

# Orbits and Bodies: A Live Audiovisual Performance with Bespoke Machine Learning Instruments

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## Abstract

*Orbits and Bodies* is a live audiovisual performance connecting exoplanet orbital data, embodied gestures, and bespoke music-making software to explore mediated musicianship and distributed agency. Structured in three continuous movements, the piece traverses sonic territories that move from environmental field recordings through rhythmic patterns and fractured sonorities to deep low-end frequencies. The performers implement bespoke systems for real-time audio generation and processing; use exoplanet orbital data as modulation streams; and track their gestures to control custom digital instruments. A salient feature is the explicit audiovisual feedback: control interfaces are video-projected into the space, allowing the audience to witness how gestures, mappings, and parameters articulate auditory and visual change. This “open process” approach positions explainability as part of the performance, co-producing intelligibility and trust through the public legibility of process.

## 1 INTRODUCTION

*Orbits and Bodies* sits at the intersection of live electronic music performance, data-driven musification (Hajdu and Fu, 2023), interactive machine learning (IML), and research-creation. It engages directly with questions of mediated musicianship and distributed agency—core concerns of the conference theme “The Generative Turn: Mediated Musicianship in a Hyper-reproductive Age.”

Contemporary generative AI tools for music tend to prioritise immediate accessibility at the expense of explainability, hindering their integration into sustained musical practice (Vigliensoni and Fiebrink, 2025). Large pre-trained models offer limited capacity for musicians to communicate their intentions clearly, and their interaction modes—typically text prompts—cannot accommodate the nuanced, embodied control that sustained creative practice demands. In contrast, *Orbits and Bodies* foregrounds a data- and interaction-driven approach in which small, artist-curated datasets and interactive machine learning serve as primary vehicles for expressing musical intention and exercising creative agency (Vigliensoni and Fiebrink, 2025; Tecks et al., 2024).

The piece draws on a broader trajectory of research exploring how explainability in creative AI systems can be understood not as a post hoc property of a model, but as an evolving relationship between artist and system, sustained through practice over time (Tecks et al., 2024). In *Orbits and Bodies*, explainability is continuously produced through performance—through the projection of interfaces, the visibility of gesture-to-sound mappings, and the audience’s capacity to witness the causal surface of the system in real time.

*Orbits and Bodies* also connects to traditions of live electronic music that emphasise liveness, embodied cognition, and the body as interface (Collins et al., 2003; Morreale et al., 2018). The use of exoplanetary orbital data as control signals introduces a speculative, world-building dimension:

planetary motion is translated into modulation streams that shape the sonic environment, while field recordings serve as gateways to distant ecosystems and memories. The performance thus combines music-making, storytelling, and world-building into a collective audiovisual experience.

## 2 METHODS TAKEN IN DEVELOPING THE WORK

The piece unfolds in three continuous movements that progressively shift the sonic centre of gravity. The first establishes a sense of place through environmental field recordings, gradually layering in processed and synthesised material. The second develops rhythmic patterns and fractured sonorities through dense, embodied interaction with the bespoke instruments described below. The third collapses into sustained low-end frequencies and slow modulations, with exoplanet orbital data driving the temporal arc toward an immersive close.

The performance is built around three bespoke digital instruments, each instantiating different provisions for explainability and performer agency as identified in our recent research-creation work (Tecks et al., 2024).

**First**, Plantasia Space is a web-based platform for collaborative sound- and music-making and world-building developed by Guarnieri. In *Orbits and Bodies*, it supports a mode of working where sonic and musical material can be revisited and regenerated across rehearsals and performances. Rather than treating generated output as a disposable stream, the platform supports (and encourages) returning to prior states, enabling further processing, and fostering transformations to regenerate sonic material. This aligns with the provision of extending iteration beyond inference—maintaining a living relationship with compositional materials rather than consuming outputs as ephemeral artefacts (Vigliensoni and Fiebrink, 2025).

**Second**, R-VAE (Vigliensoni et al., 2022) is used to create and perform with latent spaces of rhythms trained on small, artist-curated datasets. R-VAE is a variational-autoencoder-

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Figure 1: A still from *Orbits and Bodies*: the R-VAE rhythmic interface (left) and Plantasia Space (right) are video-projected into the performance space, with each performer embodying their respective interface.

based musical device designed to model and generate rhythmic drum patterns using minimal training data. The rhythmic corpus is deliberately small—often just a dozen MIDI clips—so that the performers can remain familiar with its contents, revise it when the piece demands a different rhythmic vocabulary, and retrain models on short cycles. Because the rhythmic latent space is explicitly designed to be navigable (typically bi-dimensional), it supports the mapping of the latent space to a performable control space, allowing the performers to implement rhythmic interpolations, note-onset density changes, and timbral variations as embodied parameters across composition, rehearsal, and performance.

**Third**, RAVE models (Caillon and Esling, 2021)—real-time audio variational autoencoders—are steered through face tracking and IML using the FluCoMa toolkit (Tremblay et al., 2021). IML provides a method for making latent structure actionable under the constraints of the piece: during composition and rehearsal, the performers identify salient regions in the latent space and retrain the mapping model without altering the underlying generative model. This preserves the latent space as a stable reference while allowing the performable interface to be remapped—a mechanism we have described as the latent space functioning as a *boundary object* (Tecks et al., 2024).

Exoplanet orbital data serves as an additional layer of control, modulating synthesis parameters and shaping the temporal arc of the performance. Derived from confirmed exoplanet catalogues, these data streams introduce structured unpredictability: planetary motion patterns create slowly evolving modulations that the performers respond to and incorporate in real time, grounding the speculative world of the piece in empirical astronomical observation. Within the continuum from sonification to musification to dramafication, our treatment of these data sits within musification: the orbital streams are filtered through com-

positional and instrumental constraints rather than mapped directly to perceptual parameters.

Finally, the control interfaces used to play the instruments and craft the sounds are video-projected into the performance space (fig. 1). This visual layer allows the audience to observe gestures, mapping choices, and parameter changes as they articulate auditory and visual change. Rather than remaining hidden behind the laptops, the interfaces become a shared visual surface that the audience can read alongside the performers, narrowing the perceptual gap between the bodies on stage and the system they steer. Rather than “explaining” the model in a formal sense, the projection exposes the causal surface of the system: what is being controlled, how control changes over time, and how those changes correlate with perceptual outcomes (Tecks et al., 2024). In doing so, the work seeks to position explainability as constitutive of both the performance and the system itself, with intelligibility and trust co-produced through the public legibility of process.

## 2.1 Additional Information

Project website: <https://plantasia.space>

Performance documentation: <https://media.vigliensoni.com/video/wac2025>

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