence with our environment [54]. In the context of our work, crip perspectives offer a lens to consider how enactments of ethical sensibilities – in a moment of disruption or breakdown – can inadvertently reinforce societal conceptions of disability.

2.3 Glitches as Sites of Ethical Discovery

We frame a particular moment of disruption – a glitch – as a site of potential discovery where we can attend to enactments of ethical sensibilities. The term glitch is usually used as jargon in electronic industries and programming, as well as by gamers, media artists, and designers [81]. When applied to software, a glitch is characterised by an unpredictable change in the system’s behaviour, or more broadly when something *obviously goes wrong* [41]. Unlike the word ‘error’, the looseness of the term ‘glitch’ allows for many –

unpredicted or undesirable – behaviours to be classified as glitches even though they might not arise from a technical failure or system error [81].

The term glitch has a long history in art and music [16, 91]. For example, glitches have been used to break, remix, and reimagine digitally generated music, which has in turn, formed its own genre [23]. Similarly, artists explore the aesthetic uses of technological glitches in artistic practice [67]; video game players engage in a practice called “glitching”, which exploits small errors, in order to transform their experiences of a game [77]; and musicians can leverage the accidental or deliberately caused malfunctioning of an instrument to create new forms of sound and performance [25]. In this way, glitches can be viewed as creative mechanisms through which to explore new ways of doing things, and in doing so, allow for new aesthetics – and by extension values – to emerge to around technologies [73].

Here, we adopt the perspective that a glitch is evocative if it challenges our expectations and renders a space of reflection of the values around it. Thus, we are not working a technical conceptualisation of a glitch, but a metaphorical one: a glitch is a moment that disrupts our established ways of doing things that can invite us to reflect on our ethical sensibilities and values. In this view, glitches can serve as lens through which to question the fundamental values underlying research practices and technologies rather than, for example, positioning racially biased or inaccessible technologies as the erroneous result of a “once-off bad design” [13, 20]. Thus, the glitch – when approached as a site of critical engagement – has the potential to “*throw us from normative ground*” [17] and begin questioning values that have shaped our ethical sensibilities and practices on a deeper level.

2.4 Performance-led Research as Ethical Exploration

Finally, the glitch we examine takes place in the context of a performance and dance-led research process involving industrially-designed robots. Performative and performance-led research is common in HCI [9]. Dance and choreography are relatively well-explored subjects, both as an application domain for technologies [102] and an approach to designing movement-based interactions [65]. There are tensions to consider while trying to integrate technology into dance performances [31], although carefully designed technological probes and data physicalisations can deepen dancers engagement with particular movement repertoires [5] and can foster reflection on the dance learning process [4]. However, beyond being an application domain, dance and broader artist-led approaches also offer a means of probing our experiences with technologies more deeply [60].

Our project broadly takes place in the context of interactive theatre and creative robotics [19, 48, 79]. Within the HCI community, artistic research into robotics can be used to re-appropriate conceptions of robots [53] and contribute insights into how robots can be better designed. For example, Schneiders and colleagues use the case of an art installation, which centred on a playful robotic arm housed in a “cat utopia”, to reflect on the role that robots play in multispecies worlds [80]. Further, creative work with robots has been shown to render insights into the ethics of our technologies

and practices. Jochum and colleagues show how live theatrical performance is a novel and innovative approach for studying future interactions between humans and care robots [57]. Similarly, Eriksson and colleagues, through their account of designing drones for an opera performance, demonstrate how ethics are enacted while deploying potentially dangerous technologies into novel contexts [29]. However, though artistic-led practices are often propellers of innovation, such research can still encounter barriers in HCI [62]. For example, Benford and colleagues describe the tensions that arise in gaining formal ethics approval for (often provocative) artistic-led projects and contribute better tools for doing so [12]. Jochum and Donnarumma have already noted how disability, in particular, is an essential aesthetic domain for a critical reading of robotic performance, as it can enable an engagement with conceptions of wholeness, vulnerability, uncertainty, and participation [56]. In turn, this can trouble how performances might reproduce problematic ableist assumptions or imagine new relationships between machines and human bodies [56].

Our artist and performance-led [9] research provides a rich background context against which we critically examine a glitch. This approach is broadly similar to research through design [76, 103], wherein knowledge is generated through a synthesis of creatively designing technologies, studying interactions with them, and developing theory [30]. It also bears some similarities to counterfactual design – which aims to create artefacts that purposefully counteract norms (e.g. [94–96]) – or more speculative, adversarial or critical design approaches (e.g. [6, 27, 100]) – which also used designed artefacts to generate alternative understandings of technologies and practices. However, in this artist-led work, the artist’s own creative practice – in this case, dance improvisation [22] – is the method through which novel ethical, conceptual, methodological, and epistemic understandings of a technology or research practice can be generated [8].

3 Research Process

Here, we (i) offer an overview of the project, (ii) describe the glitch, and (iii) explain our analysis process.

3.1 Overview of Project

The glitch occurred during an artistic-led research project *Robots, Dance, Different Bodies*: a collaboration between the Mixed Reality Lab at the University of Nottingham and the Centre for Dance Research at Coventry University with the support of Candoco Dance Company as a creative partner. This project employed *performance-led research* by inviting a team of professional creative practitioners with different disabilities to dance with robots [9]. The overarching goal of this project aim was to embrace the expertise and experience of dancers with disabilities to imagine creative and generative conceptions of ethics that could inform new ways of designing future human-robot interactions, particularly those involving close proximity between robots and human bodies. We note that the dancers involved in this project are colleagues rather than recruited participants, who were supported by a team of roboticists, technicians, co-designers who specialize in the development and evaluation of assistive technologies [97, 101], and soma designers who work with the body in interaction design [50, 51].

This project unfolded over five workshops between July 2023 and April 2024. The workshops were all conducted on-site at the Cobot Maker Space at the University of Nottingham. The first workshop focused on introductions and exploring different robots that we could use for the project. The second workshop focused on engaging in group bodywork and somatic practice. The third and fourth workshops consisted of facilitating dance improvisations with a pair of industrial Franka arm robots² where we encountered the glitch. The fifth workshop focused on reflection and discussion of the overall project.

While reflecting on the project, Kat sparked our interest by stating that they, as a dance-researcher working with crip theory, were interested in our collective response to the glitch that we encountered while trying to dance with the Franka Arm robots; *“It’s around that... choice to stop that might then provoke a reading of ‘it’s gone again and it’s broken or it’s frozen’. Which I have been interested in from the beginning around how we read that and how we subvert the brokenness of stillness or inability to move or non-verbal communication. That actually the glitch is part of the beauty of human experience.”*

This reflection sparked our curiosity. We conducted a 60-minute microphenomenologically-inspired interview with Kat online in July 2024 to retroactively explore their experience of the glitch. Microphenomenology is an interview technique that elicits detailed descriptions of an evoked experience, including the synchronic aspects (the cognitive, sensory, and emotional) and the diachronic ones (referring to the unfolding of experience over time) [18, 71]. It has successfully been used in HCI to surface deeper understandings of experiences with technologies [63, 75]. One team member had received formal training in and had experience of using this method, and they offered to help facilitate the interview. We drew on interviewing tactics from microphenomenology to encourage Kat to articulate the experience of the glitch in great detail. First, we employed a prompting technique often used in elicitation interview protocols and watched two short clips of the sequence just described. Each clip was 80 seconds in length, and showed the beginning of the dance to the moment the robot shut down. During the interview, Kat was guided to recount their overarching experience of the improvisation, before being prompted to revisit the moment where the robot froze and the sensations and emotions evoked by both the glitch and our embodied responses to it.

3.2 The Glitch

During the project, we worked within a novel performative setup where one dancer would operate one Frank arm robot (the control arm), and a second robot (the free arm) would duplicate those movements. A second dancer would then improvise with the second moving arm (See Figure 3). We found this setup interesting because it allowed us to explore real-time dance improvisation without the need for extensively programming or training the robots.

The team – with input from the dancers, roboticists, and other technicians – established a protocol in order to keep the dancers as safe as possible whilst working with the robots. Two team members would monitor each dancer-robot pair with an emergency stop button (similar to how spotters are employed in gymnastics). One

²Franka Arm Robot

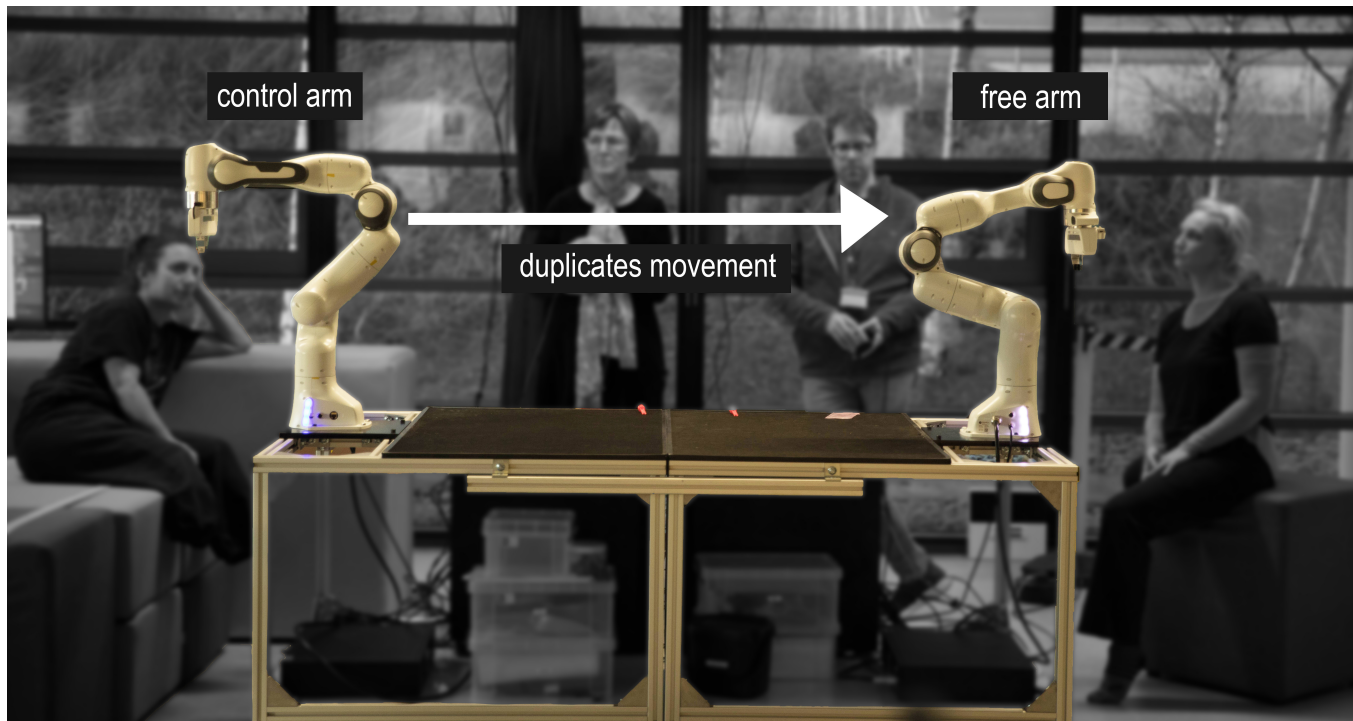


Figure 2: The robot duplication setup: the robot on the left is the control arm. The free arm on the right duplicates the movements made by the control arm.

roboticist was responsible for ensuring the operation of the robots, and another was responsible for monitoring the computer from which the robots were running. Finally, a director was responsible for taking care of the dancers – Kat and Welly – and coordinating the dance improvisations. The rest of the research team formed an audience for the performance and were encouraged to speak out if they felt something was off. This setup is shown in Figure 3.

While improvising with Franka arm robots, we frequently encountered a safety feature that caused the robot to “lock” itself: at a certain point – especially when the dancers worked with twisting, turning, or fully extending the arm – the robot would lock its joints and freeze in place, preventing any further movement or interaction. This behaviour was a designed feature, i.e., it was not caused by the robot breaking down, but rather, it was a pre-programmed defensive mechanism intended to prevent the robot from being broken. From a technical perspective, our robotics experts understood this behaviour was due to the system generating errors when the arm was manipulated in a way that resulted in the robot arm joint positions, motion velocities, accelerations, or torque levels reaching the manufacturer’s pre-set limits. The roboticists had made us aware of this safety feature prior to our work and emphasised that this behaviour was a common safety features in robotic arms. Activating this locking behaviour did not damage the robot (unless we tried to force it to move). Despite knowing the cause of this behaviour, we experienced the locking feature as being relatively black-boxed; i.e, it was difficult to establish a definitive range of movements that could be performed with the robot. Further, the

robot would need to be reset and reactivated by the technicians on our team before it could be moved again.

Though we had anticipated difficulties in attempting to dance with this industrially-designed robot, it was an extended – and at times frustrating – process, as Kat and Welly both applied somatic expertise towards understanding the robot’s range of motion. Over the course of the project, both dancers developed a sensitivity towards the robot’s range of motion, how much pressure could be applied on different parts of the arm, and how the robot’s multiple joints could be turned and twisted. Despite such skill, this locking behaviour was difficult to avoid. In the vast majority of our improvisations, the dance would end when it was interrupted by the robot locking. As such, although this behaviour was a designed safety feature, it served as a “glitch” in our research project: a breakdown that needed to be repaired before the process could continue. In other words, we reflexively treated the glitch as an annoyance that needed to be resolved.

3.3 Analysis Process

We conducted our analysis in two stages. First, we examined Kat’s interview and analysed the different ways in which ethics were being enacted in our embodied responses in the moment that the glitch occurred. To do this, we focused on the three parties that constituted the glitch as a socio-technical phenomenon; (i) the dancer, (ii) the robot, and (iii) the remainder of the research team. We drew on the concept of *ethical sensibilities* to examine what prompted the different parties to act and guided the actions that



Figure 3: The safety setup: the dancer on the left operates the control arm while the dancer on the right improvises with the free arm. Each dancer is monitored by a roboticist near them. Two team members hold emergency stop buttons. The director and the audience are positioned behind the camera.

where taken [39]. In the case of the robot, we applied the concept of ethical sensibility to consider the ways in which the technology was designed to respond to the situation. This stage of the analysis revealed an implicit ethical misalignment wherein our embodied enactments of ethics in response to the glitch did *not* align with the stated crip feminist values of the project. The results of this first part of the analysis are presented in Section 4.

This realisation prompted a critical re-analysis of our research process as a whole. The overarching project dataset consisted of 3.25 hours of footage of our dancers practicing and testing the robot arms, 1.25 hours of performance footage (45 dance improvisations) and 2.5 hours of reflection and discussion. Further, we recorded another 10 hours of plenary discussions concerning the project, another 1 hour of miscellaneous group activities, and an additional 8000 words of transcribed field notes and reflections.

Second, we revisited our overarching research process with the aim of critically examining similar ethical misalignments. We conducted an interpretative analysis of the overarching project dataset looking for different enactments of ethics in the process. For example, we analysed transcribed conversations and identified moments where team members articulated an ethical attitude concerning desirable or undesirable interactions with robots. Further, we studied videos of the dance improvisations and the reflections that they prompted, examining what the team found ethically important and valuable in these interactions.

We were struck by how often these different expressions and enactments of ethics implicitly challenged each other, yet the difference between perspectives had not been properly articulated. We were motivated to bring these different perspectives into dialogue with each other, as a means of rendering the misalignment visible for the rest of the research team and fostering a more open discussion regarding the ethics and politics of the project. The results of this second part of the analysis are presented in Section 5.

4 The Moment of Glitch

In the first part of our analysis, we present Kat’s voice to describe how the improvisation unfolded and ended when the glitch occurred. This is our starting point to analyse how (i) the dancer, (ii) the robot, and (iii) the rest of the research team enacted ethics in the moment of glitch. The improvisation is shown in Figure 4 and the video is included in the supplementary material for this paper. In line with the crip values of our project, we do not position Kat as the “subject” of this analysis but rather, we present their voice as a means of analysing our embodied ethical responses to the glitch.

Kat Recounts the Glitch: “Kate says ‘Okay, when you’re ready’ and grants permission to begin. I shift my body closer to the robot, so that I can connect with its face and hold its face with my hands. The music begins and inspires a movement quality, which is seeking to achieve a buoyancy; a fluidity within the robots movements. My movement is based on trying to achieve that in the



Figure 4: The Improvisation (left to right). (1) Kat takes hold of the robot. (2) Kat begins moving the robots from side-to-side in buoyant motions. Welly responds by moving her body in elongated motions. (3) Kat uses both hands to control the robot and watches Welly closely. (4) Kat and Welly both smile as they find a synergy and their movement flows joyously across the robots. (5) Kat's robot freezes and they grimace. Welly stops in place. (6) Kat strokes the robot. (7) Kat taps the robot. (8) Kat shrugs at Welly as Simon steps in to fix the robot.

robot's movement. Then there is the layer of not letting my vision be on the robot, but on the feeling of moving it as an extension of creating movement choices for Welly. Welly finds some gorgeous spaces within her robot. She works a lot with twisting and extending certain body parts into the spaces. I feel a connection with her, and the robots and the movements in the environment that it makes me feel joy and peace and calmness... and excitement about pushing harder, or providing a context to create more of these moments to extend the joy. That's also reflected in being aware of the sun shining on Kia and Steve particularly, and also awareness of the music. I'm not entirely sure how connected I am to the lyrics. I don't feel too conscious of anything outside of this small triangle - of me to my robot, over to Welly and her robot, and Kia and Steve. I want to project my energy into that triangle. So there is this forwards trajectory. I'm in a fluid movement and then, the robot... plunk... stops. It's abrupt. It feels like a resignation that I knew this was gonna happen all along. I feel it in my stomach. An unexpected - and expected - dramatic ending to a state of being. And with that resignation comes this tap with the fingers. It's an emerging of that forward energy, the trajectory continuing. I am trying to very quickly accept that this cannot go on, despite it not being my decision. So I tap the robot [with my fingers] to get something out of my body and to maintain the relationship or the contact that I have with the robot. And then, I also give that same understanding or acceptance over to Welly. I shrug my shoulders like 'well, it had to end eventually, my love. It was always gonna end eventually.' Then, there is the stroking moment."

4.1 Experiencing the Glitch

Now, we present three different readings of how ethical sensibilities are being enacted through Kat's narration. (i) We explore how Kat enacted ethics while dancing with the robot in the moments before the glitch occurred. (ii) At the moment of glitch, we then shift to how Kat experiences the robot engaging its safety feature. (iii) Finally, we shift to how Kat experiences the rest of the research team enacted ethics in their response to the glitch.

4.1.1 The Dancer. First, we focus on how Kat enacts ethics in the role of controlling the robot in the moments before the glitch. First, the role of operator is an ethical responsibility in and of itself. Operating the control arm entails assuming a number of responsibilities. The operator is responsible for continuing the research process; for taking care of themselves and the robot; and for taking care of the dancer improvising with the other robot. It can be an act of care - and by extension, an enactment of ethics - to assume the role of operator: *"I was becoming increasingly aware of the dynamic between Welly and I that felt the most fluid. As the workshops were going on, I was interpreting more and more that Welly found being in that lead role anxiety-inducing and I enjoyed being in that role. I take my responsibilities very seriously. And I don't. That's why it's also, like, really fraught psychologically."* This is a contextual dimension which guides how ethics need to be enacted: the research has a

desirable outcome (i.e., the robot does not break down and no harms comes to the dancers), which in turn shapes Kat's ethical sensibility towards the interaction.

Second, the setup of the dance space creates an ethical relationship between Kat, the robot, and ultimately Welly. Kat is not only responsible for keeping the robot moving, but also needs to make that movement interesting for Welly: *"I'm guiding it. I'm taking responsibility for the movement generation. I am doing my absolute best to make things as lubricated as possible for the robot, to put two guiding hands on it. One hand on the the front of it, so that I know can pull it towards me and create this ripple effect of Welly's robot approaching her. Then also, there's this wrapped right hand to make sure that it can have as many movement possibilities as are conjurable... and so I really feel like I'm doing the most work possible in relationship with this robot and its potential. I've managed to get into my body. Something that feels really nice for both of us."* This is a professional dimension that has shaped Kat's ethical sensibility. It is not only about continuing the research process (i.e., by being a dance partner to Welly), but there are situated values that shape what it means to do this research in an ethical way (i.e., by being a generous dance partner to Welly, in order to support the work that is being done).

Third, within the role of operator and the relationship it creates between dancers, ethics need to be enacted in a deeply embodied way. The way to act ethically in this moment, is to keep the research moving forward, ensure no harm comes to either the dancers or robots, and be a generous dance partner through movement. These ethics need to be enacted through the body: in this context, it is not possible to practice ethics in abstract, through conversation or dialogue. It requires considerable somatic expertise to keep the robot moving while still being a generous partner in terms of movement possibilities: *"I'm using a tension [in my own body]. I've figured out the limits in my body of what provides a stable base [for the robot]. I find it very freeing to be the mover, to not be judged in terms of fluidity, but to actually be a juxtaposition. To be fluid, and then being able to be counter that and be quite rigid. All of this shifts. I'm not rigid all the time, but I have a rigidity within my upper body, my whole body actually. That's satisfying to me. It's linked to my experience of dancing with my prosthetic legs as well. Often, if I'm using my legs, I will feel this juxtaposition in trying to move fluidly and also still not quite grasping what fluid movement means for the metal and carbon fibre. And holding this jeopardy of... the acceptance and the realism, that the prosthetics have boundaries. They have upper limits of movement and also so does my body within them. And that's questioned all the time, or put under scrutiny all the time."* In the moments before the glitch, these different dimensions of ethical sensibility - the contextual, the professional, and the deeply embodied - are entangled in how Kat enacts ethics.

4.1.2 The Robot. Next, we shift our focus to the robot in the moment that it engages its safety feature, as told through Kat's experience. The locking behaviour is an ethical consideration in the design of the robot, so we applied the concept of ethical sensibility to consider how the technology was designed to prevent itself from being broken or for other kinds of harm arising from misuse. First, Kat encounters the glitch: *"We're [the dancer and the robot] are moving downwards and then upwards, so we're going through a lot. It feels*

like we're going to make it, and then the robot locks in the moment that is going down. So we're already in this more introspective closed in moment. And then it locks." As this safety feature is designed to prevent the robot from being harmed, then in this moment, the robot is approaching its limits. From the robot's 'perspective', it is in danger of being harmed. Therefore, the robot 'enacts ethics' and engages the safety feature.

Second, there is how the glitch is experienced: *"There is the weight of the stop. I'm not anticipating the stop. So, there is the weight that I feel in my hands, and travels up through the forearms. I am also moving my upper body, my entire upper body and torso with the route that we're taking as well. And so, there is a stoppage in my hip, and then an awareness of the musculature around the ribs of coming to a sudden stop. All of this is felt very deeply within the stomach area. It feels like a weight very deep down into the pelvic floor. I become very aware of where I am still in contact with [the robot] as a way to take that feeling in my stomach. Move it back upwards, out through the forearms, out the hands and into the the robot. Then in this moment, comes the tap, a tensing of the face. An exhalation, not just a breath, but expelling the frantic energy or potential for heart rate increase and pent up aggression. I really like being aggressive in performance. But, in that moment, it didn't feel like that vibe or it didn't feel like that was somewhere that I wanted to go, or felt that Welly wanted to go. It felt very wholesome and this energy didn't feel like where I wanted to be."* In this moment, the robot engages its safety feature because its interaction with Kat is assumed to be undesirable: it could result in harm being done to the robot. However, Kat is working extremely hard to keep the robot moving whilst not harming it. As Kat is practicing ethics in such a deeply embodied fashion, this abrupt stop is experienced as profoundly jarring.

Third, however, this emotion and discomfort is evoked by more than just the glitch itself: *"I think [the aggression] is probably in multiple directions at once. I feel it towards myself, like 'Ohh you couldn't finish the move. You couldn't handle it well enough.' Then, I think, it's anger at the fact that we have reached this place of 'this means wrong'. It feels just disconnected. It's also like anger at the system. How has this movement not been thought about already? I feel like I'm not going that fast or being that ambitious with it. I'm having to be very careful, not just for the movement possibilities, but also for perceived risk of what I'm doing, so I feel some isolation, some loneliness in that moment. It's a really helpful thing to be in contact with the robot in that moment. The memory of it is quite profound. I read a lot in that. I can create my own narratives around the metaphor of that. Times in my life where I have felt responsible for the way in which things play out."*

Here, in examining the glitch, we arrive at a rupture that reveals a misalignment in how different ethical sensibilities are being enacted in this moment. We see the misalignment between how Kat and the robot each practice ethics: Kat practices ethics in a deeply embodied fashion, by putting physical work and considerable skill into the interaction. The robot also 'enacts ethics' in an embodied fashion, but in a very different way: the robot simply locks in place, physically ending the interaction. Within this, we see two slightly different perspectives concerning ethical human-robot interaction. The ethical interaction envisioned by Kat is one where embodied expertise and skill can support successful human-robot interaction. The ethical interaction envisioned by the robot is one where the

robot is operated with competence and without risk of harm. These desired ethical interactions should be compatible and complementary. However, by shutting down abruptly without warning, the robot actually reinforces an undesirable interaction: it has not supported Kat in learning about its limitations and, in doing so, has reproduced the assumption that Kat is not a skilled operator. To be clear, it is not wrong for the robot to have safety features, nor engage them if it is in danger of being broken – yet – the robot is a designed technology and it could be designed to operate in ways that better align with supporting the skills of the operator. However, more importantly here, is that within this glitch – a moment that we have decided *"means wrong"* – we also uncover a misalignment between the purported values of the project and the ethical sensibilities that are being enacted in this moment.

4.1.3 The Team. Finally, we shift our focus to how the rest of the team enacts ethics in response to the glitch, again told through the lens of Kat's experience. First, we see that the glitch is distributed. The moment of glitch is not just situated in the robot locking, but also unfolds in our responses to it: *"The music stopping was an aspect of feeling like it was stopping, but so also was the shift of the collective of people. There was a sigh, or Simon jumping off a chair, or Feng standing up to like go to the computer... which is a very beautiful thing. It's a very beautiful thing to want to jump in and fix it. It comes from a very... I guess complexity is everything. In this moment, one of the things that I see is the potential of embodied response. It's fascinating for me. Does the does the footage exist of each person's response? What would it be like to do a microphenomenological interview for each of us?"* The ethical sensibility enacted by the team is to step in and overcome the breakdown in the research process; to physically reset the robot and return it to starting position so Kat can assume the role of robot operator again. However, these embodied responses inadvertently reinforce the idea of failure: a failure to keep the robot moving, a failure to live up to the responsibilities of the role of operator, and by extension, a failure of the research process. Here, we see a parallel to the robot itself: the team is not wrong to step in and fix the robot – yet – our actions could have been better aligned with the support that Kat needed in this moment: more sensitive to how we ourselves were participating in the moment of failure and the potential affect we could have on each other.

Second, our reflexive actions reveal a much deeper ethical misalignment: *"There was a lot of narrative throughout the workshops about the robots breaking again. Or there was like an impatience to have it go as long as possible, and if it broke, that was not what we wanted. We've collectively decided that was not what we wanted. It gave me like a strong sense of empathy for the robot. 'Well, you're not the only thing potentially going wrong here, if anything is actually going wrong here.' I saw my own experience and the experience of my friends, particularly disabled ones within this consensus that was potentially going to exist unchallenged, to continue in what we think of as broken and in need of extremely quick fixing. [This consensus] was as clunky as the robot freezing, and the potential interest that comes out of that. Actually, it's one of the most interesting things performatively, to challenge an audiences expectations. Is this performance going wrong? Is this intended? And so it was also interesting to me that when [the robot stopped], it would get shut down, the performance would not continue, the music would stop. I think that's also*

why I tap [the robot]. Yeah, it is interesting because I do stop with it. The shock is there for me too. It's not like I just keep going. I assume as much as anybody that is the end and I indicate that it's the end as well. I also triggered that stoppage. That's an exciting task that I would like to play with, like how long can I fool people that it hasn't stopped?" Here, we see that the glitch is not a site of breakdown on part of the robot operator nor the robot itself. Rather, the heart of the glitch reveals an ethical misalignment; a moment where our embodied enactments of ethics in response to the glitch did *not* align with the stated crip feminist values of the project. In our project, crip and disability perspectives were intended to trouble our normative ways of doing ethics and conceptions of which bodies hold value in the design of our technologies. Yet, in this moment, our embodied responses to the glitch serve to reproduce a future where breakdown and failure – and the bodies to which those labels become attached – remain incontestably undesirable.

This ethical misalignment was deeply implicit; it did not derail the research process nor result in any overt disagreements between us. It was only later, when Kat articulated this experience through the interview, that we – the authors – came to consider our ethical sensibilities more critically. In our responses to this glitch, we were pre-reflexively enacting ethical sensibilities that are deeply shaped by socio-cultural and political forces that marginalise and alienate bodies with disabilities. We were – despite our ethical intentions – reproducing the idea that breakdowns and failures are inherently undesirable and should be treated as an annoyance to be quickly resolved [58]. Further, we were actively applying those sensibilities to what we considered to be a desirable interaction with a robot, and – if the aim of this process had been to design an artifact – we might easily have reproduced those sensibilities in future human-robot interactions. Troubled by this, we were prompted to revisit our research process: *where else might there have been implicit ethical misalignments that went unnoticed during our research process?*

5 Tracing Ethical Misalignments: Dialoguing Different Ethical Perspectives

We revisited our overarching research process with the aim of critically identifying and examining similar ethical misalignments. Here, we demonstrate how our critical re-examination of the research process revealed three other instances of misalignment between ethical perspectives; (i) Conceptions of Vulnerability and Control, (ii) Dependence on Expectations, and (iii) Value of Autonomy. We present these examples to demonstrate how Kat's articulation of the glitch – and the ethical misalignment that it revealed – created a lens through which we could critically analyse our process and come to a deeper understanding of how ethics were being enacted in different ways.

In discussing each of the three instances, we in turn: (a) we present two contrasting ethical perspectives, one technological value that was explicitly discussed and a provocation implicitly expressed through the embodied practice of dance; (b) we elucidate how the misalignment invited us to critique the socio-cultural shaping of technological values from a crip perspective [58]; and (c) we illustrate how each misalignment prompted us to consider the implicit ethics and values underlying our interpersonal relationships and the socio-technical outcomes of our work [39]. We present

these examples to show how – within these misalignments – we forged a dialogue between different interdisciplinary and ethical perspectives that acted as an invitation to bring us back into ethical alignment with the project's crip feminist values.

5.1 Conceptions of Vulnerability and Control

The first misalignment that we that identified in our research process was between the technological principle that we should mitigate vulnerability through control, and the crip perspective that exerting control over those considered vulnerable can infantilise people with disabilities. Early in our research process, we discussed the advantages and disadvantages of proximate interaction as a means of controlling the robot. Dancing with the robot – which was not its intended usage – entailed an element of vulnerability. Rather than considering this as a disadvantage of proximate interaction, we discussed how proximate interaction might enable greater physical control over the robot. If the robot is further away, then the operator might actually be more vulnerable as they have less control.

We compare this discussion with the dance improvisation *Car-men* (See Figure 5). Here, Welly moves the robot while Kat sprawls back, projecting an almost provocatively unbothered attitude towards the machine. Kat sways and jiggles their torso while eyeing the robot. Welly continues to move the robot but slowly. Kat improvises boldly, then leans back while the robot looks down at their exposed torso. Kat rises and moves purposefully around the robot, standing tall, then positioning themselves under the robot's downturned head. In other words, Kat provokes with artistic intention, purposefully making themselves vulnerable as a subversive action that puts Kat firmly in control of both the audience and the robot.

Contrasting these two examples reveals a misalignment wherein different ethical perspectives can come into dialogue. First, this is an instance where a concrete crip reading of particular values – vulnerability and control – can be made and explored in relation to our project as a whole. The first ethical perspective is *explicitly* shaped by the idea that vulnerability is a mostly undesirable quality of bodies. Though this perspective challenges the idea that proximate interaction with robots is inherently dangerous, it maintains a binary view of vulnerability needing to be mitigated through control. However, the second ethical perspective is *implicit* in the dancers' embodied practice: this improvisation demonstrates how vulnerability and control can co-exist. This enactment of ethics implicitly challenges the first perspective as shaped by the idea that power can be exerted over bodies that are considered vulnerable. The term "vulnerable" already sticks more easily to some bodies than to others, potentially positioning people as being pre-defined by "victimhood" [2]. This can, among other things, inadvertently infantilise people, rendering them as incapable and in need of paternalistic controls over their bodies [58]. Further, it can make it more difficult to move beyond damage-centred narratives towards the pursuit of happiness, flourishing, and self-actualisation [88].

Here, critical engagement reveals how our ethical sensibilities are expressed in our different professional practices. We argue that rendering such implicit ethics visible should act as a catalyst for cultivating ethical sensibilities and considering the socio-technical dimensions of our research [39]. In this case, this misalignment



Figure 5: Improvisation (left to right). (1) Kat leans back and eyes the robot. (2) Kat reaches forwards and offers a hand to the robot. (3) Kat leans back and fully exposes their torso to the robot. (4) Kat rises up again looking at the robot from beneath.

reveals ethical opportunities to engage more deeply with each other, such as more critically consider how technological discussions of vulnerability and control position each other within the research process [38]. Further, it is an invitation to consider how our envisioned research contributions and designed artefacts speak to the values of our work and what ethical sensibilities we are allowing to shape the outcomes of our process. For example, we can consider whether control mechanisms for robots are a desirable outcome of this work, and if so, how they might be designed with alternative conceptions of vulnerability and control [11]. This misalignment also suggests a different research direction towards better ways of negotiating ethics in interpersonal relationships [74]. Thus, pathways are opened to bring us back into ethical alignment.

5.2 Dependence on Expectations

The second misalignment that we identified was between the ethical principle that we avoid risk by making accurate assumptions, and the crip perspective that some bodies may be subject to problematic assessments of their capabilities. We identified this predominantly in our discussions concerning the potential risks that the dancers would need to work around while dancing with the robots, such as pointing to potential malfunctions that could result in unpredictable behaviours. For example, one roboticist stated; *“it’s important to have a kind of naming convention, because it builds up our mental model of what we expect is going to happen, quite a lot of our interaction is based on understanding, of pre-empting what the next thing*

that could happen would be [...] You build a model, the mental model, what it knows, its world and then you can then adapt your behaviour according to that. That’s why naming is important.”

We compare this discussion with the dance improvisation *Predator* (See Figure 6). Here, Welly smoothly moves the robot, to a background of ominous music, while Kat expertly weaves in-between the robot’s movements in a way that purposefully built suspense in the onlookers. Suddenly, Kat ducks beneath the robot as Welly moves it downwards, which leads to an extended and dramatic moment where the robot appears to threaten Kat from above. This elicits reactions from the audience, before Kat finally drops to the floor and out of the robot’s range of motion. In other words, Kat takes a calculated risk that forces the audience to sit with the unexpected.

Contrasting these two examples again reveals an ethical misalignment wherein different perspectives come into conversation and engage in another concrete crip reading of the value of expectation. The first ethical perspective can be understood as shaped by the idea that bodies with unknown capabilities or that might behave in unexpected ways are dangerous, and accurate assumptions are part of mitigating those potential threats. The second ethical perspective is implicit in the dancers’ embodied practice: this improvisation prompts us to forestall any quick judgments. This enactment of ethics implicitly challenges the first perspective as treating bodies with unknown capabilities as potentially dangerous. Some bodies are already subject to problematic assessments of their capabilities



Figure 6: Improvisation (left to right). (1) Welly moves the control arm while Kat improvises with the free arm. (2) Kat looks at the robot in a calculated manner. (3) Kat ducks beneath the robot. (4) Kat and the robot both rise up again.

or even positioned as a potential threat [58]. This can inadvertently essentialise groups of people based on harmful or inaccurate societal discourses, making it difficult to receive much needed forms of support or understanding [72]. Even well-intentioned attempts at inclusivity can inadvertently reinforce that some bodies are “others” by default, and, as such, subjects of study for researchers to improve their understanding [14].

Here, critical engagement reveals the deeper socio-political shaping of our ethical sensibilities and prompts us to consider how these implicit values shape our ethical practices and the socio-technical outcomes of our work. In this case, this misalignment prompts us to critically consider how our dependence on expectations shapes our own interpersonal relationships – which span different bodies, lived experiences, and professional areas of expertise – and how we might better work towards coalitions across difference [38]. Further, it can allow us to critically consider the ethical assumptions that permeate our fundamental design concepts and whether we could instead design technologies that do not rely on assumptions based on what bodies “should” be capable of doing [82]. As such, this misalignment opens a pathway towards the design of future human-robot interactions that enable different bodies to meet the world on their own terms [46]. This misalignment again opens pathways to bring us back into alignment with our project’s values.

5.3 Value of Autonomy

The third misalignment that we identified was between the ethical principle that our individual autonomy should be unimpeded, and the crip perspective that bodies are marginalised by treating constraint as inherently undesirable. We identified this predominantly in how we discussed the robot’s numerous technological constraints as regrettably limiting the dance practice, such as offering insufficient movement possibilities or being inadequate in the quality of that movement. For example, when discussing how best to move into physical contact with robots, one designer expressed regret that “*we [are] having to be constrained by the existing technology*” and another roboticist agreed that this was “*stymieing our ability to really use the technology*”.

We compare this discussion with the dance improvisation *New York* (See Figure 7). Here, Kat moves the robot while Welly plays with the space around the robot elongated above her. There’s smoothness and speed to how the robot moves. Kat watches Welly closely, constantly adjusting their body to see Welly around the robot. A moment of playful synergy emerges, where Kat rotates the head in time with Welly’s improvisations. Welly improvises in a way reminiscent of the robot arms flowing movements. Another moment of synergy emerges between Kat and Welly where they enact a fun and playful back and forth. In other words, Kat and Welly realise the aesthetic potential of the robot through a relational exchange.

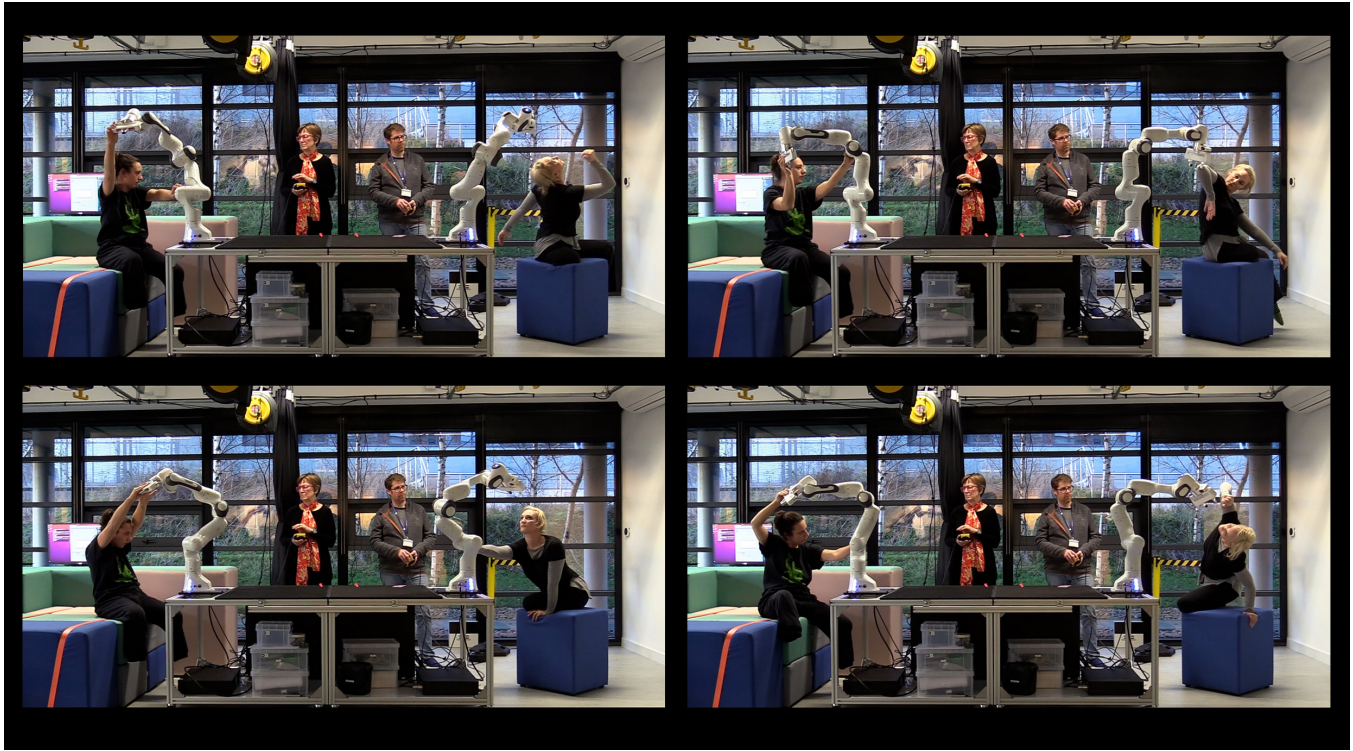


Figure 7: Improvisation. In each frame, Kat and Welly work together to maximise the robot’s aesthetic potential. They create a series expressive and dynamic shapes between dancers and robots.

Once again, contrasting these two examples reveals an misalignment wherein ethical perspectives can be brought into dialogue. Another concrete crip reading can be made of the value of autonomy. The first ethical perspective can be understood as shaped by the prerogative that other bodies should not overly infringe on our individual choices and possibilities. The second ethical perspective, implicit in the improvisation, is that autonomy is not situated in our ability to make individualistic choices. People are already marginalised by a system that values individualistic independence over all else [94]. This can inadvertently position people who require support, for whatever reason, as being less valuable than those who can live relatively independently [58]. Beyond this, the concept of independence itself hides the labour necessary to sustain our lives, which are interdependent and reliant on multiple networks of people, systems, and structures [89].

Critical engagement reveals the deeper socio-political shaping of this sensibility and in this case, prompts us to question how highly individualistic conceptions of autonomy might actively hinder the work required to forge relationships across our different experiences and practices [38]. Further, it prompts us to consider the broader socio-technical outcomes of our work, and how robot interactions could be designed in ways that are attentive to the structures and inequalities of care work [45] and that do not devalue the care necessary to sustain our lives, our relationships, and the environment [15, 26]. Once again, the misalignment suggests a way forward that can bring us back into ethical alignment.

6 Ethical Misalignments as Sites for Contestable Technological Futures

We have described how this glitch revealed a deep and implicit ethical misalignment wherein our embodied enactments of ethics did not align with the stated crip feminist values of the project. It was through engaging with Kat’s somatic experience in the moment of glitch, that we arrived at a deeper understanding of how our ethical sensibilities had been implicitly – yet fundamentally – shaped by problematic societal conceptions of how supposedly “glitchy” bodies should be treated. This led to a critical re-examination of our project looking for other ethical misalignments, including those expressed through the embodied practice of dance. This revealed three other instances of ethical misalignment: (i) Conceptions of Vulnerability and Control, (ii) Dependence on Expectations, and (iii) Value of Autonomy. Each of these misalignments serves as a site where we could discuss our different ethical perspectives and, further, consider what values we desired to shape our interpersonal relationships and the socio-technical outcomes of our project.

We have presented each of these examples in a binary fashion that starkly illustrates the contrasts between them. This serves to render these misalignments visible so they can be discussed [39]. However, it is important to note that, like any interdisciplinary collaboration, our process was complex and nuanced. Differences in perspectives were subtle – not always manifesting in overt disagreement – and often surfacing at different times or in different ways. These included discussions concerning technological ethics

and embodied dance practice as we detail here, but also in divergences between professional areas of expertise, methodological preferences, lived experiences, and epistemic commitments. We discuss these frictional aspects of our research process in greater detail in [37]. As such, ethical misalignments should not be viewed as moments of failure where we were inadvertently – either due to poor engagement or communication – working against one another. Rather, these misalignments were spaces where connections could be built, interdisciplinary understandings could be forged, and new pathways forward could be realised. They characterise a process of cultivating collective ethical sensibility [39]; a process by which we came to deeper understandings of each other, the socio-cultural and political connotations of our sensibilities, and the values that we might be reproducing in our practices and research outcomes.

In our process, we came to identify these misalignments only *retroactively*. Though these misalignments seem obvious when presented here, we did not always make the right connections between what we were “saying” and what we were “doing” over the course of our 18-month project. It was only later – once Kat articulated the glitch as a socio-technical phenomenon enacted by everyone in the process – that we were able to “close this gap” in a way that allowed us to extract the generative potential from these ethical misalignments. These misalignments were generative because they were opportunities for ethical and political intention to be exercised, moments when we could actively contest the values underlying our work and our assumptions regarding desirable ethical futures with robots. In other words, they are moments in the ethical process where we can actively choose to become otherwise and consider how things might be done differently.

Based on our experience, we have three recommendations for researchers who, like us, are always trying to find better ways of working together. First, we argue that space should be made to attend to “glitches” in the research process as they are sites where we can identify misalignments between ethical sensibilities and practices. Second, if – as in our process – such ethical misalignments go unnoticed as the process unfolds, even retroactive analysis and critical engagement can serve to foster ethical realignment and support outcomes that serve the values of the research. Thirdly, and finally, we argue that the misalignments should be sites where our ways of practicing ethics actively made are *contested* and *contestable*.

Our ways of practicing ethics in technology design and development – i.e., developing ethical guidelines, avoiding risk, ensuring safety and so on – can easily be perceived as matters of incontestable common sense. In many ways, this is a welcome turn; striving for ethical research is a fundamentally moral endeavour and the vast majority of researchers (including ourselves) do not wish to cause harm. However, space needs to be made for dispute concerning *the best ways of practicing ethics*. Contestation is central to how we interact and form societies [68], and is vital to challenging how our ways of doing ethics might inadvertently reinforce existing power dynamics, in particular, those enacted on or through our bodies [38]. Therefore, we do not see the point of identifying ethical misalignments as a matter of curtailing potential disagreement. Rather, in this work, we needed to make our differences even *stronger* in order to properly debate the ethics and politics of our work. In this way, debate can be fostered concerning how technologies – particularly robots and other machines – are often developed to promise better

and more ethical futures which, however, fail to value every body equally [3].

7 Conclusion

We consider it vital – both ethically and politically – that our research community critically attends to the assumptions that have shaped our ways of practicing ethics and the futures that we are envisioning through research [38, 39]. If our preconceptions of *the best ways to do ethics* are left unquestioned, we could – even unintentionally – perpetuate existing system of exclusion [40]. Therefore, we should attend deeply to the glitches where our underlying ethical assumptions are exposed. In our case, felt ethics offered us a path to analyse the glitch from and somatic perspective which generated new understandings of our practices and relationships to one another. In doing so, we create created space to debate alternative ethical futures. We call for ethics to be considered as an ongoing project where we challenge the best ways we can be in the world with technologies and work towards conditions of flourishing.

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