

# *The Living Net: A Haptic Experience of Personal Data*

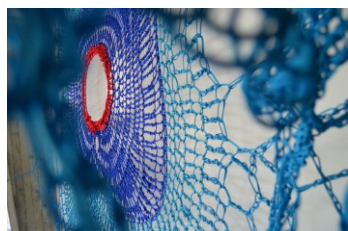


Figure 1: Hand-crocheted net made of nylon rope.

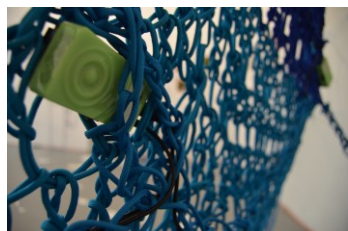


Figure 2: Vibrotactile interface woven into the net.

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## **Abstract**

*The Living Net* is a transdisciplinary project that explores tangible mediations of personal data and living archives. Weaving theory and praxis from dance, music, digital humanities, computer science, and engineering, *The Living Net* explores new methods for engaging users in real-time experiences with personal data production, or “data shed.” We do this as a meditation on the torrents of data we produce in our everyday lives and to raise questions about how we value persons, objects, and information.

Exploring the role of the body in conversations about personal data, *The Living Net* brings attention to the boundaries and power infrastructures erected when people are represented as disembodied, abstracted, “immaterial” metadata. In this, *The Living Net* offers real-time tactile experiences of personal data through the use of interactive vibrotactile interfaces and personal objects of meaning, both of which are woven into a hand-crocheted net (see Figures 1 and 2).

## **Author Keywords**

Wearable technology; vibrotactile interface; embodiment; somaesthetics; personal data

## **ACM Classification Keywords**

H.5.2 [User Interfaces]: Auditory (non-speech) feedback, haptic I/O, and user-centered design

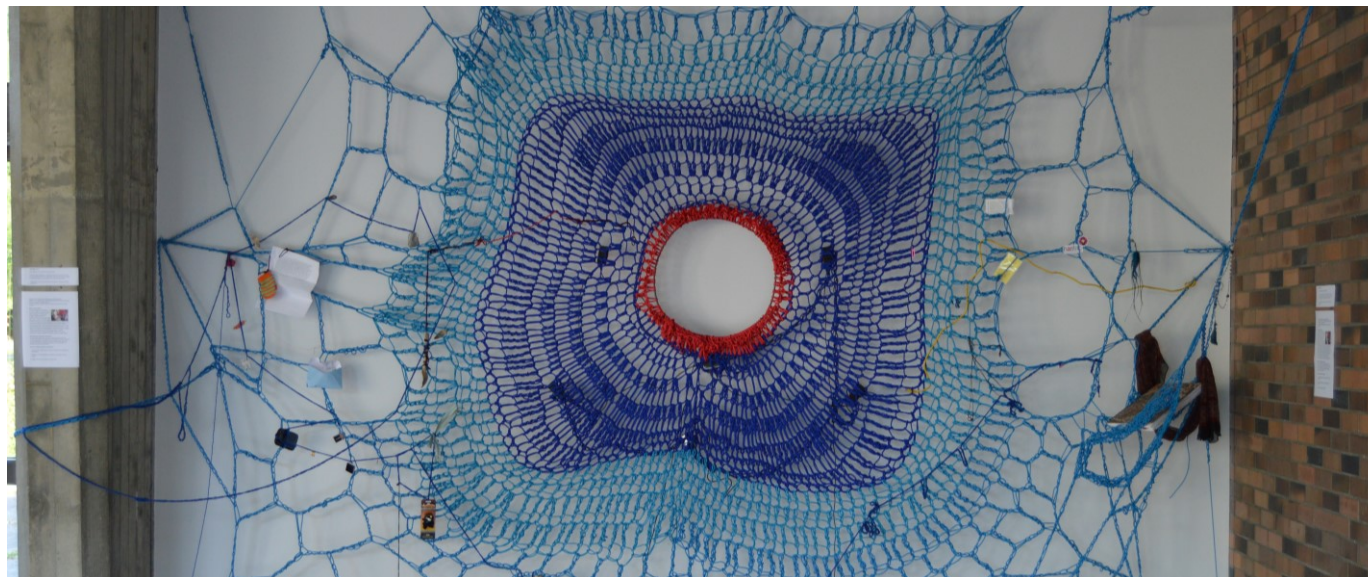


Figure 3: *The Living Net* with personal objects and the interactive vibrotactile interface woven into the crocheted net.

### Vibrant Lives: Conceptual Inspiration

*The Living Net* is an interactive installation affiliated with larger research project *Vibrant Lives*. *Vibrant Lives* investigates the massive amounts of data we produce daily through our personal devices [3]. Inspired by Jane Bennett's *Vibrant Matter*, we are working to understand how non-living things like our devices and data are themselves "quasi-agential" forces that shape lived experience [1]. We explore these theories through use of custom-built vibrotactile interfaces that reconnect disembodied personal data to embodied people through touch.

*The Living Net* builds upon this research by asking who is present and, more importantly, who is missing in 21<sup>st</sup>

century archives. Invoking Carolyn Steedman's work in *Dust*, we ask people to offer us the "ends, endings, traces, and trailing" of their everyday lives, such as items from their pockets, purses, and junk drawers (see Figure 3) [4]. These are the things that Steedman suggests make up the archives of people who are most often excluded from archives and their networks of power. The collection of objects for *The Living Net* began with an initial request sent out to members of FemTechNet, an international network of scholars, students, and artists who work in feminist science and technology (see Figures 4 and 5) [2]. With each installation, we expand this collection creating a growing "archive" of everyday life. We weave all of these objects into the net to make tangible the



Figure 4: Personal objects contributed by FemTechNet members.



Figure 5: Personal objects contributed by FemTechNet members.

seemingly inconsequential ephemera from everyday life. We entangle both personal data and personal objects into the net to reflect upon and honor that which is lost and that which is unseen in the big data network of digital information. *The Living Net* interactive installation includes the following materials: 1. a large hand-crocheted net made of nylon rope, 2. an interactive vibrotactile interface, and 3. participants' personal objects.

### Hand-Crocheted Net

The hand-crocheted net was constructed as a meditation on big data. As a physical, tangible object it draws parallels between computational practices and feminized crocheting practice; both use complex algorithms, repetition, and collaboration as a means to complete the work. In an effort to accommodate new spaces, the net has grown with each installation, meaning its form evolves with each showing. The result is a massive, intricate, complex web upon which we weave the vibrotactile interface and the personal objects. Highly malleable, it can be modified to fit many spaces and only needs to be anchored to a sturdy wall or ceiling upon which the rope can be hung and stretched (see figure 3).

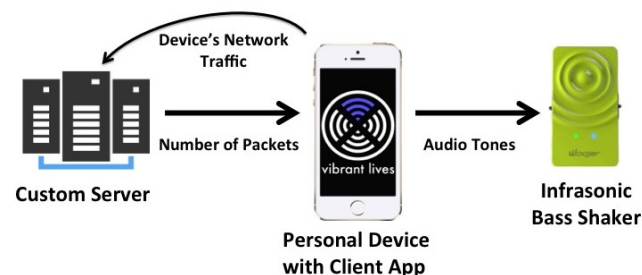


Figure 6: Vibrotactile interface overview.

### Vibrotactile Interface

The interactive vibrotactile interface includes 1. a custom server that captures, identifies, and distributes data, 2. a mobile phone application that sonifies collected data, and 2. infrasonic bass shakers.

#### Custom Server

We operationalize personal data output as the magnitude of network traffic transmitted by a particular smartphone or tablet device. However, these devices generally do not expose the services required to monitor their own network traffic. We wrote a server application to monitor and capture all network traffic without logging or recording such activity. When a user starts the client app on their phone, it notifies the server that it wants to receive information about its network usage. The server stores the client's IP address and counts the number of network traffic packets sent by that address. Then, once per second, the server sends a message back to the phone containing the number of packets it has sent. The client app maps this data to the amplitude of the audio tones produced by the app. This is in turn transformed into haptic, vibrotactile feedback (see figure 6).

#### Mobile Phone Application

The mobile phone application allows participants to use their personal mobile or tablet devices as an interface for their own data output. Developed for both Android and iOS, the mobile phone application is available on Apple App Store and Google Play Store. Once participants join the project's "vibrantlives" wifi network, a "join event" button auto-populates in the application. Participants click on this to receive the aggregated quantity of their own data output. Since we are specifically interested in the idea of 'data shed' or

data loss, the application only receives information about outgoing data activity. Once the application receives a user's data output from the server, it converts that data into real-time audio feedback, which in turn drives the infrasonic bass shakers. Designed to run in the background, users can close out of the application and navigate various applications and websites in their phone to experience the ebb and flow of their own data shed. A demo of the mobile phone application can be found here: <https://vimeo.com/139883507>

#### *Audio driven haptic feedback*

Rather than exploiting a phone's internal pager motor, we decided to use infrasonic bass shakers to drive the haptic feedback. This allows users to feel their data loss while still navigating through their mobile phone. The bass shakers are woven into the net so that participants can feel their own data shed collide with other participants' data across the net. We chose to work with bass shakers because they 1. are easily driven via a smartphone's audio hardware, and 2. provide much richer and more nuanced haptic experiences than pager motors. Testing revealed that the device strongly resonates at about 88 Hz. Consequently, in order to achieve the greatest dynamic range, all haptification is carried out by driving the device with a sustained 88 Hz sine wave layered with aurally pleasing harmonics and overtones. While *The Living Net* intends for people to feel their data shed, participants also have the option of hearing it. We sonify the aggregate data shed of everyone on our custom network so that audience members may hear the composite data output of the group.

### **Personal Objects and Performance**

We ask participants to entangle themselves into the installation by offering small objects from their pockets, purses, and bags. These items are crocheted into the net by two of the installation designers. The "performance" of crocheting in the objects addresses notions of invisible labor and invisible losses, and points to the objects' absence within our own lives once they have been integrated into the net. Furthermore, the performance of crocheting the objects into the net allows the installation designers to embed themselves within the installation experience, rather than merely "watch over" it. As a result, *The Living Net* provides a more entangled experience between presenter and performer, installation and body, digital and physical.

### **References**

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