Designing Counter-Choreographies: Embodied Choreographic Approaches for Critical Examination of Online Tracking

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Abstract

This paper describes a workshop conducted as part of practice-based research that aims at critiquing online tracking algorithms commonly found in everyday web environments. The workshop introduced participants to online tracking algorithms using a series of choreographic exercises that informed a discussion on the topic and strategies to counteract data-driven extractivist technologies. We analysed the outcomes of our workshop and showed that it allowed individuals to become more aware of their lack of agency over data harvesting and its use by digital services, and enabled them to develop strategies for reclaiming agency over their personal data. We discuss how the choreographic approach used in the workshop contributes to engaging people in a critical examination of online tracking in their everyday lives and to inspire forms of countering extractive algorithmic systems. Our paper contributes empirical insights on how choreography can be used to raise awareness of data tracking online.

CCS Concepts

• **Human-centered computing** → *Interaction design*; **Interaction design process and methods**; **User centered design**;

Keywords

Online Tracking Algorithms, User-Data, Extractivist Technology, Embodiment, Algorithmic Awareness, Critical Design

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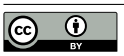

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1 Introduction

Algorithmic systems are often made opaque by design, and users are unaware of how much of their data is being collected [46] and

for what purposes. The impact of these algorithmic systems on society has been reported in various instances of causing harm and inequality [34]. These systems include those that use online tracking algorithms, which are present in most of the web services that we access today [35]. Since the early days of web services, surveillance capitalism [62] has been the driving force of online tracking technologies, with the shaping of consumer behaviour being almost always translated into corporate profits. The advertising sector is at the forefront of collecting extensive datasets on users' online activities that enable them to make predictions and influence people's behaviour [58]. These datasets can be demographic data, such as age or geographic location, or metrics associated with user engagement, such as number of clicks, scroll percentage, or time spent on a webpage.

Various countries are regulating the extraction of users' data. One example is the General Data Protection (GDPR) law in effect in the European Union (EU) since 2018. This law sets new parameters for data rights, privacy policies, and transparency of data processing and introduces binding sanctions that can be imposed on those who do not comply [35]. However, a study measuring the impact of GDPR on the Web concluded that although overall transparency in data collection and processing has increased, there is no evidence that online tracking has decreased [35]. The reasons for the latter are many, such as the violation of GDPR requirements [55] or the use of deceptive design and dark patterns, which are manipulative functionalities employed in digital systems against the user's best interest even where they do not fall foul of GDPR [17, 28].

This paper describes a workshop conducted as part of a practice-based research project that investigates online tracking algorithms commonly found in everyday web environments. Central to this research is the understanding of embodiment as physical engagement that emerges from everyday experiences and that binds our perceptions and actions [21].

Our workshop uses choreographic approaches to connect data tracking with daily gestures that people perform both offline such as standing and moving around, and online such as clicking or scrolling. We define choreography as the analysis and creation of movement sequences [25] and expand it to the realm of daily movements. We use choreography to lead people to critically examine and assert their freedom of movement and agency in societies that are intricately if subtly, controlled following the view of the Brazilian theorist André Lepecki [2]. In the workshop, we propose an embodied choreographic approach to foster an understanding of the actions we perform and the computational systems with which we interact online. The goal is to enhance participants' awareness of online tracking which can inform strategies to reclaim their agency over their data and advocate for overall algorithmic transparency. To do so, we pose the following research questions:

- RQ1: How can we design a workshop that allows people to gain awareness and counter data-tracking algorithms through embodiment and choreography?
- RQ2: How does the workshop support participants in critically reflecting on online tracking and devising strategies to counter it?

The workshop introduced participants to online tracking algorithms through the lens of choreography. The participants engaged in a series of exercises that included mapping daily tech usage, performing embodied interpretations of user metrics, and experiencing the visualisation and sonification of tracking requests from a custom version of the Duck Duck Go browser extension. The workshop activities informed a discussion on online tracking and an exploration of possibilities for counteracting such extractivist technologies. At the end of the workshop, participants responded to an open-ended questionnaire designed to assess the impact of the workshop's proposed methodologies on enhancing awareness and engendering novel perspectives on online tracking algorithms.

We analysed the workshop data (photographs, researcher notes, transcripts, and questionnaires) using reflexive thematic analysis [19]. The results showed how our choreographic approach allows for growing awareness around the lack of agency regarding data harvesting and its use by digital services, for developing a diversity of strategies for reclaiming agency over personal data-tracking, and for utilizing embodiment to support critical reflection on online tracking.

This work thus contributes to human-computer interaction (HCI) research by (1) presenting a new workshop design for raising critical awareness and countering data-tracking through an embodied choreographic approach; (2) generating empirical insights on how our approach engages people in critical examination of online tracking in their day-to-day and inspires forms of countering extractive algorithmic systems.

2 Related Work

We first describe the literature on systems that support the democratisation of choreography in HCI. We then show how embodiment and choreography were used in previous works to reveal and critique computational algorithms.

2.1 Democratizing Choreography in HCI

An existing body of work within HCI has considered technological approaches to supporting, transmitting and democratising choreographic practices, as discussed in previous literature reviews on dance in HCI [5, 32, 60]. These works have contributed to developing platforms and systems aiming at making visible information on the practitioners' dance composition, conceptual framework, and, at times, socio-political views. Specifically, work such as Motion Bank [24] and Synchronous Object [43] are two online platforms that document the arrangement of movement and choreographic structures of a particular set of dance pieces. Although the content of these two systems differs, they both aim to enrich the performer's and audience's comprehension of choreographic work. These two works have made dance data and choreographic processes visible with the incorporation of text annotations. Sarma [1] is an online database that includes documentation of workshops, labs, research projects, and research publications in the performing arts. This database has been a useful resource for our work in showcasing multiple approaches to publishing scores and involving audience participation. The Double Skin/Double Mind (DS/DM) installation [4] and after that the 'pre-choreographic' system by Emio Greco and Pieter C. Scholten (EG|PC) formalises terms, categories, metaphors, types and modifiers used by the company to train their dancers to embody their specific movement qualities [33]. This work is part of

a longer lineage of work developing interactive systems for the documentation of the dance vocabulary of EG|PC [20]. More recently, choreographer Wayne McGregor collaborated with Google Arts and Culture to create an AI-driven tool that generates choreography based on a repertoire of video footage from McGregor's archives. The idea of the tool is to transmit the repertoire by allowing dancers to generate their own version of it [39].

What these works highlight is the importance of creating tools for sharing and transmitting movement practices. They also illustrate how dance practices have contributed to HCI and computing by bringing to the foreground the centrality of meaning-making with the moving body [38]. Our work builds on this literature and proposes to use dance, choreography, and embodied meaning-making to reflect on computational processes.

2.2 Choreography to Reflect on Technology

Crucial to this research is the goal of growing awareness of how algorithms operate in digital services: which data are being extracted and for what purposes? Are users aware, for example, that their activity, such as scrolling on a webpage, is being tracked and potentially shared with third parties? There has been an emergence of proposals for tackling algorithmic awareness and legibility by integrating embodied approaches. An example that specifically incorporates dance is Somatic Data which uses somatics to represent data graphs [45]. That work involved professional dancers who were tasked with devising choreographed sequences that would allow individuals to physically experience the data through movement. Another example is the work by Backhouse et al. [9], who made use of physical theatre —- in particular, Forum Theatre, a technique by the Brazilian theatre maker Augusto Boal —- to involve audiences in reflecting on the impact of engagement-based algorithms. Also inspired by performance techniques and the improvisation work of Boal, Andersen and Wakkary developed workshops that engage participants in novel and personal ways to reflect on their relations to technologies [7]. Finally, Elsden et al. use theatre techniques, such as improvisational props within workshops, to engage participants in speculative enactments fostering critical discourses in HCI and interaction design [23].

Dance and choreography have also been adopted more broadly for critically engaging with technological apparatuses. An example is the Cryptodance initiative [16] that hosts events with the intent of collectively reflecting on issues of privacy, safety, and surveillance through embodiment and dance. As part of their work, Cryptodance developed an exercise that engages audiences in creating short movement sequences to enact digital encryption. Another example of an embodied approach to engaging with algorithmic transparency is Pothong et al.'s [48] use of performative methods such as Live Action Role Play (LARP) to support participants' examination of the possibilities and repercussions of transparency.

Another line of work integrating dance and movement to improve algorithmic transparency and literacy (e.g., [44]) includes projects such as Body.Scratch [8], a tool designed for children and adolescents that uses the visual programming language Scratch with choreographed movements to engage learners in an embodied and cooperative process to grasp concepts in computer science. Data Theatre [13] is an entry point for growing data literacy by engaging participants in emotional and meaningful embodied performance of data stories. Bodygramming [40] is another approach that uses embodiment to develop an understanding of basic programming concepts in physical computing. All of these projects integrate embodiment- and movement-based practices as part of learning processes in computer science, with the intention of democratising coding and increasing algorithmic literacy.

More broadly in the art scene, various artists have been bridging embodied, performative and participatory methods to engage with and critique algorithms and computational processes in society. One example is the artwork *Score for Performing User* [37], a series of instructions-based exercises that invite users to reflect on their identities and question issues around privacy, ethics, and justice in online environments. Another example is the *Higher Resolution* [36] exhibition at the Tate Modern, curated by Hyphen Labs and Caroline Sinders, which explored the dynamics of user interactions with machines and algorithms that influence their privacy, behaviour and digital rights. Another work is the participatory performance RCO mediated by mobile phones by Sarah Fdili Alaoui which engages audience members in embodied tasks to reflect on social and technological norms and constraints. Another example is the work *Listening Back* [29], which provides an add-on for the Chrome and Firefox browsers that maps Internet cookies to different sounds creating a melody while browsing. While our work is similar to *Listening Back* in using data trackers' sonification to raise awareness of online tracking, it differs from *Listening Back*, which is presented solely as a performance, incorporating embodied interactions and active participation.

These previous works developed strategies of integrating physical movement to make digital and often abstract processes more tangible. As such, they share efforts similar to those in the workshop presented in this paper. Indeed, they are choreography-inspired and movement-led works that pay special attention to day-to-day gestures to reflect on agency, or lack of agency, within control systems. During our workshop, we use choreographic prompts (see 4.1.2) to lead participants to reflect on the data traces they leave behind and explore new forms of resistance through the design of 'counter-choreographies' (see 4.2).

3 Methodology and Epistemological Positioning

3.1 Positionalities and Roles

The first author is a white, female, able-bodied, non-English native speaker. Before holding an undergraduate degree in Graphic Design and a postgraduate degree in Media Design, she completed an advanced degree in classical dance. She has collaborated with various choreographers and contemporary dance companies. This lifelong commitment to dance influences her approach to embodied methods and to challenging the mind-body split when working in HCI. This study is part of the first author's PhD, which explores the use of choreographic practices in data ethics.

The second and last authors are HCI researchers with specialisations in dance and music. They both contributed to the workshop's design, the analysis of the qualitative data, and the paper's writing.

Workshop participants were invited to contribute to the paper. The participants' affiliation varies from academic and non-academic

institutions to working independently. In addition to their involvement in the workshop, each provided minor contributions, such as editing and grammar revisions, or suggestions to clarify or enrich the content of the text.

3.2 Methodological Approach Informing the Workshop Design

3.2.1 Critical Practices. Our workshop methodology borrows from Critical Technical Practice [3] and Critical Design [61]. In the fields of art, design, and computer science, there is a legacy of methods and approaches for critically reflecting on technological artefacts and their impact on society by investigating them as sociotechnical systems [15]. One example is Critical Technical Practice [3], which has been mostly applied to the field of Artificial Intelligence (AI). It sees technology development not as an end in itself, but as an opportunity to reflect on the assumptions and attitudes that form around technology [22]. In Critical Technical Practice, artifact production is a chance to engage critically.

Similarly, Critical Design Research 'seeks to disrupt or transgress social and cultural norms' through design [12, p. 288]. It is a research through design methodology that explores alternative design values that prioritise ethics and bring about social change [10].

In line with Critical Design Research, we designed our workshop with instructions that invite participants to analyse their digital ecosystem, interrogate the algorithmic and data practices of the services they use, and engage critically in the production of 'counter-choreographies' for these ecosystems.

3.2.2 Embodied Sense-Making. Embodied sense-making refers to making sense through the body of the environment in which we find ourselves. In HCI, it has been described as collaborative, embodied, and participatory [51]. The workshop we conducted is a collaborative, embodied, and participatory space in which participants contribute to each other's sense-making processes and establish shared meanings and intersubjectivity. We deployed a set of choreographic techniques to facilitate individual and collective bodily experiences. These include prompts for participants to respond through physical enactments such as standing up, walking, or making gestures. Our goal for these prompts is to encourage participants to enact and embody invisible and abstract concepts related to online tracking.

4 Designing the Workshop

The workshop focused on the notion of 'countering'. In line with our RQ1, the workshop aimed to inspire participants to develop counter-movements to current opaque and extractive algorithmic systems, here seen as 'choreographies'. The workshop was divided into two main parts: (1) Identifying and Analysing (choreographies) and (2) Problematizing and Countering (choreographies).

The first part focused on introducing online tracking and mapping its presence in daily life, while the second part guided participants towards creating 'counter-choreographies' or strategies against the prevalence of tracking. We summarise the activities of these two parts in Table 1. These activities followed a specific order building up on each other to progressively guide participants towards generating 'counter-choreographies'. In line with critical design practices, each activity was designed to foster reflection and critical thinking towards different aspects of data tracking, as described next.

We designed the workshop following an iterative process. We first facilitated two pilot iterations of the workshop before coming to a final third version. The pilot workshops consisted of a series of activities that were either iterated or discarded.

Both pilot iterations of the workshop took place in the UK, the first in Bristol, in April 2023, and the second in Leeds, in May 2023. A total of 17 people attended the first iteration of the workshop, most attendees had a background in arts (including dance and performance) and/or computer programming, aged between 24-52, one person identified as nonbinary, and the remaining half identified as male and the other half as female. In the second workshop iteration, there were 10 participants. They consisted of artists or retired people doing art as a hobby; other backgrounds included reflexology, administrative work and housekeeping. The age range was between 19-86 and the majority identified as female. Similar forms of data collection and analysis as described in the paper were conducted in the pilot studies. They served to inform the iterative development of the workshop. In both pilot workshops, recruitment was managed by the venue organisers.

4.1 Part 1: Identifying and Analysing (choreographies)

The activities of the first part of the workshop drew from the two previous pilot iterations.

The first two activities introduce the participants to the main topics of online tracking and the choreographic approach that guided the research. The second half directs participants to reflect on their digital ecosystems and how they are implied in online tracking, paving the path for the making of counter-choreographies.

4.1.1 Browser Tracking Demo. In the first iteration of the workshop, participants were introduced to their browsers' web developer tools to interact in real-time with online environments and their content. They were then invited to 're-choreograph' the webpage of their choice by making changes to its style and content. This exercise was left out in future iterations as it requires prior technical knowledge in web programming, which participants in that specific event had but not in future workshop iterations.

Instead, to introduce online tracking algorithms we delivered a performative lecture, using a custom browser tool to illustrate concepts related to tracking and user analytics. Specifically, the first author created a tool for visualisation and sonification of tracking requests that operates as a browser extension in Chrome (Figure 2). This tool consists of a custom version of the open-source Duck Duck Go privacy extension [27] that maps each tracking request to audio and visual feedback in JavaScript. For each tracker request, the sound of a single metronome click plays and the background colour of the page flashes pink. Depending on which page is visited and the amount of tracker requests, the audio-visual effects will trigger repetitively. These effects are intended to give a rhythm to the experience of being tracked. Thus, online tracking algorithms are introduced to the participant by providing an audio-visual experience of tracking in the web browser.

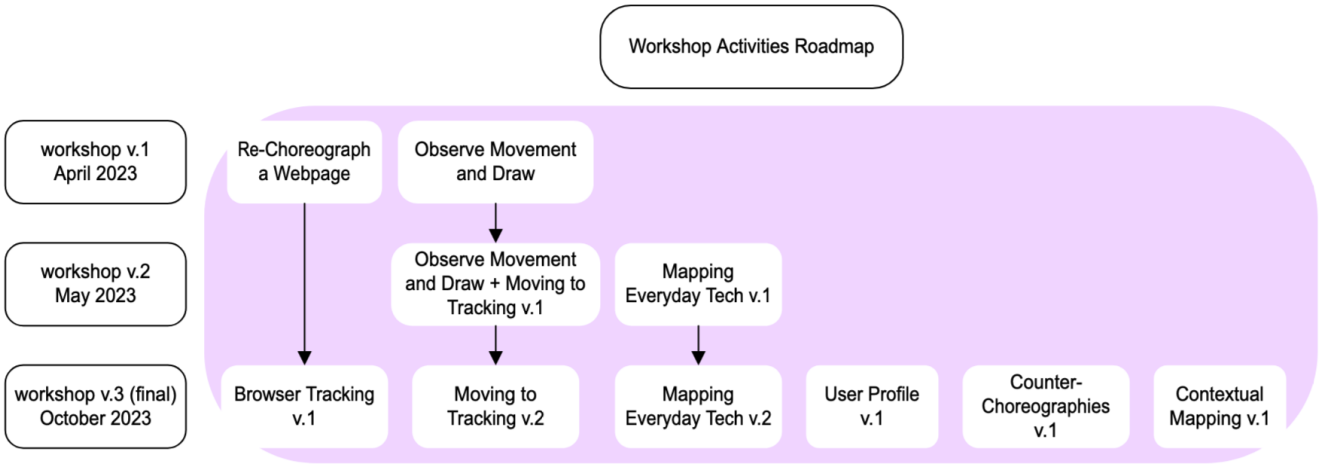

Figure 1: Image schema displaying the HCCC workshop activities roadmap.

Table 1: Overview of workshop activities.

Part 1: Identifying and Analysing (choreographies)

Activity	*Length*	*Description*
Browser tracking demo	10 min	Visualisation and sonification of tracking requests from a custom version of Duck Duck Go browser extension
Moving to tracking	20 min	Collective physical enactment of choreographic prompts inspired by user analytics data collection
Mapping everyday tech	10-15 min	Individually, listing the digital services used daily and reflecting on the data these services gather
User profile	20 min	In groups, making of a profile representative of the group based on a common digital service

Part 2: Problematizing and Countering (choreographies)

Activity	*Length*	*Description*
Counter-choreographies	30 min	In groups, generating ideas on resisting or counteracting online tracking in the common digital service by combining movement vocabulary and user metrics
Contextual mapping	15-20 min	In groups, analysing 'counter-choreographies' in relation to other sectors, such as the economy, industry, policy or the environment

As seen in Figure 2, the extension allows users to view the same trackers on the web console displayed as a list with a pink background colour. We chose to make tracking elements appear coloured in pink to differentiate them from the rest of the browser interface. Information on the trackers includes their name, the likelihood of fingerprinting, and the trackers' prevalence on the web (these are provided by the Duck Duck Go extension).

4.1.2 Moving to Tracking. In both pilot iterations, we included an exercise that consisted of observing people's movements and drawing them on paper. Although this exercise worked well as a form of breaking the ice and warming up to movement-based tasks, the connection to tracking felt abstract, which is why this exercise was left out in the last iteration.

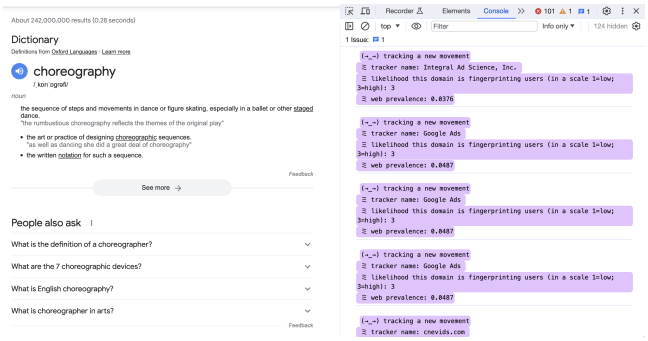

Figure 2: Screenshot of a webpage with the Chrome browser web-console open on the right side, displaying the Duck Duck Go privacy extension adapted and developed by the first author.

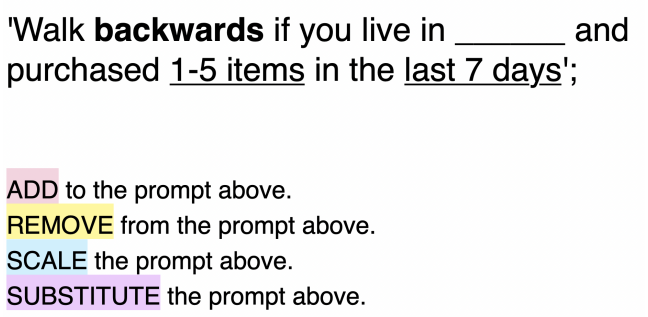

Figure 3: Example of a choreographic prompt presented to workshop participants during the Moving to Tracking exercise.

For the second and last iteration of the workshop, we designed a 'Moving to Tracking' activity (the second exercise in Table 1), in line with our embodied sense-making methodological approach, which engaged participants in physical enactments using daily gestures to gain an embodied understanding of online tracking technologies. The activity consisted of participants engaging in specific movements in response to prompts facilitated by the first author and inspired by user analytics data collection. An example of one of these choreographic prompts is: 'Walk backwards if you live in this city and purchased 1-5 items in the last 7 days' (see Fig. 3). In the last workshop, the prompts were projected onto a screen for participants to follow the exercise easily. Participants were then invited to voice out loud modifications, for example by 'adding', 'removing' or 'substituting' parts of the prompt. This vocabulary was reused in the second part of the workshop as described in Section 4.2.

These choreographic prompts were designed to instruct participants to use familiar daily gestures and physical actions to enact data-tracking algorithms, for example, by connecting the physical activity of 'walking' with personal information such as 'location' or purchase history. The prompts have been iteratively designed and tested throughout the workshops and were inspired by works of the dramaturge Augusto Boal who developed the Theatre of the Oppressed in the 1980's [14] and postmodern choreographer Yvonne Rainer [59]. Both these artists took inspiration from pedestrians and crowds' movements to open new performative possibilities and inspire social transformations through the de-alienation of the body and mind by bringing attention and disrupting the repetitiveness of daily tasks. Similarly, our workshop interweaved movement and choreography with concepts related to daily online tracking.

Figure 4: Image of the template for the 'mapping everyday tech'. Participants fill in names of online services they use (blue boxes on the left) followed by the corresponding data they think is extracted by the same service (pink boxes on the right).

4.1.3 Mapping Everyday Tech. This exercise was designed following a critical approach (see Section 3.2.1) in the second iteration of the workshop. We invite participants to critically reflect on the data that digital services gather. To do so, participants were asked to write down the apps and digital services they use daily for their work or in their personal lives. These include, for example, social networks, news, maps or transit apps, shopping, online banking, and search engines. For each of these, participants were asked to write down data that they believed were collected, such as date of birth, gender, location, and audio or photo files, among others. The template for 'Mapping Everyday Tech' (Figure 4), and consecutive A3 templates were specifically designed for the last version of the workshop for the participants to complete this task.

4.1.4 User Profile. In this activity, participants were randomly assigned to groups of two or three people. Participants were asked to choose one digital service listed in the previous 'Mapping Everyday Tech' task which was common to all group members.

They then created a 'user profile' by filling in an A3 template (Figure 5) with user data representative of the group commonly gathered by web analytics. These were data relating to age, gender, geographic location, device typology and brand, operating system, and language preferences. They were also asked to provide average value metrics related to user interaction, such as session duration, number of page views, and number of clicks, among others.

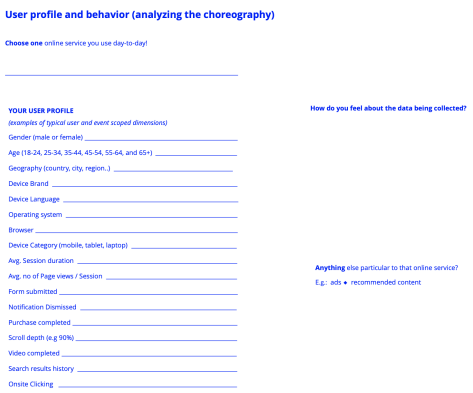

Figure 5: Image of the 'User Profile' template.

The 'User profile' activity concludes the first part of the workshop as delineated in Table 1. This exercise aimed to construct a real-case scenario of a user and their relationship to a digital service to which participants could relate to. This profile served as the basis for the subsequent activities.

4.2 Part 2: Problematising and Countering (Choreographies)

The activities of the second part of the workshop did not draw from the first two iterations and were created anew in the last iteration of the workshop.

4.2.1 Counter-Choreographies. This second part of the workshop was designed using a Critical Design methodological approach (see 3.2.1). It engages participants in the critique of online services through the production of 'counter-choreographies'. In the 'Counter-choreographies' exercise (Fig. 7), participants were provided with a set of movement vocabularies, of which they were previously introduced to in Section 4.1.2, that they could select using colourful paper cards with the words: 'add', 'remove', 'scale', 'substitute', 'repeat', 'freeze' (as seen in Fig. 6). They were also provided with user metrics, which are commonly used by tracking algorithms, that they could select using grey cards with the words: 'user's age', 'user's gender', 'user's device', 'user's screen resolution' and 'language preference' (as seen in Fig. 6). Lastly, they were provided with a set of user behaviour cards including the words: 'clicks', 'scroll percentage', 'idle time', 'browser history', 'engagement time', 'location', 'duration visiting a webpage' and 'search queries'; and with categories cards including the words: 'active user' and 'predictive audiences'. We also provided small blank cards for participants to create their own vocabulary. Participants were then asked to pair the elements of movement and user data vocabulary to generate ideas for resisting and counteracting online tracking on the online service and user profile defined in Section 4.1.4.

4.2.2 Contextual Mapping. Finally, for the 'Contextual mapping' activity (Figure 8), the group analysed their 'counter-choreography' in relation to other sectors, specifically the tech industry, economy, policy or the environment. This activity invited groups to critically

Figure 6: Examples of the workshop card printouts used in the 'Counter-choreographies' exercise.

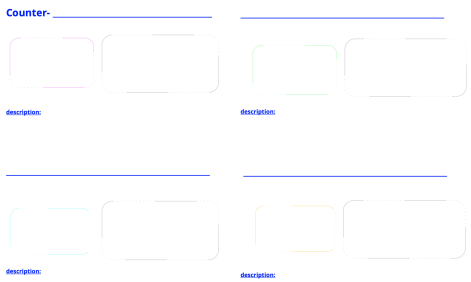

Figure 7: Image of the template for the 'Counter-choreographies' exercise in which participants place the movement vocabulary (colourful cards in Figure 6) and the user metrics (grey cards in Figure 6) into the empty boxes above.

reflect on how their approach of disrupting tracked metrics could more broadly inspire or effect change on matters related to, for example, to policy, environment, economy and industry.

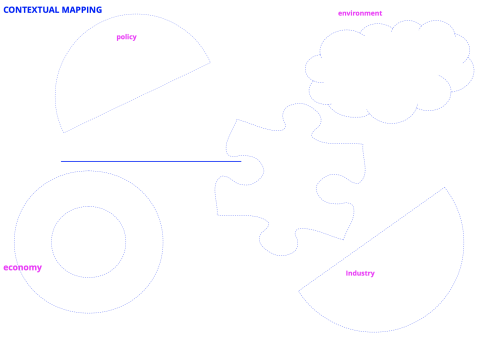

Figure 8: Image of the 'Contextual Mapping' template.

4.3 Group Discussion and Questionnaires

The workshop ended with a collective discussion in which participants shared propositions and reflections on their 'counter-choreographies'. Participants were also asked to fill in a questionnaire. It contained open-ended questions including 'How have the embodied and choreographic approaches changed the way you think about online tracking (if at all)?'; "What do you think is the strength of the concept of 'counter-choreographies'?"; "Where do you see the concept of 'counter-choreographies' being usefully applied?"; 'Are there any ideas, methods and/or processes that you will take with you that might be of interest to your professional practice?' Finally, participants were asked if they faced any difficulties during the workshop and if they had any suggestions for improvement.

5 Deploying the Workshop in Practice

5.1 Workshop Organisation

We ran the workshop twice in October 2023 in a room at our university and it was scheduled from 11AM-3PM. Each time, we ran it with half of the recruited participants to accommodate their availability and to facilitate it more easily.

5.2 Participants

We recruited 16 participants. Eight attended the first workshop, and eight the second. During the two sessions, participants were grouped in groups of two or three people. The resulting groups were assigned numbers from 1 to 6 and the corresponding group members were assigned unique IDs from P1 to P16 for anonymisation purposes.

Participants received an email invitation to participate in the workshop. Their contacts were gathered from the professional network of the first author of this paper. We chose to recruit participants with prior knowledge of data-related algorithmic processes but who did not necessarily have experience with somatic practices or dance. Our goal was to investigate the benefits that may arise from using a choreographic approach to critique data tracking. As mentioned in the positionality statement, the first author has a background in dance and choreography. She ran the workshop by utilising her 'somatic connoisseurship' to facilitate the embodied exercises in each activity [31].

In the post-workshop questionnaire, participants provided information on their demographics. The participants' ages ranged between 29–53. Ten people identified as female, three as male, one as gender fluid, one as nonbinary, and one did not respond. Participants identified as tech-literate, with a high level of technological confidence, including around online tracking. Their professional backgrounds were spread across the fields of art, design, HCI, software development, and policy. They worked in industry and/or academia and their practice and research related to data ethics, digital rights, and algorithmic justice. All participants were informed about the nature of the workshops and provided consent to use their information for our research study, which was approved by the ethics committee of our academic institution.

5.3 Data Collection and Analysis

We collected data from the questionnaires and the audio recordings of group discussions. We also collected data from the workshop results in the form of photographs of the printouts and observation notes taken by the first author during the workshop. We analysed data from the audio transcripts, photographs, observation notes from the workshop and questionnaires using a reflexive thematic analysis [19]. The thematic analysis process followed a six-phase structure of familiarisation, coding, theming, reviewing, definition, and documentation [19].

The familiarisation phase was done by printing all the data, reading them, and annotating them. The first coding phase was made by the first author using a spreadsheet. Using a different tab in the same document, codes were grouped into themes. Based on the initial codebook, one additional author reviewed the coding and theming outcomes. This analysis aimed to capture a broad understanding of how our participants engaged in the workshop activities and the connections they made between the choreographic approach and the online tracking. The first and second authors then proceeded to refine the themes reported in Section 6.

6 Results

From the analysis of the data, three high-level themes were generated. The first focused on how our choreographic approach allows for growing awareness around the lack of agency regarding data harvesting and its use by digital services. The second theme highlighted the diversity of strategies that emerged to reclaim agency over personal data and tracking. The third theme concerned how embodiment and choreography supported critical reflection on online tracking. Below we expand on the themes and provide quotes from participants evidenced by the 'counter-choreographies' they created (Table 2).

6.1 Reflection on the Lack of Agency Regarding Data Harvesting and its Use by Digital Services

Our findings showed that the critical, embodied and choreographic approach described in Section 4 improved participants' awareness of the lack of agency that they experience online. Participants reported that the critical approach underlying the design of the workshop allowed them to deepen their understanding of how their data is harvested and used by digital services. For example, in the responses to the questionnaire, P3 described how the sound 'experience' during the demo of the browser extension in the first activity in the workshop was 'very powerful to solidify an understanding of how pervasive tracking is'. Each of the six groups focused on different aspects of the online platforms. However, they all reflected on their agency within these platforms and lack thereof.

Group 1 referred to feeling 'locked' in a digital ecosystem when presenting their 'counter-choreography' during the workshop. They focused on Apple products, which facilitated data access and synchronisation across devices through the Apple ID feature. Although they acknowledged the seamlessness of the service, they critiqued the fact that this 'unique portal' means that a single company gets a monopoly over their data.

Table 2: Overview of the 'counter-choreographies' created by participants in the workshop.

Groups	Platform or Topic	Description of Counter-Choreography
Group 1 (P2, P5 and P6)	Apple ID	'Apple Garden' is a proposal to shift the use of devices from individual to collective or communal use.
Group 2 (P1 and P4)	Google Maps	'Get Lost' is a proposal to randomize location data or remove it entirely.
Group 3 (P3, P7 and P16)	Zoom	Two proposals: first actively switching to alternative platforms; second scaling down the use of all such platforms.
Group 4 (P9, P10 and P12)	Instagram	'Intentionality' is a proposal for a feature that allows to set an intention and choose the granularity in which content appears on the platform.
Group 5 (P8, P11 and P14)	'Time'	A proposal to disrupt capitalist notions of time embedded in algorithmic-driven platforms.
Group 6 (P13 and P15)	Reddit	A multiplicity of 'counter-choreographies' to be acted upon the platform.

Group 2 felt particularly concerned about the data used to build their profile on the Google Maps service and how it matched with other services for providing recommendations or for selling ads. They expressed concerns about data inferences, the opacity of the company's practices, and the inability to fully erase their data traces.

Group 3 examined Zoom, highlighting its role as a default platform for collaboration with some users who rely on it extensively throughout their workdays. They expressed concerns about the dependency on the platform for both personal and professional use and its implications regarding the data collected, such as voice and contact information. Their counter-choreography highlighted the dependence on corporate technology in the workplace and the lack of agency in choosing platforms in the work context.

Groups 4 and 5 reported a lack of control in the time spent interacting with digital devices. While Group 4 focused on Instagram and the content they feed it. Group 5 examined the contrast between how digital devices shape the experience of time versus individual and collective human temporal perceptions. They highlighted tensions between these experiences, critiquing the normative and politicised time-frames imposed by technological artefacts, especially online platforms.

Finally, Group 6 reflected on how interactions and content creation on Reddit can reveal private and intimate details. They noted that users of niche sub-Reddits might unknowingly share personally identifiable information, such as specific geographic locations.

These six examples show how the workshop activities, and specifically those that we designed for the first part of the workshop (Section 4.1), allowed participants to reflect on their lack of agency on a variety of platforms. Specifically, the activity of the user profile described in Section 4.1.4 allowed participants to collectively analyse the strategies that are deployed online for data harvesting in relation to each particular platform that they focused on. While their choices of technologies, platforms and services were distinct, the critiques that they voiced were similar in condemning the insidious yet opaque online tracking practices of these digital services.

6.2 Strategies for Reclaiming Agency over Personal Data and Tracking

As described in Section 4.2, in the second part of the workshop, participants were asked to create their own strategies, referred to as 'counter-choreographies'. Each counter-choreography brought to the surface concerns shared among group members along with proposals for actively tackling their concerns. For example, P10 mentioned: 'it's made me think about paths of disruption, about not accepting things just the way they are, a slight wake-up call for my digital laziness'. Although the groups used the same printouts of movement vocabulary and user data, the outcomes of the workshop have proven versatile. They illustrated different combinations of using the movement vocabulary and the user data to inspire a large range of 'counter-choreographies'.

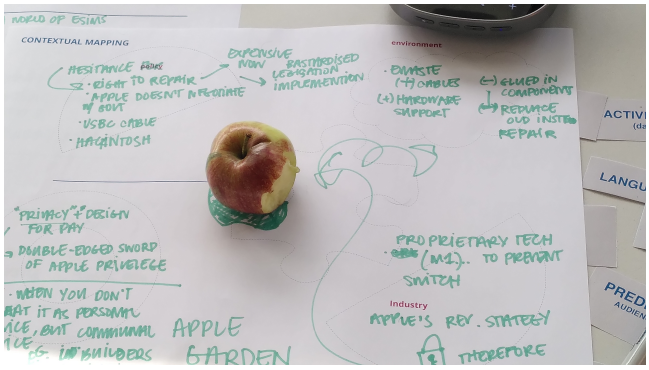

Figure 9: Contextual Mapping of the 'counter-choreography' entitled 'Apple Garden', by Group 1.

Group 1 came up with the 'Apple Garden', presented in Figure 9, a proposal to shift the use of devices from individual to collective or communal use. This idea comes from the practice of sharing a single device amongst several users, as observed on construction sites in India, P6 noted. The group proposed a strategy centred on either 'one to many' or 'many to one' – a counter-choreography to confuse the 'overseers'. By distributing a single Apple ID (a user account in Apple's ecosystem) to multiple persons, or conversely, by a single user obtaining multiple Apple IDs, the company would have a harder time 'knowing' a unique user through their online behaviour. This counter-choreography favoured a collective approach concerning our digital ecosystem over an individualistic one.

'Get Lost' is a proposal from Group 2 that focused on Google Maps, to randomise location data or remove it entirely. Ultimately, this counter-choreography is an invitation to disentangle from location tracking, get lost, and explore new routes. A group member, P1,

wrote in their questionnaire response that the choreographic approach supported her reflecting not only on 'when to move but also when to stop moving'. In her reflection, she mentioned adopting the choreographic vocabulary from the workshop and understanding movement as both a physical activity and a political stance.

Group 3, who looked at the Zoom video conferencing platform, proposed a combination of two interventions. One required actively switching to other platforms. The second entailed scaling down the use of all such platforms, for example, by restricting features such as video to voice only. This counter-choreography highlighted participants' dependence on corporate technology in the workplace and the lack of agency in choosing their work platforms.

Group 4 named their counter-choreography 'Intentionality'. They proposed a feature that would allow one to set an intention and choose which content appears on Instagram according to what they intend to consume. The goal of this counter-choreography was to regain control over content filtering in social media platforms.

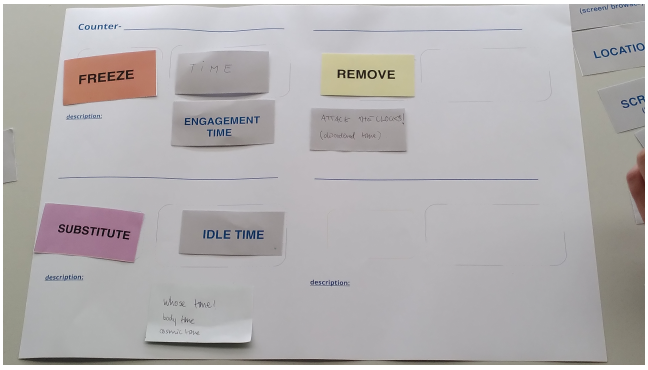

Figure 10: Work-in-progress 'counter-choreography' focusing on the notion of time by Group 5.

Group 5 proposed a counter-choreography presented in Figure 10 for disrupting the capitalist notion of time. For example, they used the workshop movement vocabulary to 'freeze' time and consequentially computational processes and data harvesting. Essentially, this counter-choreography disrupted the idea of 'user's time as money", forging new ways of valuing and experiencing time.

The last group, Group 6, created a multiplicity of counter-choreographies, as presented in Figure 11, which included the disruption of user data that are often collected by digital services. For example, they proposed to keep their screen up, freeze themselves, or be perpetually hyper-visible online while being offline.

Participants reported in the questionnaire that designing their own counter-choreographies allowed them to feel more empowered. In the words of P3: 'it feels empowering for me to think and physically act out ways to resist or block, which feels more active than opting out for example'. Participants also reported that the counter-choreographies allowed them to imagine concrete ways of disrupting the tracking activities that they focused on. P13 said 'using a choreographic perspective highlights the deliberateness and curation of online tracking activities—it enumerates them and makes me consider entry points to how these specific actions can be disrupted rather than them only being passive and pervasive as

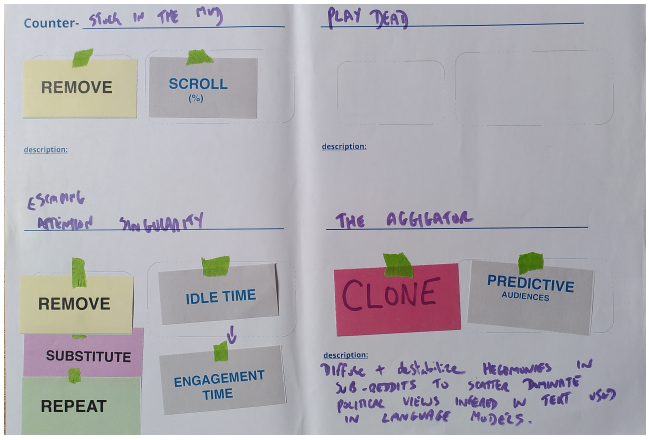

Figure 11: 'Counter-choreographies' by Group 6.

they can often appear.' They described the counter-choreographic method as a tangible and accessible approach that supports their reflection and action on forms of intervening: 'it invites the imagining of concrete localised interventions into a field which is complex and may otherwise be impenetrable' said P13. Similarly, P2 referred to the accessibility of the approach: 'the creative and social language of dance that allows new ways of thinking about interventions in our digital lives and reclaiming our space-time'.

However, the participants mentioned that it can be challenging to imagine forms of resistance or disrupting systems that seem so embedded in daily life. In the discussion at the end of the workshop, Group 6 mentioned this difficulty and the tendency to think of strategies that already exist for which there are, for example, existing plug-ins or single-use apps. The same group mentioned the importance of thinking about strategies that are not only focused on what a single user can do but also inspire collective action and have a greater impact.

Overall, the workshop activities supported participants in imagining concrete, tangible, and accessible strategies to disrupt online tracking algorithms. They saw the activities as a way to feel empowered and 'free' themselves from imposed rhythms, gestures, and constraints set by the different digital services.

6.3 Embodiment and Choreography for Engaging with a Critical Reflection on Online Tracking

The most recurring theme from the data collected in the discussion and questionnaires was the role that the embodied and choreographic approach played in engaging participants in an active critical reflection and countering of online tracking.

Most of the participants explicitly mentioned the embodiment as a relevant part of their workshop experience in their questionnaire responses. Some highlighted the fact that the embodied and choreographic approach introduced in the move to tracking activity (described in Section 4.1.2) and further explored in the counter-choreographies activity (described in section 4.2) made the topic of online tracking more personal, accessible and creative. In the words of P9, from their questionnaire response: '...it makes the critique

and ideation of alternatives more accessible, as talking about it as a dance is more relatable'. P9 added that the choreographic approach provided a frame and structure that encouraged relating to data tracking in a personal way. Similarly, P14 found the approach clear 'while allowing room for improvisation and imaginative and critical ideation'.

Many participants discovered in the workshop the benefits of utilising the physical body to understand and act upon the phenomenon present in online tracking. P16, who contributed to the counter-choreography focused on Zoom, highlighted how the choreographic approach paved the path to 'solutions that gave agency to our physical bodies: that went totally beyond techno-solutionism'. They added that our approach helped reflect on how data tracking is 'contained and extended to our physical bodies and that remembering that is important'. P15 also described 'physicalisation', or enacting online tracking physically, as a helpful way of growing an understanding of the topics. Other participants mentioned that the embodied and choreographic approach opened new perspectives on the topic, with P8 stating that they 'think differently when moving' or P4 mentioning their feeling of connection through the body and processing of the topics 'through different senses'. Some participants emphasised how using the body created new connections and allowed these topics to be integrated and memorized in a grounded and visceral way, in the words of P14: 'it sank better in my memory, provided a new way to look at these topics. Built on a network of associations that felt more visceral. Better grounded to a real-world context'. Indeed, the workshop guided the attention and sensitivity of the participants to the body as a means for critical thinking about issues related to their lack of agency and to surveillance and control in online tracking. P11 commented: 'I found myself thinking about bodies and control explicitly.' Similarly, P10 mentioned: 'I think it provides a playful yet smart formulation of what can be complex and layered technologies, relating it back to the body, back to personal agency that then latter is reflected for the collective'.

In summary, our results show that all of the participants engaged with the workshop's embodied and choreographic approach and that this approach provided them with an intimate, visceral, grounded, accessible and creative way to critically reflect on their own data and how it's tracked online.

7 Discussion

7.1 The critical and empowering Potential of 'Counter-choreographies'

Our paper illustrates how we designed and assessed a workshop that proposes a new embodied and choreographic approach that allows people to critically reflect upon and 'counter' extractivist technologies. First, our empirical findings highlighted how the workshop allowed us to raise awareness about the limited control individuals have over data harvesting and its use by digital services. By doing so, it contributes to efforts on the de-alienation of users, which has been advocated by various tech activist groups, such as Tactical Tech [53]. This non-profit distributes resources to promote digital literacy such as the Data Detox Kit, a toolkit to reduce online traces on mainstream online services [54]. There are other notable examples of tools and services that empower people to become more resilient in their digital presence. For example, the project My Data Done Right by Bits of Freedom, [42], helps users keep track of requests in order to access, remove, correct, or move their personal data from online services as per GDPR. While they provide fundamental help to people to gain control of their data, people need to already be aware that their data are being misused or accessed without their knowledge. Our workshop contributes with an approach for engaging audiences and growing their interest, which then further supports them in taking action in relation to the topic of data tracking. We believe that gaining awareness of data tracking is a first step towards data agency and self-determination.

Second, our findings highlighted the variety of strategies developed by participants to regain control over their personal data. Once the participants gained awareness of the extractivist technologies they use, they were able to imagine a variety of creative and disruptive alternatives to these technologies and solutions to their concerns. This was evidenced by the reappropriation of the choreographic vocabulary that we proposed, such as 'freeze' or 'substitute', which proved useful in empowering participants to create counter-choreographies (see 11), and in some cases served as a starting point for creating their own vocabulary and response strategies. A main contribution of our workshop is thus to support participants in finding their own 'counter-choreographies' as personal strategies that allow them to meaningfully address their personal concerns. Thus, our approach contrasts with 'one-size-fits-all' approaches to data privacy, which are often the approaches that software tools (e.g., [50]) and how-to guides (e.g., [49]) adopt. Instead, we advocate for empowering people by providing tools and vocabularies that let them imagine their own alternatives to their own issues.

7.2 Bringing Embodied Choreographic Approaches to Critical Research in HCI and vice versa

The choreographic approach presented adds to the diversity of embodied approaches used in HCI (e.g. [31, 41, 48]). These methodologies emphasise the generative and creative potential of physical involvement [57] in the design and experience of interactive systems [38]. Our approach also adds to workshop frameworks that make use of theatre techniques [7, 23]. It distinguishes itself from these existing works by drawing from choreographic techniques that understand movement and embodiment not only as a facilitator but as having a central role in enacting, reflecting and critiquing the status quo. Thus, the novelty of our approach is to add a critical and political perspective to how choreographic methods can be utilized in HCI. Our results showed how the embodied quality of counter-choreographies has proven particularly useful in making abstract and often obscure technical concepts more tangible, accessible, concrete, and situated in a user's day-to-day experience. Our results also showed that our embodied approach allowed critical, political, and social matters on how digital services insidiously harvest personal data to be experienced by people physically, viscerally, and intimately. Our results position our contribution as unique in HCI by bringing criticality to embodiment and embodiment to critical approaches. Connecting the body with politics is not new in dance and performance arts [2]. However, in HCI, these two philosophies,

approaches, and communities tended to be distinct until now, with few recent efforts to bridge methods such as soma design with ethical considerations [47, 52, 56].

We contribute with a direct and applicable way of bridging critical methods with an embodied choreographic approach. Our work proposes concrete physical activities and prompts to facilitate people's development of 'counter-choreographies' that support their digital awareness and exploration of new forms of subversion of current technological control and surveillance mechanisms. In line with existing artistic works such as [6, 29, 37], the activities and tools designed for the workshop engaged people in critical reflection on the impact of algorithms, in this case online tracking. They did so by introducing choreographic prompts and vocabularies that centre people's reflective and critical take on technology in their bodies.

Although we do not frame our approach as Feminist per se, we argue that it embodies the feminist values described by Bardzell [11]: pluralism, participation, advocacy, ecology, self-disclosure and embodiment. Specifically, we took great care to invite participants from diverse cultural backgrounds, bringing a plurality of perspectives that help to avoid homogenisation or totalising views on the topics. The involvement of participants in the workshop and in post-workshop activities, such as continuing conversations or contributing to this paper, led to forms of advocacy and distribution of authority within the development of the larger body of work. It also embraced a holistic and ecological standpoint that reflects on context and relationality: 'the ways that design artefacts in-the-world reflexively design us' [11, p. 1307]. The feminist value of self-disclosure was reflected in the first activity demonstrating the browser extension that visualised and sonified tracking requests, allowing us to make visible 'the ways in which it effects us as subjects' [11, p. 1307]. This power imbalance between users and the digital systems they use was recurrent in our group discussions and served as the basis for the counter-choreographies that participants created. Finally, in line with Bardzell values, embodiment was at the core of our research. We centred the experience of data tracking on the body by inviting participants in movement activities during the enactment exercises and in designing counter-choreographies to online tracking. Thus, while we do not qualify our approach as Feminist per se, mixing critical and embodied methods led us to propose an approach that aims towards the same goals (as feminist HCI) of resisting the status quo and proposing actionable alternatives to oppressive mechanisms found in computational systems such as surveillance capitalism [62].

7.3 Limitations and Future Works

Although our study may seem limited to participants identified as tech-literate with some level of knowledge of online tracking, our approach revealed aspects of online tracking they had not previously been aware of. This shows how our approach is useful to audiences of various degrees of tech literacy, including professionals in the field.

Another limitation of this study is that it covers a single activity with no follow-up over time. In our future works, our aim is to further engage in longitudinal studies utilising counter-choreography as a long-term intervention to empower users to critique online tracking algorithms in their daily use of digital services. Additionally, we aim to develop in our future works a robust toolkit for the HCI community to use similar activities from embodied sense-making to critique computational systems and algorithms beyond online tracking in a variety of possible contexts. We see the potential for our workshop to inspire existing strategies for resisting extractivism and techno-solutionism and to (bodily) empower people to become more resilient in their relationship with technology. We believe that our approach has the potential to feed into multiple critical academic circles, such as research communities working on Experimental AI [30] and Graspable AI [26]. These two areas could both benefit from the choreographic approach reported in this paper to further develop their critical engagement with people. Additionally, our approach can apply to issues that relate to labour in the tech industry and inspire alternative structures of cooperation and solidarity, for example, in the context of tech labour unions and other forms of collective organisation. As Bonini and Treré identify [18], workers in the gig economy have been inventing and adopting tactics to bypass and resist algorithmic surveillance. We see the potential for expanding the concept 'counter-choreographies' to enable collective action against technological platforms and algorithmic power.

8 Conclusion

'Dancing not with but against or outside systemic structures!' —P4

This paper demonstrated firstly how we designed a workshop proposing a new choreographic and embodied approach called 'counter-choreography' that engages people in critically reflecting on data tracking, and then designing their ways of countering it in the web technologies they use. Secondly, the findings derived from analysing participants' experiences of the workshop demonstrated how counter choreographies supported them in gaining awareness of their lack of agency regarding data harvesting and its use by digital services, and how it allowed them to generate strategies for reclaiming their agency over their personal data. Overall, we discuss how the insights gained from our design and empirical study can directly inform and inspire practices in HCI that work to utilise the body and embodiment in digital activism to improve algorithmic awareness and user empowerment.

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