DIVERSE DATA

IEEE VISAP 2024

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DIVERSE DATA

In the world we now inhabit, data has become as omnipresent as the air we breathe, permeating every corner of existence. It moves invisibly through the veins of the Earth, coursing through networks of machines, flowing effortlessly from the smallest speck of dust to the farthest reaches of the stars. We gather it relentlessly, with the same instinct as we gather the stories that define us, seeking to comprehend all that we see, touch, and imagine. But data is not just something we observe from a distance, dispassionately cataloging the universe—it becomes part of us, merging with our flesh, altering the very way we inhabit the world, shaping the contours of our lives like invisible hands molding clay. And like humanity itself, it is boundless in its diversity, a reflection of the countless ways we experience life. Each fragment of data, like each moment of existence, reveals new dimensions of what it means to be human. Yet, in this vast sea of information, where every flicker of life leaves its trace, we are confronted with shadows that stretch as long as the light. Technologies that promised us endless possibilities have also brought forth new dangers: the dark art of profiling, the theft of identities, the quiet violence of erasure, the specter of fake news. In this digital age, where every keystroke is recorded, every whisper captured, we find ourselves vulnerable, exposed not only to the eyes of machines but to the biases of those who program them. And so, in the midst of this tidal wave of data, we face an urgent question—how do we reclaim what is ours? How do we shape this flow, not as a force of oppression but as a channel for justice, for beauty, for the marginalized voices that have too long been drowned out by the roar of progress?

It is in this spirit that the VISAP program called out to all those who seek to transform the world through the prism of data. More than just a tool for analysis, data has the potential to reveal the innermost truths of our time, if only we learn how to see. And so, we ask: how can we create new forms of visual language that not only reflect the rich diversity of human experience but also invite us into deeper conversations about equity and inclusion? How can we harness this ever-growing ocean of data not merely to depict the world as it is, but to poetically imagine it as it might be? The VISAP'24 Diverse Data program seeks to answer these questions by inviting artists, scientists, and thinkers to explore the fertile intersection of technology and creativity. In doing so, we strive to challenge assumptions about the nature of data, its aesthetics, and its place in our lives. Through a rich dialogue of papers, pictorials, and artistic works, we will weave a tapestry of ideas that stretches across disciplines and perspectives, united by a common thread: the belief that data, when handled with care and intention, can become a

medium for profound human expression. Online and in person this October, we open our doors to all who wish to contribute to this conversation—whether through the creation of generative art, where algorithms give birth to new worlds, or through the use of experimental techniques that reveal hidden layers within the data we so often take for granted. We seek the visionaries who dare to prototype technologies that merge sustainability with beauty, who approach data with both rigor and playfulness, asking how it can serve not only our intellect but our imagination. At the heart of this inquiry lies a deep desire to reimagine the role of data in our society. It is no longer enough to simply collect and analyze; we must engage with data as a living thing, capable of telling stories as complex and multifaceted as the people who generate it. How do we interact with data in the age of augmented and virtual realities? How do we visualize the 'more-than-human' world—those vast ecosystems that pulse with life beyond the limits of our perception? How do we allow data to speak for the Earth itself, as it cries out through the slow unraveling of our climate?

As we move forward, we recognize the power of data not only to connect us but also to divide us. The digital divide remains a chasm that averts the possibility of a seamless data flow, particularly in the Global South, where access to the tools of the future remains a distant dream for many. And yet, often, it

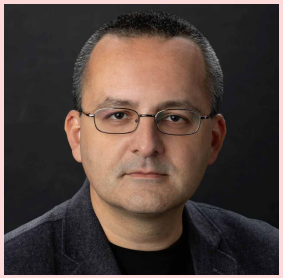
is in the very places where data flows are disrupted that diversity emerges and the seeds of the future are sown, where the resilience of communities, forged in struggle, offers a blueprint for a more equitable world. The VISAP program embraces this global perspective, seeking to narrow the chasms of inequality and to build bridges that unite us in a shared pursuit of knowledge, creativity, and justice. In the end, the VISAP'24 Diverse Data program is not just about data—it is about the stories we tell with it. It is about imagining new worlds, where diversity is not a challenge to be overcome but a wellspring of creativity and strength. It is about creating spaces where all voices can be heard, and where the beauty of our collective humanity can be expressed in ways that are as diverse and complex as the data that now shapes our lives. Together, we will chart new paths, finding in the vastness of data not only the future of technology but the future of the human spirit. Thank you for joining us!

Sincere gratitudes from the VISAP 2024 Committee:
Rewa Wright, Rebecca Xu, Pedro Cruz, Santiago Echeverry, Lori Jacques, Todd Linkner, and Kate Terrado

Alberto Cairo

VISAP KEYNOTE: THE GOLDEN AGE OF VISUALIZATION DISSENSUS

Historians of visualization often say that the 19th century was a Golden Age of the craft, as it was the time when much of the syntax and vocabulary that we use to this day were developed. This talk will propose to make the 21st century a Golden Age of dissensus in visualization, a rebellion against popular and overarching rules, norms, conventions, and historical myths that should be deeply scrutinized and then either reframed—if their usefulness is corroborated—or discarded.



Alberto Cairo is a visualization designer, journalist, art director, consultant, and educator. He's the Knight Chair in Infographics and Data Visualization at the University of Miami, where he's also director of visualization at UM's Frost Institute for Data Science & Computing.

Since the late 1990's, Cairo has led news graphics and data visualization teams in Spain, Brazil, and the United States. Among them, the one at the online edition of the Spanish newspaper El Mundo; Cairo's team won more international infographics awards than any other worldwide between 2000 and 2005.

Cairo is the author of several landmark books, The Functional Art (2013), The Truthful Art (2016), How Charts Lie (2019), and The Art of Insight (2023), and is working on a fifth one. He has taught in more than 30 countries, and worked for organizations and companies such as Google, Microsoft, McMaster-Carr, the European Union, Eurostat, the World Bank, the Centers for Disease Control and Prevention, the U.S. Army National Guard, and many others.

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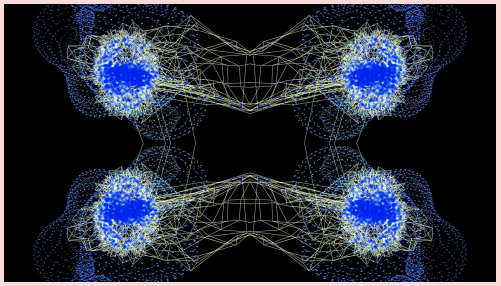
EXHIBITED ARTWORKS

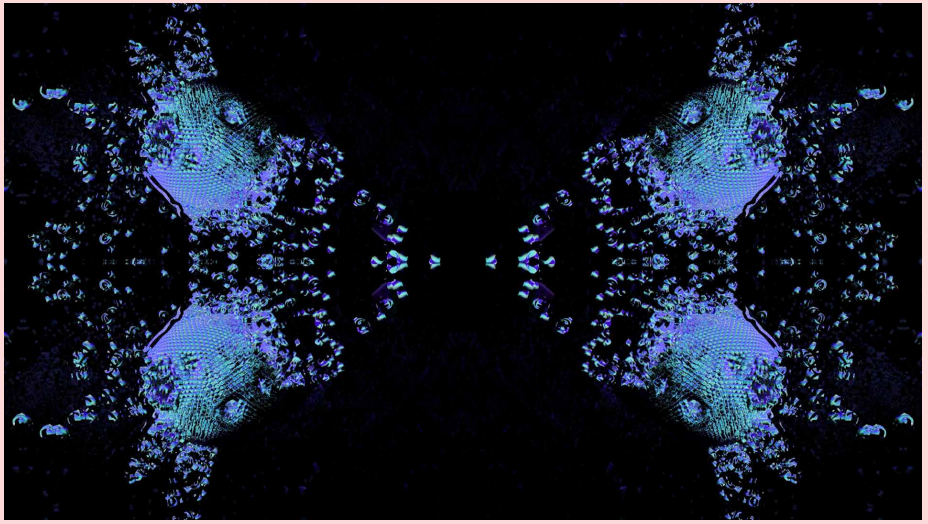
Uncalculated Studio, *School of Creative Practice, Queensland University of Technology, Brisbane, Queensland, Australia*

BIORHYTHMS: ARTISTIC RESEARCH WITH PLANTS, REAL-TIME ANIMATION AND SOUND

youtu.be/Q5D8ABeSo6o



In the video series 'Biological Rhythms', electrical signals generated by plants are sonified and captured to drive real-time data visualisations. From this live data, we will create a series of eight video pieces (see links to draft versions of the first four in 'Recent work, video links' section below). Living plants and the human body may appear to be very different entities, but they have many underlying confluences. Once such confluence is that both generate bio-electrical signals that pass through bodily systems. In 'Biological Rhythms' we will use these signals to generate real time visualisations, revealing the unseen bioelectrical rhythms of plants. Through the biological sciences, we understand plant meta- processes such as osmosis and photosynthesis, yet because their cellular

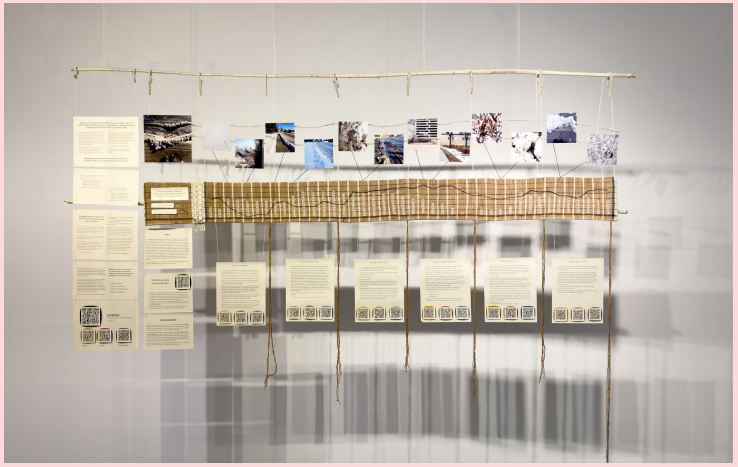


structure is so delicate, plants are notoriously hard to study in fine detail. Sonifying plant signals affords a method to explore their bio-rhythms in an accessible form for a non-scientific audience. As part of our bespoke and innovative method, the electrical signals from plants are converted to audio and passed through the program Touch Designer, where the plant signals activate complex geometrical forms. Simon Howden composes 'human' music which is mixed live with the plant signals, allowing us to explore co-creation with living plants as a posthuman mode of artistic research.

Karly Ross, *University of Calgary, Calgary, Alberta, Canada*

CURBSIDE

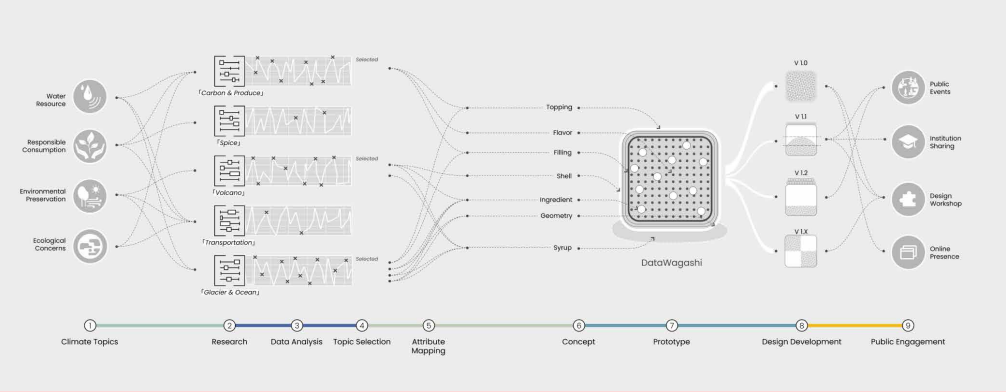
Curbside is a personal exploration of (dis)ability and (im)mobility in wintertime Calgary. I use textiles, texts, and photographs to weave together self and the environment. Curbside connects quantitative data about snow and temperature with traces of environmental conditions using dyed yarns and photographs. Interlaced throughout are theoretically grounded autobiographical reflections about disability. These reflections focus on how landscape forms and interacts with disability in ways that are informed by water, snow, and ice. It embodies how different forms of data such as quantitative weather data, material traces, and personal stories can work together. Curbside also provides an example of how data art can incorporate highly personal experience to illuminate local systems in thoughtful ways.



Tiange Wang, *VLab, Cambridge, Massachusetts, United States*
I-Yang Huang, *VLab, Cambridge, Massachusetts, United States*

DATAWAGASHI: FEELING CLIMATE DATA VIA NEW DESIGN MEDIUM

vimeo.com/983950256



Inspired by Wagashi, the traditional Japanese confection art regarded as a microcosm of time, space and nature, DataWagashi is a new medium aiming to make data tangible, accessible and fun by blending taste, smell, touch, texture, and physical interaction into the vocabulary of data communication. By embracing a sensory upgrade from data visualization to data physicalization, Data Wagashi turns data into an experience that is sharable among people and accessible to those with different sensory capabilities, making complex environmental data approachable, foster empathy, and empower people to make better choices.

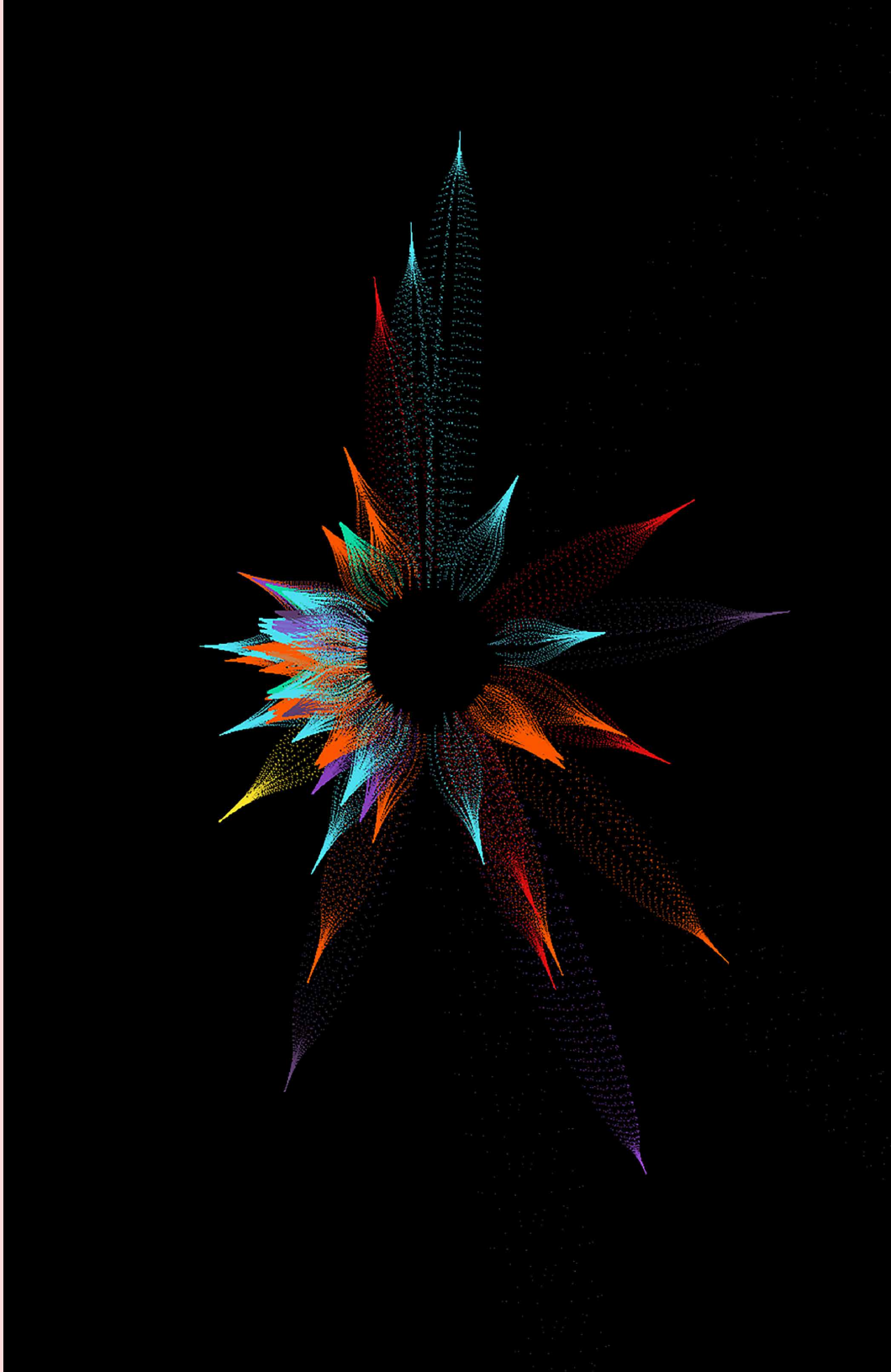
Elizabeth McCaffrey, *Khoury College of Computer Sciences + College of Arts Media and Design, Northeastern University, Boston, Massachusetts, United States*

DISPLACEMENT FLOWERS: VISUALIZAING GLOBAL HUMAN DISPLACMENT DUE TO NATURAL DISASTERS

vimeo.com/953616089

One of the pressing consequences of carbon-fueled climate change is its direct link to causing various forms of natural disasters. These disasters range from wildfires, and floods, to tsunamis and earthquakes. In the fallout of these disasters many people become displaced from their homes. By the year 2050 it is estimated that 140 million people will be displaced from their home countries of sub-Saharan Africa, South Asia, and Latin America due to these disasters (World Bank). As a result, it is of increasing importance to address the impacts of climate change and not only the effects on the environment, but also on the world's inhabitants.

This visualization was created in order to showcase the impact of natural disasters and the need for climate reform globally in an aesthetically beautiful, and interpretable, way.



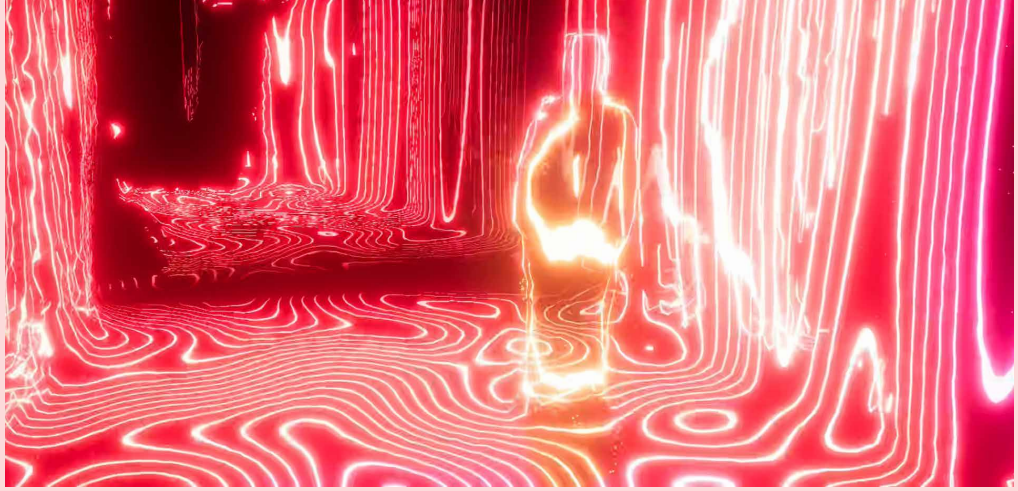
Botao Amber Hu, *Reality Design Lab, New York, New York, United States*
Jiabao Li, *School of Design and Creative Technologies, University of Texas at Austin, Austin, Texas, United States*
Danlin Huang, *China Academy of Art, HangZhou, China*
Jianan Johanna Liu, *China Academy of Art, HangZhou, China*
Xiaobo Aaron Hu, *Reality Design Lab, New York, New York, United States*
Yilan Elan Tao, *Reality Design Lab, New York, New York, United States*

ECHOVISION

vimeo.com/955577972

"EchoVision" is an immersive art installation that allows participants to experience the world of bats using sound visualization and mixed reality technology. With a custom-designed, bat-shaped mixed reality mask based on the open-source HoloKit mixed reality project, users can simulate echolocation, the natural navigation system bats use in the dark. They do this by using their voices and interpreting the returned echoes with the mixed-reality visualization.

The exhibit adjusts visual feedback based on the pitch and tone of the user's voice, offering a dynamic and interactive depiction of how bats perceive their environment. This installation combines scientific learning with empathetic engagement, encouraging an ecocentric design perspective and understanding between species. "EchoVision" educates and inspires a deeper appreciation for the unique ways non-human creatures interact with their ecosystems.



Rita Costa, *Independent, Lisbon, Portugal*
Beatriz Malveiro, *Independent, Lisbon, Portugal*

FLAGS OF INEQUALITY

Flags of Inequality is a physical data exhibit based on the digital project of the same name. This artwork is a collection of forty-nine incomplete pride flags that invite the audience to reflect on the inequalities still faced by the LGBTQ+ population of European countries.

In this artwork, we intend to visually represent data on the struggles still faced by the queer population in many European countries. This collection aims to highlight the ongoing challenges related to discrimination, legal inequalities, and social acceptance that LGBTQ+ individuals encounter daily. Through art and a familiar symbol, the visual representation of this data helps empathize and raise awareness.

Francesca Samsel, *University of Texas at Austin, Austin, Texas, United States*
Benjamin Keisling, *The University of Texas Institute for Geophysics (UTIG), University of Texas at Austin, Austin, Texas, United States*

INTERVIEWS WITH THE ICE: ART AND SCIENCE

"Interviews with the Ice", an art science collaboration is an installation made up of five columns, each representing a point in time where scientists have made leaps in understanding about Greenland's geologic history, ice coverage and melt rates. Methods have included marine sediment samples, seismic data of Greenland's continental shelf, the drilling of ice cores, ice-penetrating radar and satellites. Each of these datatypes have particular textures and have been used to reconstruct particular ice geometries, bedrock sediment formations, and documentation of

Greenland's ice coverage through the millennia. Bring the scientific methods and data of this far off region into our physical environment, the work is mixed media combining wall constructions and bowls of glass and clay documenting Greenland's ice sheet changes.

Ignacio Pérez-Messina, *TU Wien, Institute of Visual Computing and Human-Centered Technology, Vienna, Austria*

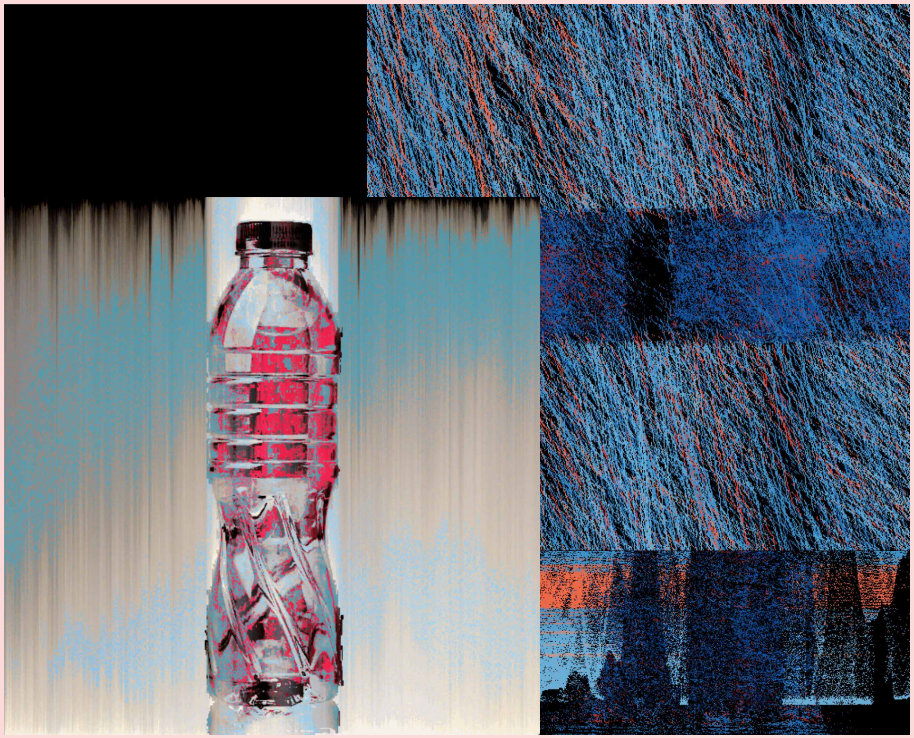
MOSAIC MEMORY DRIVE

youtu.be/7kQUH994bhI

Self-tracking data may be the most massive and pervasive type of data, often in a format not usually recognized as such: photos. Digital photography allows us to keep a record of where we have been, what we have seen, and, most importantly, how we have felt. Photos achieve this because they are their own visualization — organic and full of detail — retaining impressions that we also hold in our memories. It is through the excessive richness of images that a direct and intimate connection to each of us is created.

When we speak of image data, we usually refer to the meta-information (time, location) and content that can be extracted from it (what can be objectively identified within the image), thus obscuring the organic nature that gives it its auratic quality. Paradoxically, it is only by considering the digital image as a technical object — a matrix of RGB values — that its material plasticity is brought back to our awareness, and its auratic quality is retrieved.

Mosaic Memory Drive is a puzzle of self-tracked memories. It reproduces an image by using the pieces of another in an endless loop of re- and de-construction. It is a series of anagrams — or anagraphs: permutations of pixels — where an "original" data is present only as the rearranging tiles that lend themselves to another, challenging assumptions about the information actually stored in our data and ourselves.

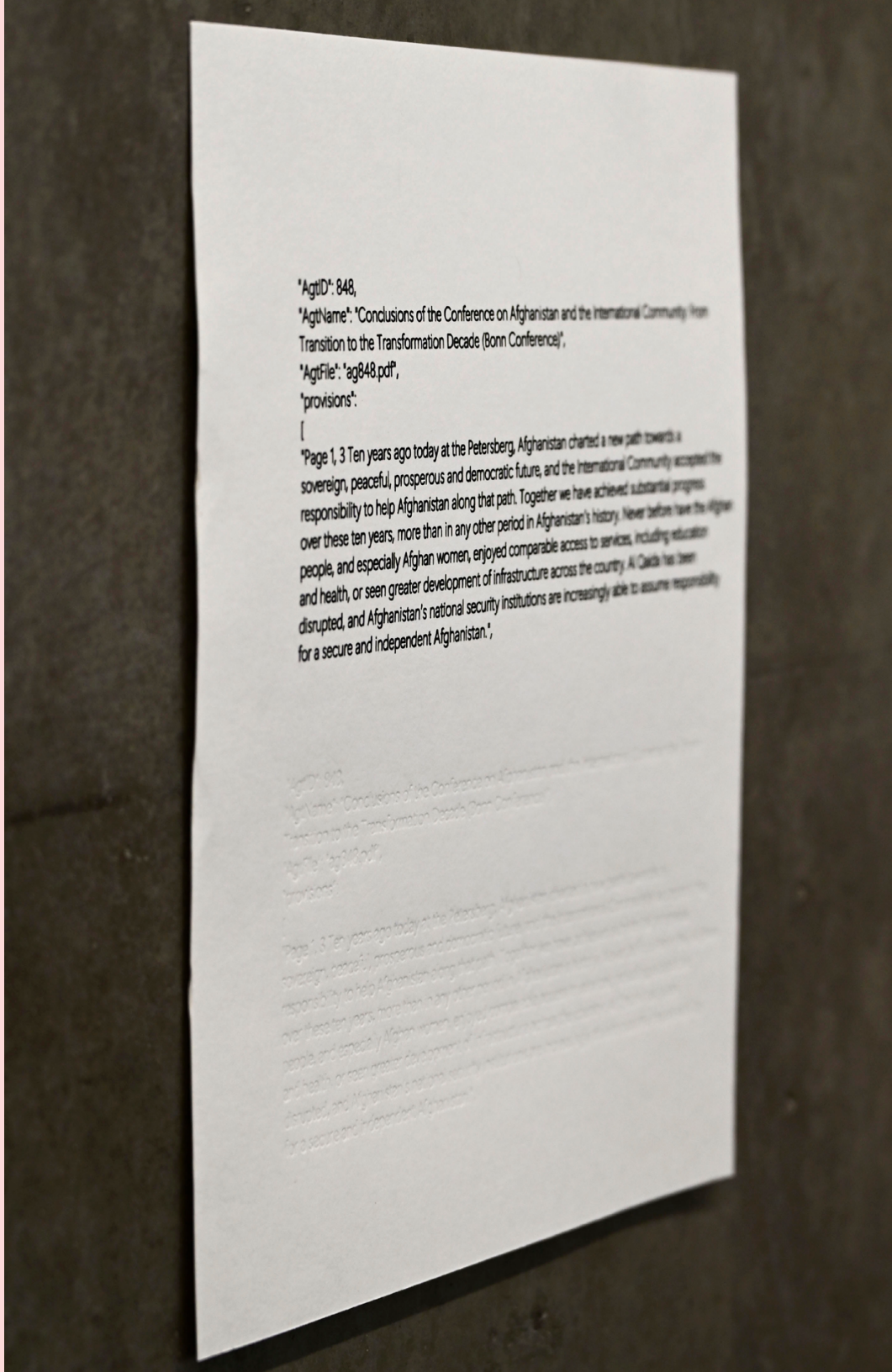


For this process to be accurately displayed, it needs to be run in real-time, as video encryption dissolves the images' materiality to make files lighter and their progressive decryption faster. Mosaic Memory Drive is thus a process of encryption and decryption itself. The technique can also be used to encode space-filling and pixel-based visualizations into images, supporting the creation of novel data-driven narratives.

Jenny Long, School of Informatics,
University of Edinburgh, Edinburgh, United Kingdom
Jinrui Wang, School of Informatics, T
he University of Edinburgh, Edinburgh, United Kingdom
Tomas Vancisin, School of Law (PeaceRep),
Edinburgh, United Kingdom
Laura Wise, School of Law (PeaceRep),
Edinburgh, United Kingdom
Xinhuan Shu, School of Computing, Newcastle University,
Newcastle Upon Tyne, United Kingdom
Tara Capel, University of Edinburgh, Edinburgh, United Kingdom
Uta Hinrichs, School of Informatics,
University of Edinburgh, Edinburgh, United Kingdom

PIECES OF PEACE: WOMEN AND GENDER IN PEACE AGREEMENTS

With armed conflicts and wars continuing to occur globally, peace has been an enduring and crucial concern. In the efforts to resolve these conflicts, a vast number of peace agreements have been signed. In this project, we examine the extent to which women and gender are explicitly acknowledged or addressed in peace agreements. Using debossing, we physicalize the mentions of women and gender in these agreements as a means to increase awareness and recognition of these suffered but often-overlooked crowds.



Anshul Roy, *College of Visual and Performing Arts, Syracuse University, Syracuse, New York, United States*

RAGE AGAINST THE ARCHIVE

youtu.be/9XWW8zewTNY

Rage Against the Archive is an artivist project comprising video, performance, and new media art that scrutinizes how the New York Public Library's (NYPL) digital archives catalog, display and even sell dehumanizing ethnographic images from colonial India. This work critically probes whether institutional archives perpetuate the cycle of colonial trauma and the camera's violence. My conceptual approach is anchored in a critical paradigm intended to underscore how technology still commodifies the bodies of people of color, and how we, as a more conscientious society, should consume certain historically traumatic images online.

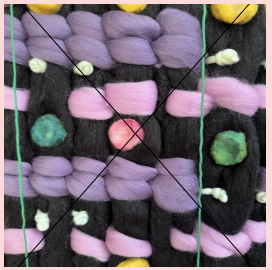
The People of India, published between 1868-75, is one of the world's oldest and most comprehensive ethnographic books, commissioned by the British colonial government in India after the 1857 First War of Independence. After experiencing violent uprisings and the first challenge to their colonial rule, the Britishers were keen to understand the native tribes and their cultures to rule them better and prevent future rebellions. The camera, masquerading as an objective device for data collection, was employed as an imperial tool to document the natives, "othering" them. Dehumanizing ethnographic portraits were used as data points with an agenda to push forward a pseudo-scientific theory about the racial, economic and cultural inferiority of Indians to justify colonial rule. How does this problematic historical data exist in our contemporary institutional archives? For this project, I explored NYPL's online archives, which digitized the original book, providing the public free access to these ethnographic images. However, NYPL's website also sells these images of suffering as "Fine Art Prints" in various options. Infusing archival practices with capitalism raises some critical question

In my experimental browser-based video, I use Google Chrome's "Inspect Element" feature as a glitch resistance tool to modify the underlying HTML code of NYPL's website, inserting texts in the website that resist the colonial ideology and question the fixity of memory present in the archive. I also developed a Chrome browser extension that subverts NYPL's website and replaces all the "Buy as Art Print" options with an error message in an act of Electronic Civil Disobedience. With these symbolic digital gestures, I hope to restore some dignity to my ancestors, who have not only been exploited before by colonial photographers, but whose visual representations are also being commodified today by NYPL. In my project, I use web technologies to challenge and disrupt entrenched power structures and propose a decolonized digital archive where technology is harnessed to foster respect and care. I believe that digital archives, in some cases, instead of being harbingers of free knowledge, are just another way to amplify the camera's violence, and they must be raged against.

Carmen Hull, *College of Arts Media and Design, Northeastern University, Boston, Massachusetts, United States*

RAP TAPESTRY: A MUSIC VISUALIZATION TOOL WITH PHYSICAL WEAVING DATA PHYSICALIZATION

Our work builds on the study of notational systems and poetry lyrics in the context of rap music and offers rich insights into the complexities of language, culture, and expression in a postcolonial culture. We have created three platforms that combine to make up one installation. 1) A screen-based interactive visualization system that demonstrates the encodings as you listen to the song, with filtering and scrubbing capabilities, 2) the physical rap tapestry weaving to be exhibited on a large wall surface and 3) a series of individual prints of the instrumental breakdown printed into small books or 'zines'.



weidi zhang, *media and immersive experience center, Arizona State University, Tempe, Arizona, United States*
Jieliang Luo, *Independant Researcher, Beijing, China*

RECOLLECTION

yzhangweidi.com/recollection

This artwork was born of witnessing my grandmother's memory regression due to dementia, where her cherished stories dissolved into fragmented words. Dr. Mary Steedly once described memories as a "densely layered, sometimes conflictual negotiation with the passage of time", and in 2022, over 50 million people faced this painful reality of memory loss due to Alzheimer's and related dementias. Yet, amidst this poignant backdrop, the emergence of text-to-image AI systems in 2022 offered a glimmer of new perspective, as they harnessed the power of language to imagine and reassemble fragmented memories, possibly to weave what time and disease had stolen.

When we coexist with machines, will we accumulate synthetic recollections of collective symbiotic imagination? Is language capable of re-weaving and synthesizing memories? How does our collective memory inspire new visual forms and alternative narratives?

Recollection is an assemblage of intimate human-machine artifacts that emphasizes the contributions from three sides: artists, machines, and participants. This customized AI application facilitates multiple AI techniques, like speech recognition, text auto-completion, and text-to-image, to convert language input into image sequences of new memories. As an interactive experience, participants will whisper their personal memories with fragmented sentences, and our system will automatically fill in details, creating new touching visual memories.

We developed our customized AI system by fine-tuning a pre-trained transformer-based AI model to learn the documentaries of Alzheimer patients' visual memories and their descriptions. The system imagines new memories of "love" and "loss" by interpreting real-time narratives from participants in the installation. Our system emerges as a vibrant and inclusive conversation starter, transcending boundaries with support for over 89 different languages, embracing the diverse cultural artifacts.

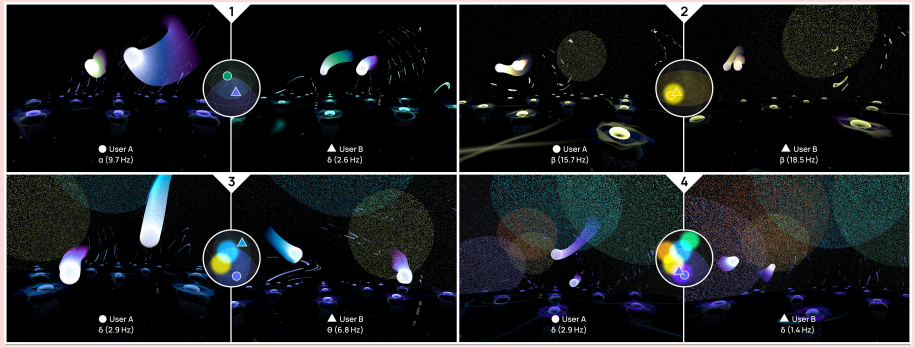
In the art installation, we chose not to showcase the direct visual output generated by our AI system. Instead, we drew inspiration from fine-art practices such as the Monotype, a printmaking technique tracing its origins to the 1640s, and slitscan photography, known for capturing sequential slices of a subject over time. We aimed to present ReCollection by combining generative methodologies with fine-art practices, investigating new aesthetics that explore the fleeting visual imagery, undergoing dissolution, tilting, printing, and reprinting over time.

By providing a conceptual framework for non-linear narratives, which constitute symbiotic imaginations, and future scenarios of memories, culture production, and reproductions. It may inspire the cure for memory regression by providing a future scenario, a thought experiment, and an intimate recollection of symbiosis between beings and apparatus. It raises people's awareness of future memory preservation and their empathy for the dementia community through a personalized aesthetic experience. It offers an artistic approach and future prototype for cultural heritage reproduction and re-imagination and explores the tensions that exist in the co-relations between visual representations, language, and narratives.

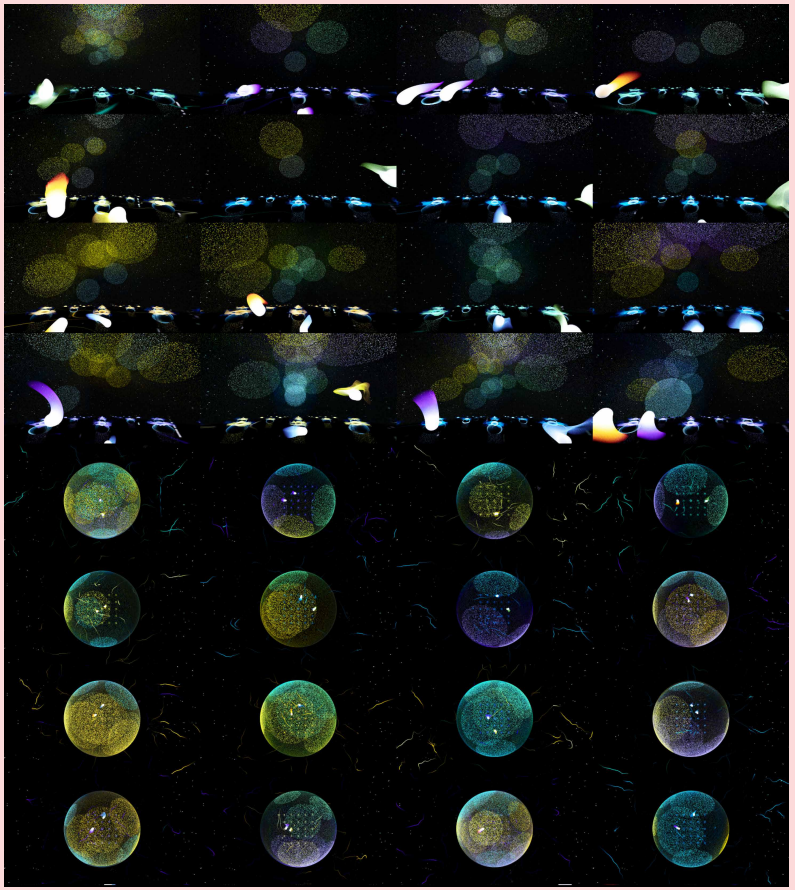
Xin Feng, *Independent Researcher, San Mateo, California, United States*
Tiange Wang, *VLab, Independent Designer, Cambridge, Massachusetts, United States*

SynCocreate: Fostering Interpersonal Connectedness via Brainwave-Driven Co-Creation in Virtual Reality

vimeo.com/912243880



Collaborative art and co-creation enhance social well-being and connectivity. However, the combination of art creation through mutual brainwave interaction with the prosocial potential of EEG biosignals reveals an untapped opportunity. SynCocreate presents the design and prototype of a VR-based interpersonal electroencephalography (EEG) neurofeedback co-creation platform. This generative VR platform enables



paired individuals to interact via brainwaves in a 3D virtual canvas, painted and animated collaboratively through their real-time brainwave data. The platform employs synchronized visual cues, aligned with the real-time brainwaves of paired users, to investigate the potential of collaborative neurofeedback in enhancing co-creativity and emotional connection. It also explores the use of Virtual Reality (VR) in fostering creativity and togetherness through immersive, collective visualizations of brainwaves.

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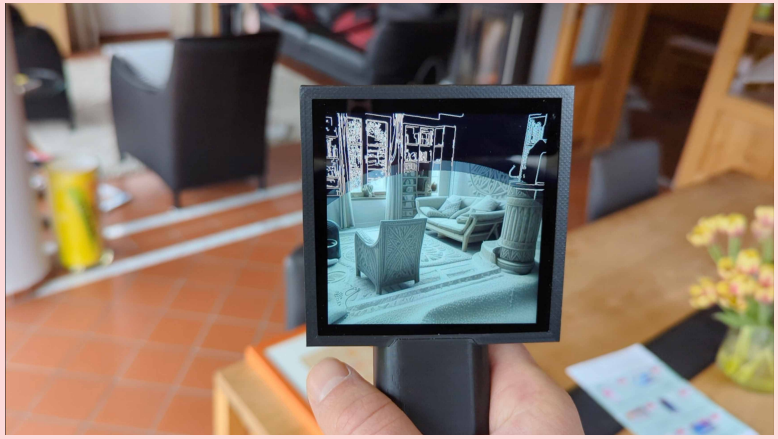
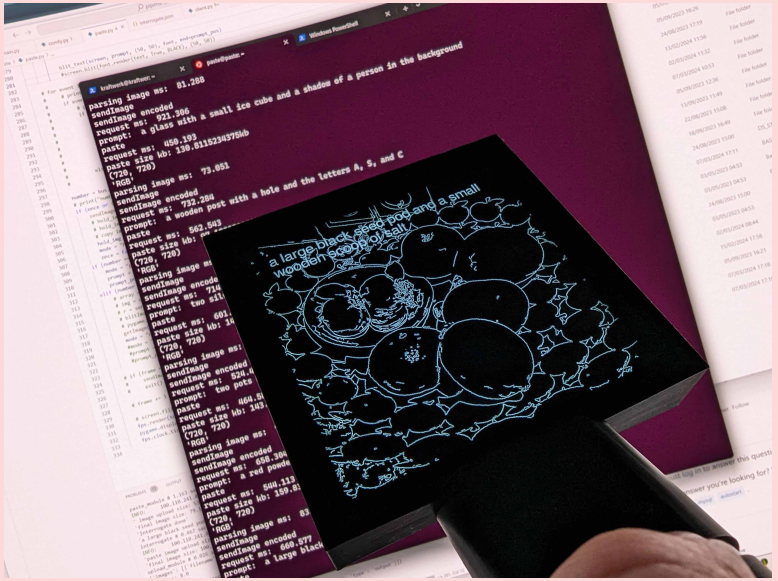
TRANSFERSCOPE — SYNTHESIZED REALITY: SAMPLE ANYTHING. TRANSFORM EVERYTHING.

vimeo.com/929277009



Transferscope is an interactive installation that lets users explore and reflect the implications of generative artificial intelligence on our perception of the physical world. The handheld device allows users to sample materials and concepts and aesthetics and seamlessly project and apply them onto any object or scene, thereby creating imaginative and unique visual experiences.



The artifact offers a unique perspective on the role of data in artistic creation, and invites visitors to critically reflect the aesthetic character of state-of-the-art image generation algorithms, emphasizing the importance of diversity in data sources (to train the models) and outputs. It demonstrates how AI can serve as a collaborator in the artistic process, enhancing human creativity while making tangible new insights into the nature of visual data. This installation facilitates also reflecting on the ethical and cultural implications of data set curation for the aesthetic characteristics of current generative AI models.

PAPERS

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HUMANITY TEST — EEG DATA MEDIATED ARTIFICIAL INTELLIGENCE MULTIPLAYER INTERACTIVE SYSTEM

Artificial Intelligence (AI) systems are increasingly prevalent in everyday life and across various sectors, notably intelligent assistants, healthcare, and education. In the realm of human-computer interaction, AI interactive systems aim to foster connections and understanding among users further, deepening the communication between humans and machines as well as among multiple individuals. However, this paper highlights that current studies have neglected the media and philosophical dimensions, culminating in an interactive system named the 'Humanity Test.' "Humanity" refers to emotions and consciousness, while "test" signifies a critical study of AI technology and an exploration of the distinctions between humanity and technicality. Furthermore, based on a review of related literature, we argue that the focus of AI system research is shifting, with electroencephalogram (EEG) data becoming a trend in AI system integration. Collecting and analyzing experimental data, we identified three design directions: enhancing immersive experiences, creating emotional experiences, and expressing ideas. The experiment results indicate that integrating EEG data into AI systems markedly improves participants' immersive and emotional experiences. This integration not only promotes a deeper understanding of the human-machine boundary but also encourages empathic interactions among users. Based on these findings, EEG data as a medium shows a promising potential to enrich interactive experiences, providing new insights into integrating technology with human emotions.

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NUMERICAL EXISTENCE: REFLECTIONS ON CURATING ARTISTIC DATA VISUALIZATION EXHIBITIONS

Data visualization is often associated with efficiency and the production of insights. However, nonconventional visual works with data, particularly artistic visualizations, are less frequently discussed, despite some notable exceptions. Artistic visualization is typically presented and debated at conferences on data visualization and related areas in computing and design, usually involving an exhibition of works in parallel. While there are established exhibitions in electronic art, collective exhibitions focused on artistic data visualization, especially those independent of academic events, remain rare. Additionally, there is a notable

gap in the literature regarding the curation of artistic data visualization exhibitions, whether in physical or online environments. This article addresses this gap by exploring the curatorial processes behind two artistic data visualization exhibitions, "Numerical Existence" and "Numerical Existence: Emergencies," held in Rio de Janeiro in 2018 and 2024, respectively. We will present an overview of artistic data visualization exhibitions, discuss the role and unique challenges of curation in this field, and share detailed insights from our curatorial experience with the two exhibitions. Furthermore, we will propose future directions for research and practice in the curation of artistic data visualization. Through this exploration, we aim to contribute to the practice of curating artistic data visualization, providing reflections and recommendations to enhance the development and appreciation of this emerging field.

~

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SPACETIME DIALOGUE: INTEGRATING ASTRONOMICAL DATA AND KHOOMEI IN SPATIAL INSTALLATION

As advanced technology reshapes our perception, the dialogue between humans and the universe undergoes a transformative shift. Understanding this evolution within the vast expanse of spacetime can illuminate our path forward. To illustrate this paradigm shift, we propose the creation of a spatial art installation that embodies the revolution in dialogue. Drawing on interdisciplinary research and methodologies spanning cosmology, anthropology, philosophy, astronomy, acoustics, computer science, and nomadic traditional singing, we embark on a transformative journey. This work juxtaposes the most advanced astronomical observation practices of humanity with the ancient nomadic tradition of conversing with the cosmos using artistic language. Specifically, it engages in a dialogue between the astronomical data from the

James Webb Space Telescope and the throat-singing tradition of Khoomei. Subsequently, the work models the propagation of these sounds in three-dimensional space and materializes them into tangible entities. By immersing observers in the spatial representation of this dialogue, we offer a profound experience of humanity's evolving relationship with the universe within the fluidity of spacetime.

~

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WHAT'S MY LINE? EXPLORING THE EXPRESSIVE CAPACITY OF LINES IN SCIENTIFIC VISUALIZATION

Data is moving beyond the scientific community, flooding communication channels and addressing issues of importance to all aspects of daily life. This highlights the need for rich and expressive data representations to communicate the science on which society rests and on which society must act. However, current visualization techniques often lack the broad visual vocabulary needed to accommodate the explosion in data scale, diversity and audience perspectives. While previous work has mined artistic and design knowledge for colour maps and shape affordances (glyphs) in visualization, line encoding has received little attention. In this paper we report on an exploration of visual properties that extend the vocabulary of the line, particularly for categorical encoding. We describe the creation of a corpus of lines motivated by artistic practice, gestalt theory and design principles and present initial results from a study of how different visual properties influence how people associate these into sets of similar lines. While very preliminary, the findings suggest a rich set of line visual features to support both association and categorical hierarchies, and provoke further inquiry into how and why line encoding can be more expressive encoding multivariate, multidimensional data.

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"NORTHNESS": POETIC VISUALIZATION OF DATA INFRASTRUCTURE INEQUALITY

"Northness" is an installation that maps the latitudes of the servers that host the most popular websites in Brazil. Composed of three-dimensional typographic sculptures, a touch screen and projection, the work allows the public to visualize and locate the servers of the one hundred most accessed websites in Brazil. This installation is part of research in artistic data visualization that addresses issues of the data infrastructure sustaining our society, highlighting the Global North's dominance in data flows. "Northness" was featured in the exhibition "Numerical Existence: Emergencies," which took place in 2024 at the Futuros Cultural Center in Brazil.

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A PERFECT STORM

In the face of pressing global issues like climate change, data visualization is a powerful tool for making sense of complexity. With the project "A Perfect Storm", we aim to engage audiences in the oft-difficult conversation around global climate change in a way that considers the emotional responses that the topic can trigger. Through a metaphorical approach of visually juxtaposing countries' climate risk with their climate responsibility, we encourage critical reflection on the human experience and inequities of climate change related loss.

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CITY PULSE: REVEALING CITY IDENTITY THROUGH ABSTRACTION OF METRO LINES

Metro systems are the pulsing veins of cities, traversing the city's texture and preserving the memory of urban life. Visualizing invisible urban metro landscape makes each city's unique identity and development more emblematic. In this project, we introduce an abstraction method that encodes metro routes as lines, cities as squares, and the global map as an abstract representation. Along with the implementation of an interactive system, the project enables a comprehensive visual exploration of the global metro lines. Through this highly abstract and minimalist form, each city's structure, symbolic identity, and regional development are revealed. Moreover, the colorful global metro map efficiently portrays the diversity and evolution of metro lines worldwide. With this pictorial we narrate the design process and our reflections along the project.

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DESIGN PROCESS OF 'SHREDDED LIVES': AN ILLUSTRATED EXPLORATION

This pictorial illustrates an autoethnographic exploration of my design practice for the data physicalization "Shredded Lives: A Decade of Migrant Loss". It emphasizes the parallel development of seven design components — Interaction Mode, Technology, Data Representation, Physical Configuration & Scale, Dataset, Engagement Mode, and Spatial Experience. This flexible, non-hierarchical approach allows each component to inform and evolve alongside the others, stemming from a desire to thoroughly explore the design space without confinement by initial restrictions. As these components overlap and intersect, dynamic interactions occur, leading to the manifestation of design ideas.

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LOADING CERAMICS: VISUALISING POSSIBILITIES OF ROBOTICS IN CERAMICS

This article introduces an artistic research project that utilises artist-in-residency and exhibition as methods for exploring the possibilities of robotic 3D printing and ceramics. The interdisciplinary project unites artists and architects to collaborate on a proposed curatorial concept and Do-It-With-Others (DIWO) technological development. Constraints include material, specifically local clay, production technique, namely 3D printing with a robotic arm, and kiln size, as well as an exhibition concept that is further elaborated in the next chapter. The pictorial presents four projects as case studies demonstrating how the creatives integrate these constraints into their processes. This integration leads to the subsequent refinement and customization of the robotic-ceramics interface, aligning with the practitioners' requirements through software development. The project's focus extends beyond artistic outcomes, aiming also to advance the pipeline of 3D robotic printing in clay, employing a digitally controlled material press that has been developed in-house, with its functionality refined through practice.

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PIECES OF PEACE: WOMEN AND GENDER IN PEACE AGREEMENTS

With armed conflicts and wars continuing to occur globally, peace has been an enduring and crucial concern. In the efforts to resolve these conflicts, a vast number of peace agreements have been signed. In this project, we examine the extent to which women and gender are explicitly acknowledged or addressed in peace agreements. Using debossing, we physicalize the mentions of women and gender in these agreements as a means to increase awareness and recognition of these suffered but often-overlooked crowds.

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