S+T+ARTS INSIDER

science
+ technology
+ the arts

An E-Magazine series
powered by S+T+ARTS Ec(h)o

AI & COMPUTING

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S+T+ARTS
INSIDER
N°I/6

EDITORIAL NOTE

ARTIFICIAL INTELLIGENCE & HIGH PERFORMANCE COMPUTING

Rapid advances in digital technologies are reshaping how societies function, govern, and innovate. **Artificial intelligence** has become a central focus for **technologists**, **industry leaders**, and **policymakers** alike—simultaneously pushed forward through massive investment and constrained through emerging regulatory frameworks. This acceleration has also brought renewed attention to **the infrastructures that enable large-scale computation**, from supercomputing centres to new initiatives such as European AI Factories. Yet alongside this growth, **persistent challenges remain**: algorithmic bias, limited transparency, uneven access, and the social and environmental costs embedded in **AI-driven systems**.

It is within this context that **artists' engagement with AI and computational infrastructures becomes particularly valuable**. Artists working directly with these technologies contribute more than interpretation or critique: they experiment, probe limits, and expose assumptions embedded in technical systems. Through their practices, **they help surface questions** of fairness, accountability, and authorship, while **proposing alternative**, more equitable principles **for technological development**. By translating complexity into experiential forms, artists expand access beyond academic and industrial elites, support public understanding, and **encourage innovation that is socially and environmentally aware**. Their involvement often leads to AI tools that are not only more transparent and human-centred, but also more usable—**opening new possibilities for SMEs**, **public services**, and **creative industries** alike.

ABOUT S+T+ARTS

S+T+ARTS INSIDER

STARTS Insider is a **series of six e-magazines**, each dedicated to a specific field, showcasing how artistic thinking can actively shape innovation processes across sectors—from manufacturing and health to AI and the creative industries. Drawing on insights from nearly a decade of the STARTS Initiative, this series highlights lessons learned from collaborations that align artistic practice with European research, industry, and policy goals. Together, these editions demonstrate how alliances between art, science, and technology not only advance innovation, but also ensure it remains human-centred, culturally grounded, and publicly accountable.

ABOUT S+T+ARTS

Launched in 2016, STARTS (Science + Technology + Arts) is an initiative of the European Commission demonstrating that artistic practice is not an add-on to innovation, but a powerful driver of it. At a time of accelerating digital transformation, climate urgency, and social fragmentation, STARTS challenges the idea that technological progress alone can deliver meaningful solutions. Instead, it positions artistic inquiry as a catalyst that disrupts assumptions, reframes problems, and opens up new trajectories for systemic innovation.

STARTS is built on a clear philosophy. Interdisciplinarity lies at its core: artists work side by side with scientists, engineers, technologists, policymakers, and industry partners, introducing experimental thinking, critical reflection, and alternative ways of knowing into research and development processes. Societal relevance ensures that innovation is purpose-driven, addressing real-world challenges such as AI ethics, sustainability, biodiversity, health, and social inclusion. Systemic change guides the long-term vision: STARTS aims not just to produce projects, but to embed artistic methods into research cultures, innovation ecosystems, and governance frameworks.

Since its inception, STARTS has supported 21 large-scale collaborative projects, involving over 165 partners across 26 countries, spanning universities, research centres, SMEs, industry leaders, cultural institutions, and public bodies. At the heart of this ecosystem are 381 artistic residencies , embedding artists directly within laboratories, companies, factories, and policy environments. These residencies have generated new tools, methods, business models, and policy insights—often continuing well beyond their original timeframe.

Funded by more than €65 million in EU investment (2016–2025), STARTS represents a strategic commitment to culture-driven innovation. Its lasting impact lies not only in numbers, but in reshaping how innovation is imagined—showing that Europe's digital and green transitions are strongest when creativity, ethics, and technology evolve together.

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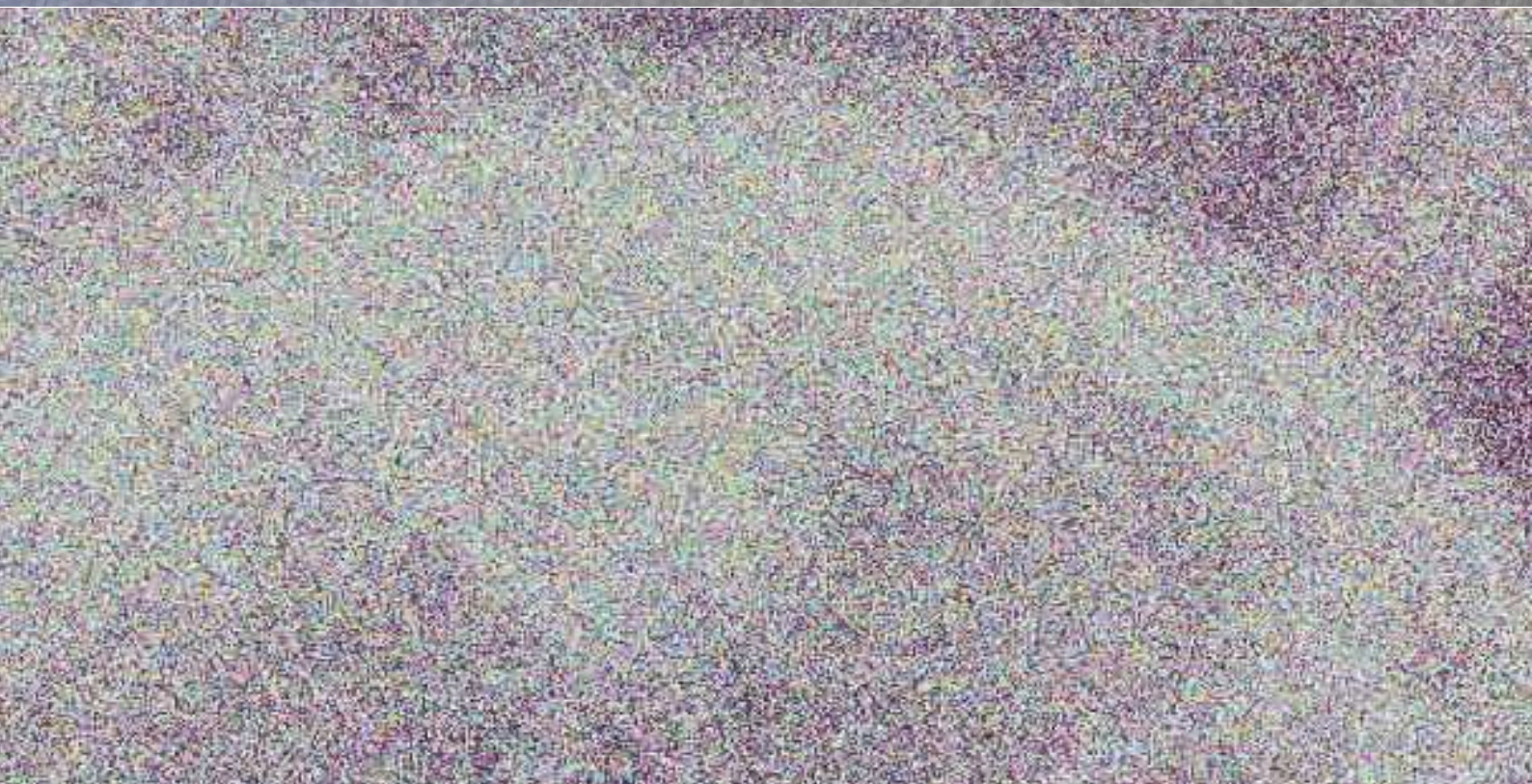
CASE STUDIES





María Arnal describes the Impossible Larynx app, developed during the STARTS AIR residency with BSC. Photo: Paula Fernandez Vergara.

IMPOSSIBLE LARYNX
MARIA ARNAL DIMAS (ES)

S+T+ARTS AIR RESIDENCY

Impossible Larynx is a residency project by Maria Arnal in collaboration with the Barcelona Supercomputing Center. The project investigates the **physical and technological limits of the human voice** by combining a Digital Twin of the larynx with **AI-driven voice synthesis**. Multiple AI models were trained on curated datasets of traditional a cappella and Flamenco singing, enabling real-time voice transformations that surpass human biological constraints. The research explores the latent space of these models, revealing how subtle variations in vocal parameters can produce new sonic possibilities—a critical step for understanding how AI encodes and generates expressive human-like sound. A 3D visualization tool maps the simulated vocal tract in real time, making the transformation both perceptible and interpretable.

By merging artistic experimentation with scientific expertise, the residency produced a **versatile prototype with outcomes spanning music, AI research, and healthcare applications such as speech therapy and voice recovery**. The trained models also become part of Maria Arnal's musical performances, generating new expressive possibilities on stage. The collaboration demonstrates how artists working directly with HPC infrastructures can explore latent spaces and computational processes in ways that are both conceptually and experientially rich.



INDUSTRY AREAS ADDRESSED:

medicine (speech therapy, voice recovery, gender-affirming care), music and sound production, AI research

TECHNOLOGY APPLIED:

high-performance computing (HPC), digital twins, machine learning, AI-driven voice synthesis, simulation, real-time visualization



Courtesy of the artist: Marielena Papandreou

GR-AI-N
MARIELENA PAPANDREOU (GR)

VOJEXT RESIDENCY

Developed by the artist Marielena Papandreou in collaboration with **Robothnik**, GR-AI-N is a **robotic fabrication system** that applies AI not to accelerate production, but to fundamentally **rethink material use** in **industrial manufacturing.** The project addresses a widespread inefficiency in timber processing: **high-quality offcuts** are routinely discarded because they fall outside standardised **production workflows**. GR-AI-N reframes this "waste" as a primary input, using AI to adapt design and fabrication processes to material variability rather than eliminating it.

The system combines **computer vision**, **AI-driven analysis**, and **robotic manipulation** to scan each timber offcut, capturing its geometry, grain structure, texture, and imperfections.

Instead of forcing irregular material into predefined forms, AI tools generate designs that follow the **wood's natural characteristics**. A dual robotic end-effector assembles these fragments into three-dimensional mosaics, allowing complex objects to emerge from heterogeneous pieces with minimal manual intervention. This reverses a dominant industrial logic: rather than simplifying materials to suit machines, **machines are made responsive to materials**.

While AI is already widely used in industry to optimise speed, cost, and precision, GR-AI-N demonstrates how artistic research can extend these practices toward **sustainability** and **long-term value**. By preserving grain continuity and extending the lifespan of carbon stored in wood, the project aligns efficiency with ecological responsibility. More importantly, it introduces new evaluative criteria—material care, continuity, and resource stewardship—into AI-assisted manufacturing.



INDUSTRY AREAS ADDRESSED:

timber and wood processing, furniture and product design, robotic manufacturing, circular manufacturing





TECHNOLOGY APPLIED:

computer vision, 3D scanning and point-cloud processing, AI-assisted design, robotic fabrication



Photos: Andrés Mañón

HOLLY +
HOLLY HERNDON, MATT DRYHURST AND HERNDON DRYHURST STUDIO (US)

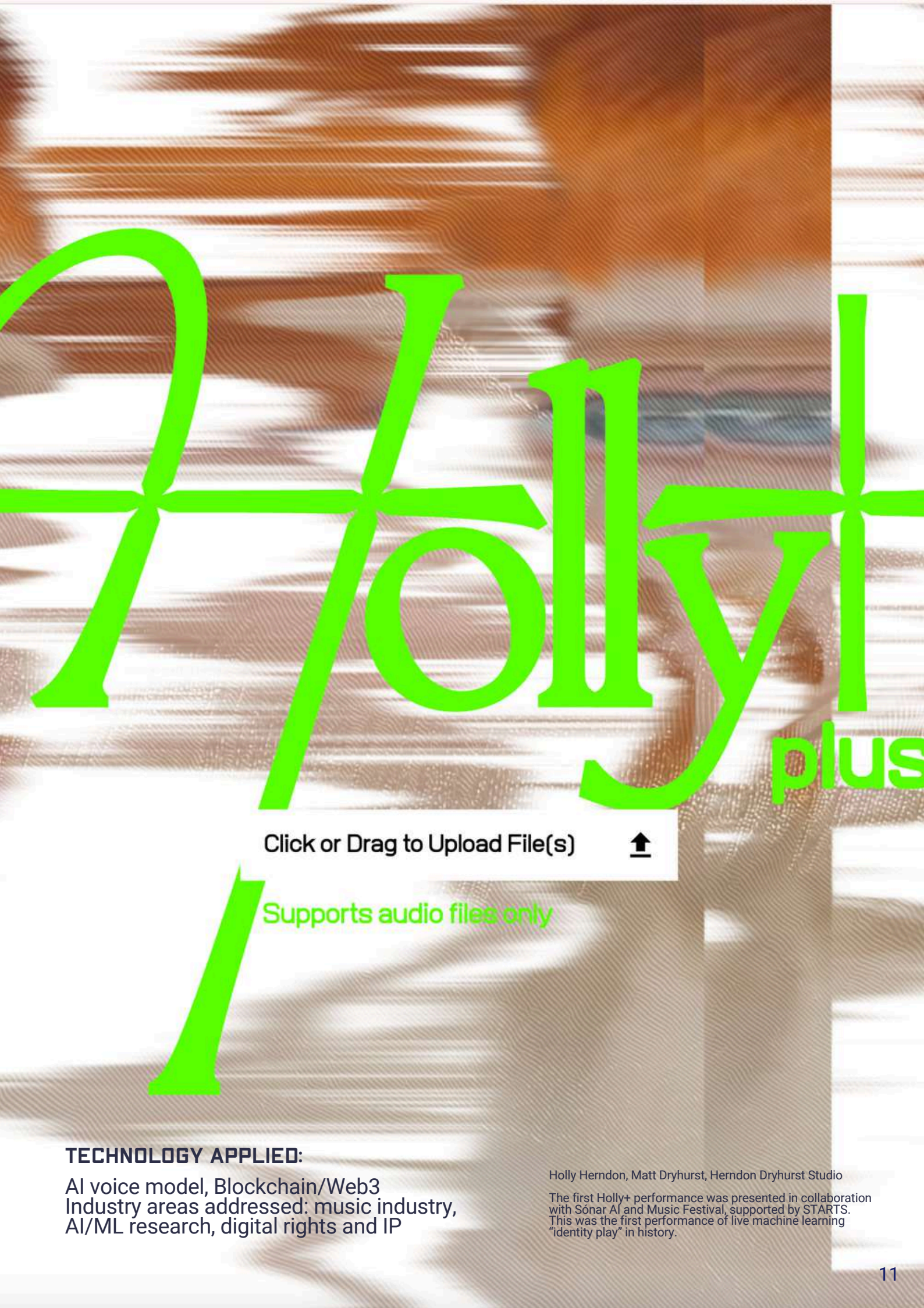
S+T+ARTS PRIZE, GRAND PRIZE FOR ARTISTIC EXPLORATION, 2022

Holly+, by Holly Herndon and Matt Dryhurst, winner of the 2022 STARTS Prize Grand Prize for Artistic Exploration, is a working prototype for how AI can be integrated into the **music industry** without reproducing extractive models of authorship and ownership. The project centres on a **digital twin of Herndon's voice**, an **AI voice instrument** that anyone can use to create music.

The first instrument allowed users to upload polyphonic audio and receive it rendered in Herndon's synthetic voice; subsequent tools for **live performance** and **composition** were developed collaboratively with AI studios and research partners like Never Before Heard Sounds and Voctro Labs.

Rather than framing synthetic voices as a threat, the project tests how they can be deployed transparently and with consent, addressing growing industry concerns around **deepfakes**, **licensing**, and **voice rights**.

Stewardship of the digital identity is managed through the Holly+ DAO, where hundreds of members collectively vote on appropriate uses of the voice. Approved works can be verified via on-chain provenance, while revenues are shared between creators, the DAO, and the artist, and reinvested into new tools. With over 70 released works, *Holly+* demonstrates a **permissive model of AI-driven music production**—what Herndon calls "Identity Play"—offering the industry a concrete alternative to restrictive or platform-controlled approaches to AI, copyright, and creative labor.



TECHNOLOGY APPLIED:

AI voice model, Blockchain/Web3
Industry areas addressed: music industry, AI/ML research, digital rights and IP

Holly Herndon, Matt Dryhurst, Herndon Dryhurst Studio

The first Holly+ performance was presented in collaboration with Sónar AI and Music Festival, supported by STARTS. This was the first performance of live machine learning "identity play" in history.

case study D.



Photo: Council of Foods © Nonhuman Nonsense 2024

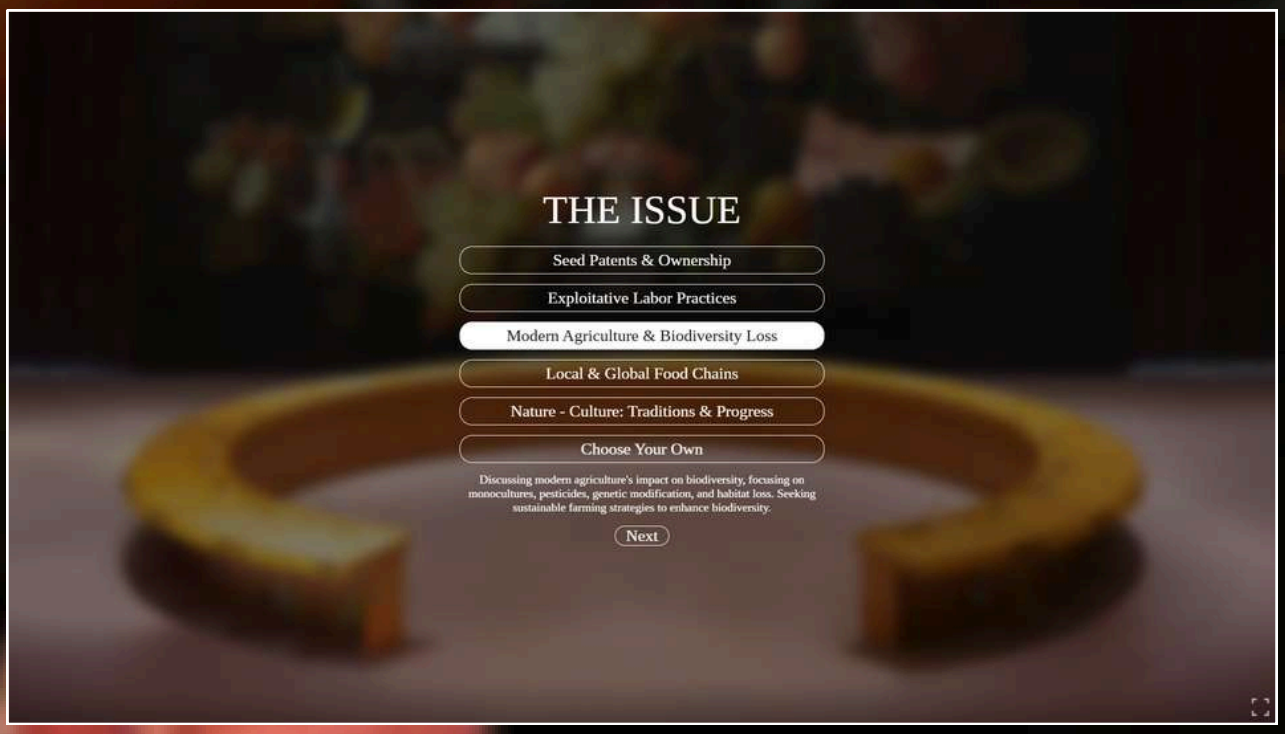
COUNCIL OF FOODS
NONHUMAN NONSENSE (SE)

HUNGRY ECOCITIES RESIDENCY

The Council of Foods is an **interactive digital platform** that uses **AI-generated food avatars** to support accessible, multi-perspective conversations about the **global food system**. Developed as a browser-based environment, it invites users to engage with ten distinct "**council members**," each representing different production methods, environmental impacts, and ethical positions. Through **real-time dialogue**, users can ask questions, explore trade-offs, take notes, and generate reports, turning complex food system dynamics into a **navigable learning** and **reflection process**.

AI functions here as a **sense-making interface** rather than an optimisation tool. By structuring conversations across multiple viewpoints, the platform **reveals interdependencies** that are often obscured in policy debates, such as the links between agriculture, ecology, labour, and consumption. Tested with SMEs including Logiqs and BeeSage, the system demonstrates readiness for scenario-based learning and can be extended with new characters or thematic modules.

By presenting food items as AI-driven interlocutors, *The Council of Foods* raises awareness of the **socio-ecological consequences** embedded in everyday choices and regulatory frameworks. This approach helps **address persistent knowledge gaps** that limit effective policymaking, offering policymakers, industry actors, and citizens a transparent entry point into understanding how food systems are shaped—and how they might be governed differently.

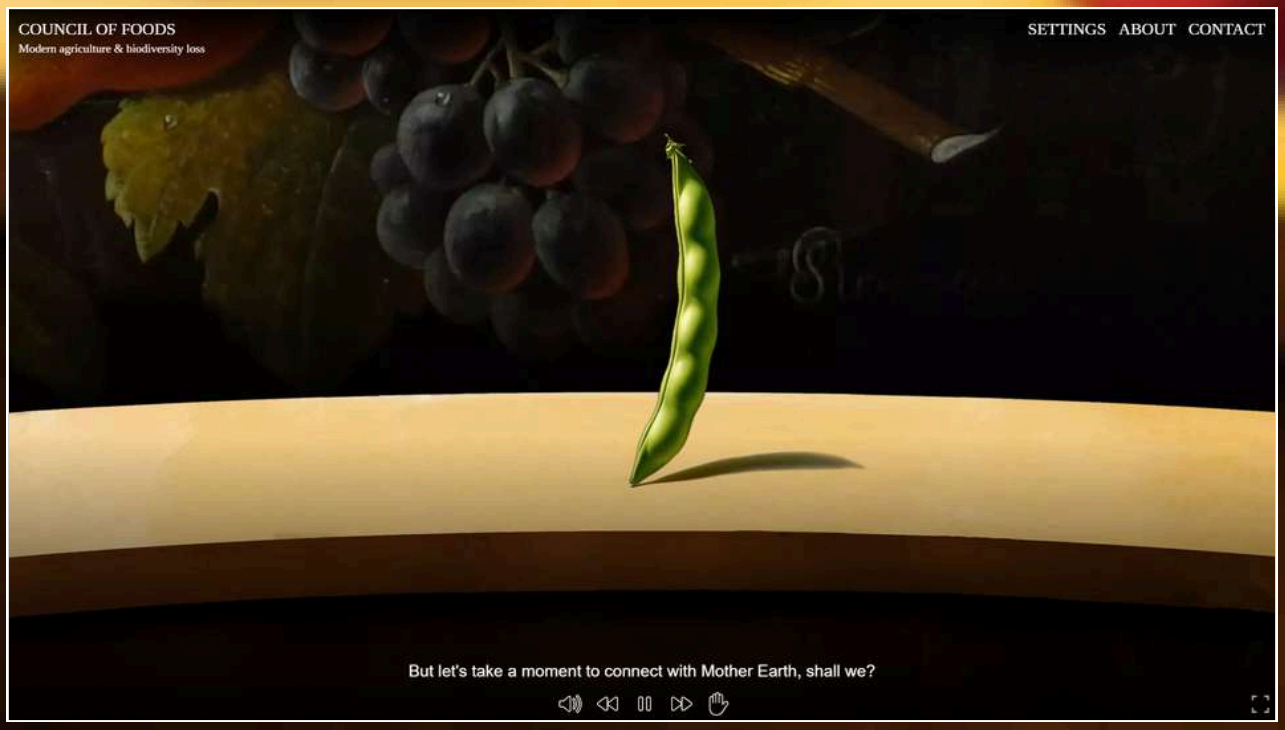


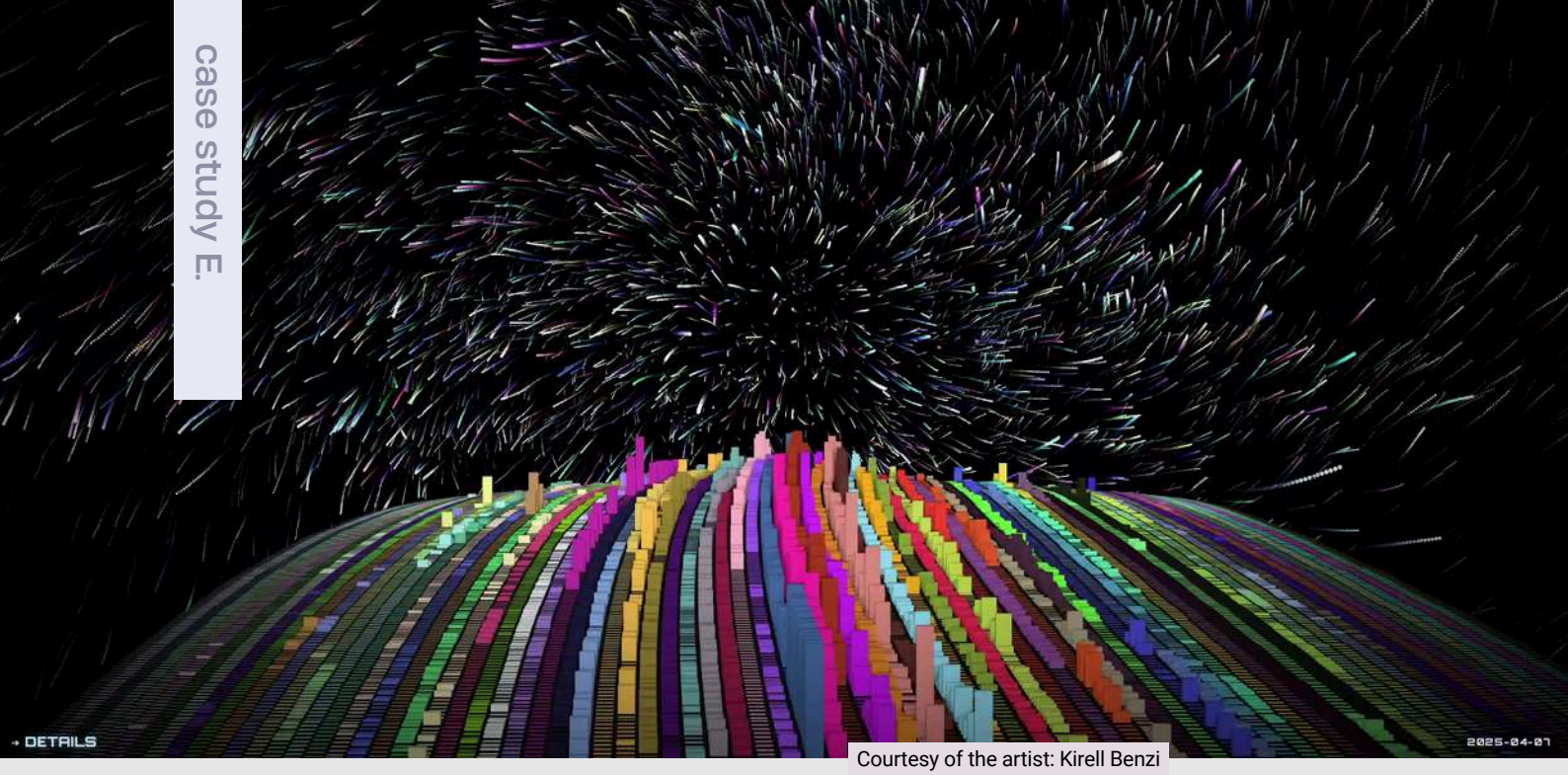
INDUSTRY AREAS ADDRESSED:

food and agriculture, environmental sustainability, policymaking and governance, education and training

TECHNOLOGY APPLIED:

generative AI, large language models (LLMs), conversational AI, AI-generated avatars, browser-based interactive platforms





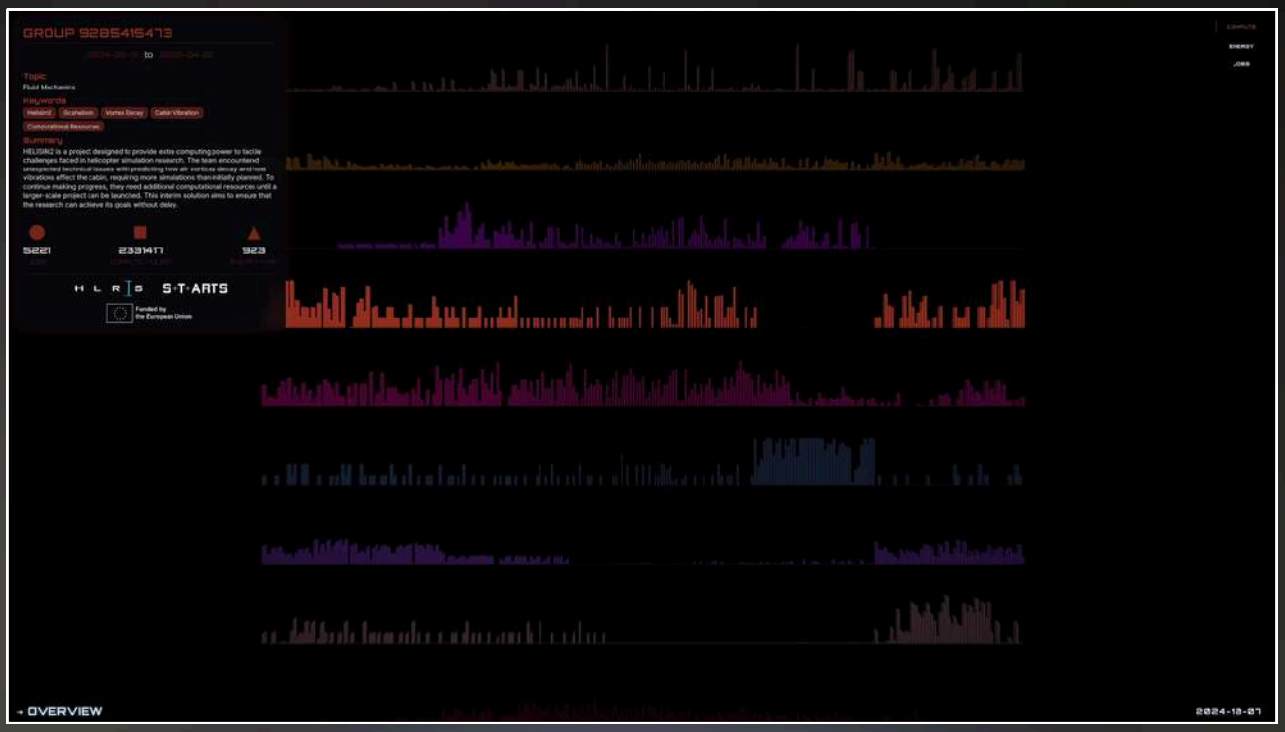
Courtesy of the artist: Kirell Benzi

HPC DATA SYMPHONIES KIRELL BENZI (AT)

S+T+ARTS EC(H)O RESIDENCY

HPC Data Symphonies is an artistic research project developed by Kirell Benzi within the STARTS Ec(h)o residency at the High Performance Computing Center Stuttgart. It **transforms operational data** from the **HAWK supercomputer** into an **interactive, data-driven experience** that makes the rhythms of the centre's daily activity tangible. **Logs from different research groups** and departments are visualized as a **dynamic landscape**, showing when and how **computational resources** are used across the institution. A "human-scale translator" converts compute and energy into familiar terms of effort and time, helping visitors grasp the **scale of the infrastructure** without technical expertise.

By giving artists direct access to HPC data and systems, the project makes the centre's work more legible and opens a dialogue around its **societal and environmental footprint**. A physical installation allows visitors to pedal a bike to **drive the visualization**, comparing human effort with the energy demands of the supercomputer. Run on-site or online, *HPC Data Symphonies* transforms abstract operations into shared, accountable infrastructure, demonstrating how artistic involvement can foster awareness, engagement, and reflection around advanced computational technologies.

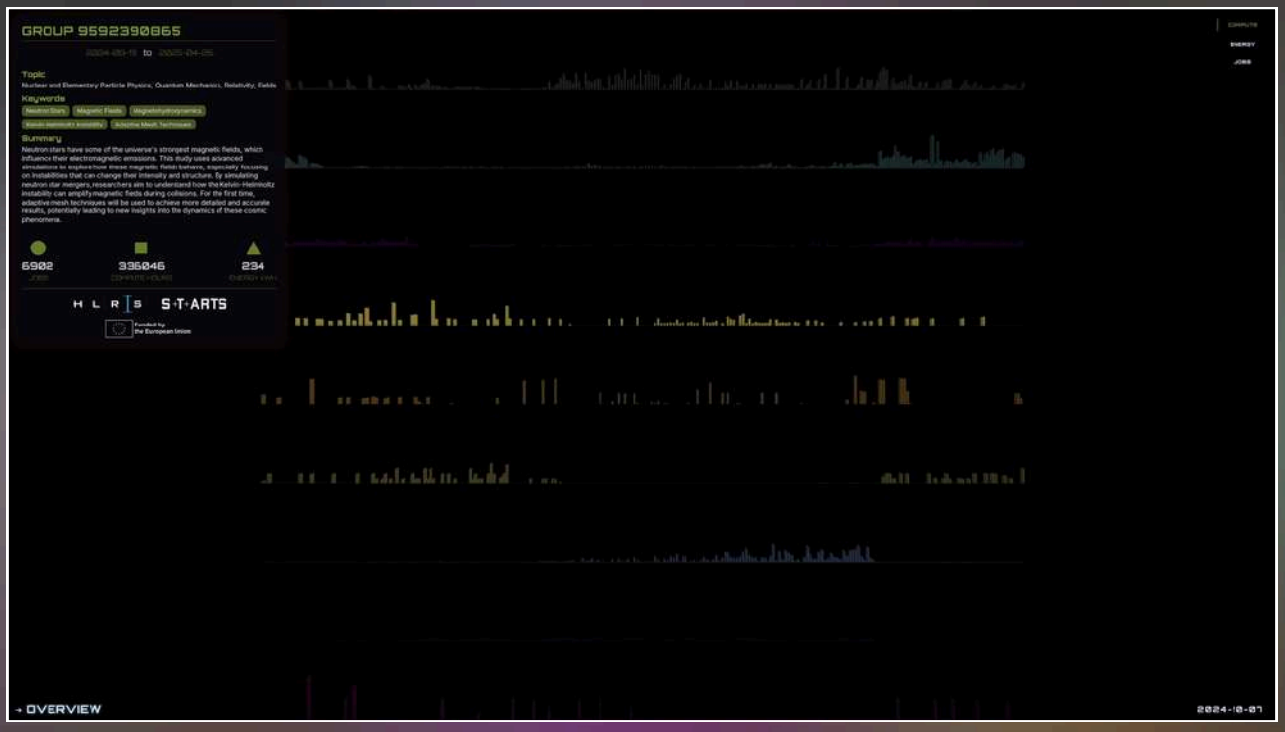


INDUSTRY AREAS ADDRESSED:

high-performance computing, data centres, energy and sustainability, science communication

TECHNOLOGY APPLIED:

high-performance computing (HPC), data visualisation, real-time visualisation, human-computer interaction



INTERVIEW WITH



INTERVIEW WITH FERNANDO CUCCHIETTI



FERNANDO CUCCHIETTI

DATA ANALYTICS & VISUALIZATION @ BARCELONA SUPERCOMPUTING CENTER-CENTRO NACIONAL DE SUPERCOMPUTACIÓN BSC-CNS

Fernando Cucchietti (AR/ES) leads the Creative Intelligence Laboratory at the Barcelona Supercomputing Center (BSC-CNS). He holds a Ph.D. in quantum computing and has conducted postdoctoral research in the US and Spain. His work focuses on scientific data visualization, digital twins, and AI-driven industrial applications, alongside long-standing collaborations with artists at the intersection of art, science, and public engagement.

Barcelona Supercomputing Center (BSC-CNS) is a leading research centre dedicated to supercomputing and computational science, developing advanced technologies and expertise in areas including Data Analytics & Visualization, AI, and digital technologies to address major scientific and societal challenges.

INTERVIEW WITH FERNANDO CUCCHIETTI

S+T+ARTS: Can you tell us a little about your work at the Barcelona Supercomputing Center?

Fernando Cucchietti: I lead the Data Analytics and Visualization group. We work on transversal applications of different statistical and numerical models based on data, including AI applications. We also produce visualizations, dashboards and interactive installations—things that contain information or data represented in visual or other interpretable forms. We apply these technologies to industry and urban projects: manufacturing, public administrations, logistics, services and more.

We started small, focusing on visualization, but the group grew rapidly into data analytics. We began working heavily with AI around 2016. Before that, we used mostly statistical models—AI was only one among many approaches. In 2016, we started working with generative AI for time sequences, which are very important for industry because sensor data comes as a series of points in time. For us, this was similar to music—also a temporal series of data.

We were interested in creating new patterns, identifying anomalies and detecting strange or repeated patterns. That year, we did an experiment on music composition using AI models, and that's how we bootstrapped ourselves into this field.

S+T+ARTS: Your background moves between 3D animation, physics and quantum computing. How did that path bring you to where you are today?

Fernando Cucchietti: When I was very young, I worked in TV advertising—I did 3D animation for television from 1991 to about 1994. This was very new at the time; not even Toy Story or Jurassic Park had come out yet.

Then I left that to study physics and worked on quantum computing for a while in the 2000s. By 2011, I was tired of working in academia doing theoretical work, so I decided to switch to something closer to industry and actual applications. I studied in Argentina, completed my PhD at Los Alamos National Laboratory in the US, and then came to Europe—to BSC, where I started working with numerical simulations on a supercomputer.

I created the visualization group because it allowed me to combine my expertise in 3D animation with the science we were doing. We created some documentaries that won awards, and started growing from there. The data part came naturally because we were processing so much data to create the videos that it became something we could offer externally. After processing came analysing, then generating data, and so on.

INTERVIEW WITH FERNANDO CUCCHIETTI

S+T+ARTS: So it came naturally — you started from the artistic side, then switched to mathematics, industry, engineering, and now you're mixing both?

Fernando Cucchietti: You could put it like that, but actually I started on the artistic side because I was good with computers. The real beginning is that I was a programmer. In 1990, people at advertising agencies didn't have anyone who could use a computer to do fancy stuff. So I came in because I knew how to programme and use computers. It's actually a longer zigzag.

S+T+ARTS: How do artists become involved with BSC today, and how are these collaborations structured?

Fernando Cucchietti: We don't have a formal programme right now, though we're trying to establish one for residencies and collaborations. So far, we've had two types of collaborations. The first comes through S+T+ARTS projects—we've had artist residents who came here through S+T+ARTS, and those are already somewhat structured. The second type is internal: sometimes we have projects and resources to fund a collaboration with an artist. These are less structured.

People come to us because they hear about the centre and our big computers, or because they know our work. We also sometimes seek out artists ourselves. My team is very heterogeneous—we have people from art and artistic backgrounds, as well as animators, designers and people from cultural and creative spaces. Sometimes we do projects where we are our own artistic counterpart—technology projects with our own internal artistic efforts.

S+T+ARTS: What do these collaborations lead to in practice—films, interactive visualizations, music generations?

Fernando Cucchietti: Our main focus is not on art production per se. It comes first from the technology and innovation side. We might have a technology we want to learn or develop, or a problem we need help solving—help from someone in the humanities, a different perspective, or an artist with specific skills. This then translates into: given this need or new technology, what kind of artistic environment or message could we be working on? Then it becomes an artistic project, which leads to different kinds of media.

INTERVIEW WITH FERNANDO CUCCHIETTI

We've been making videos for a long time, often documentaries about science. We particularly like interactive installations because people engage much more with them. We also conduct research on interaction and how people engage with data through technology devices.
For example, eight or nine years ago, we explored how people respond to data visualizations inside virtual reality. We created an artistic piece about noise in the city—you could fly through a complicated version of a city and hear different sounds. This also helped us understand the technology for practical applications. What we learn from such experiments sometimes feeds into our industrial projects. We've also worked with music and new technologies involving screens, cameras and sensing how people move, but mostly our work is digital.

S+T+ARTS: You started experimenting with generative AI relatively early. How has your approach to creating with AI evolved since then?

Fernando Cucchietti: Yes.
We started working with music generation in 2016. The models we had back then were very different from today's, but we were still quite successful. From music, we moved to generating text—poetry, books—and then data, such as sensor data.

We started using image generation for documentaries a few years ago, mostly to illustrate and discuss the technology itself rather than for external artistic purposes.

Only recently have we begun using generative AI without the topic being AI itself. We came back to sound through voice generation models. We're collaborating with a local singer from Barcelona, Maria Arnal. She was a resident in one of our STARTS projects and presented her new album last year at Ars Electronica. The album includes choruses and voices created with our models, along with some of the visuals we produced for her show.

> "EXPLORING WHAT THE TECHNOLOGY CAN DO, UNDERSTANDING IT, AND SOMETIMES CREATING OUR OWN MODELS AND TECHNOLOGY„

Our creative work in this space has mostly been about exploring what the technology can do, understanding it, and sometimes creating our own models and technology—as we did with Maria Arnal.

INTERVIEW WITH FERNANDO CUCCHIETTI

S+T+ARTS: You work alongside other science departments. How is this kind of work received when, for example, you publish something about writing poetry with software in an engineering journal?

Fernando Cucchietti: Every paper has its own focus. Even if we publish in an engineering journal and the topic is writing poetry or creating a singing voice, we still need to explain in detail the technical aspects—why the model is new compared to previous work, what numerical methods we used, how we trained the models and so on.

If we send it to a more artistic journal, or something from the cultural or humanities sphere, then we can focus on questions like: what does it mean to clone someone's voice? Where is our voice? We can dwell on very different aspects. You have to know your audience.

S+T+ARTS: Are institutions or companies outside the cultural sector also approaching you to develop projects with artists?

Fernando Cucchietti: Only museums and some cultural institutions have approached us for that. A city hall or a manufacturing company—that kind of third party outside the cultural environment—has never contacted us. We have worked on commissions from museums, foundations and some cultural magazines. Those are people already in the cultural environment who know what the expectations are.
That is definitely something to develop in the future. It would be great—it's another layer of mediation between technology and the public.

“WHAT DOES IT MEAN TO CLONE SOMEONE'S VOICE? WHERE IS OUR VOICE?„

INTERVIEW CONDUCTED BY GILLES GAUTIER S+T+ARTS MAGAZINE, 13 FEBRUARY 2026*

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GO FURTHER

GO FURTHER

The questions raised throughout this issue extend far beyond the projects and perspectives presented here. From artistic experiments with AI and high-performance computing to new ways of thinking about data, infrastructure, authorship and sustainability, these resources offer further perspectives on the evolving relationship between art, science and technology. Explore additional projects, articles, podcasts and events to continue the conversation and discover new ways of engaging with the possibilities — and challenges — of computational technologies.

Resources

Article

Simulation + Imagination: A European Perspective on Art and Supercomputing

in SCIENCE+TECHNOLOGY+ARTS: Lessons Learned from a Decade of European Transdisciplinary Innovation (P.100–103), 2026

This article examines how artists and European high-performance computing centres can collaborate to explore new forms of knowledge, experimentation and public engagement. Drawing on the S+T+ARTS AIR project, it highlights both the challenges of bringing artistic practices into highly technical environments and the opportunities that emerge when artists and scientists challenge each other's perspectives, from making complex phenomena tangible to rethinking scientific visualisation and research processes.



Replay

Quantum Horizons: Strategic Infrastructures and Entangled Futures

Conference Panel @ Ars Electronica Festival 2025

Bringing together Bettina Kames, Fernando Cucchietti, Armin Linke, Giulia Bini, Emergence Delft, Robert Meisner and Oscar Diez, this session explores how quantum technologies and large-scale infrastructures are reshaping our understanding of the planet, the cosmos and ourselves. Drawing on experimental physics, space and Earth observation, and large-scale sensing systems, it considers the entanglements between computation, scientific research and the infrastructures that make new forms of knowledge possible.



Film

S+T+ARTS AIR
Project Film (2025)

How can art, science and technology help us understand something as essential — yet largely invisible — as the air we breathe? This film follows the S+T+ARTS AIR project, bringing together ten artists, eight consortium partners and four S+T+ARTS Centres and Hubs across Europe to explore air, biodiversity, urban environments and technology through artistic research and interdisciplinary collaboration.



© SYMBODY Dataset, by Natan Sinigaglia

Article

The art-driven innovation Lens on AI
by In4Art, 2025

Six use cases on generative AI: Making the Invisible Visible in Health, Nature, and Human Connection. Drawing on the S+T+ARTS AIR project, this publication explores how artistic experimentation can contribute to AI innovation through six use cases spanning health, nature and human connection, highlighting new ways for artists, scientists and technologists to work together.

Events

AI & Music powered by S+T+ARTS
@ Sónar

A Sónar programme exploring the intersection of AI and musical creation through performances, talks, workshops and artistic research. The programme also gave rise to the AI & Music Podcast, a series of three thematic episodes and ten interviews exploring AI as instrument, collaborator and creative tool.

Podcast

theGATE Festival
organized by Media Solution Center – HLRS
@ High Performance Computing Center

A festival bringing together artists, scientists and technologists to explore the intersections of art, science and technology through exhibitions, performances, talks and workshops. Its programme has featured research and artistic projects around AI, high-performance computing, quantum technologies and scientific infrastructures.

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SCIENCE
+ TECHNOLOGY
+ THE ARTS

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