Synthetic Ornithology

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In *Synthetic Ornithology*, visitors encounter a simulation of how shifting climates might transform Australia's avian soundscapes. Powered by a bespoke ML model trained on an archive of birdsong focused soundscapes and corresponding climate data, the installation generates future sonic environments based on user-selected scenarios. The speculative soundscapes reflect the richness and complexity of Australia's ecosystems, while revealing how these voices may adapt—or fade—under the pressures of climate change. Ultimately, Synthetic Ornithology underscores the profound impact human interventions may have on the soundscapes of tomorrow, inviting reflection on our collective responsibility to preserve these fragile ecological realms.

Additional Key Words and Phrases: soundscapes, simulation, machine learning

1 Program Notes

Synthetic Ornithology is an interactive sound installation that explores potential ecological futures by generating realistic birdsong-focused soundscapes in real time using a bespoke machine learning model for generative audio EAGLE (Environmental Audio Generation for Localised Ecologies). EAGLE, trained on thousands of Australian birdsong-focused soundscapes, each tagged with time, location, and climate conditions, can simulate future climate-based ecologies that react to changing climate conditions through sound. Visitors select a future time, location within Australia and climate conditions via a touchscreen interface, and the work generates a sonic representation of that scenario. The EAGLE model correlates the relationships between discrete geophonic, biophonic and anthropophonic audio features and climate parameters, allowing this interactive installation to create speculative soundscapes based on these discrete components and their likelihood to appear in a given scenario.

Fig. 1. A wide view of the installation at Phoenix Gallery Melbourne 2025

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2 Project Description

Synthetic Ornithology is an interactive sound installation that explores potential ecological futures by generating realistic birdsong-focused soundscapes in real time using a bespoke machine learning (ML) model. Visitors select a future time, location within Australia and climate conditions via a touchscreen interface, and the work generates a sonic representation of that scenario, along with generative text that contextualises the scenario with social, environmental, activist and climate history. The work builds on soundscape composition, and its use of a bespoke ML model for audio generation, extends the field into a speculative modality.

The dataset used to train the model was sourced from Xeno-canto [1] and the Macaulay Library[2]. Captured largely by citizen scientists, recordings in these archives, rather than unbiased soundscapes, are birdsong-focused recordings that also capture the surrounding sonic environment. Entries are often short, recorded using handheld devices, lack consistent microphone placement and frequently include evidence of human presence such as footsteps and clothing rustles. The inclusion of artefacts of human presence and from variations in capture quality and techniques in the dataset used for training means that these artefacts will also appear in the model's generated output. *Synthetic Ornithology* embraces these artefacts primarily as they make the sound more 'relatable'. Footsteps and clothing rustles place a human in the audio scenario, giving the listener a presence to substitute themselves into. This resonates with Feld's voicing, part of a reciprocal process that connects to the listener's sense of self and to an embodied experience of place [1]. Additionally, the colouring of audio from small recording devices connects to a more intimate experience of sound.

Synthetic Ornithology is unique in that the entire audio output of the work comes from the ML model, with no post-processing. The work's highly realistic soundscapes sound lifelike (blind surveys rated the generated output and real recordings almost identically); however, they also contain subtle deviations, especially when more extreme climate conditions are proposed. Here the sonic vocabulary of the work is apparent; biophonic sounds not usually heard together appear in the same soundscape, one bird species sings the call of another, and familiar bird calls appear with unexpected variation. The combination of highly believable, yet sublimely altered details is often seen in hyperrealist works like Patricia Piccinini's 'The Instruments of Life'[3] , which use realism to engage audiences and exaggerations to highlight external issues. *Synthetic Ornithology's* sonic hyperrealism is unique and grounds the speculative scenarios in familiar experiences, creating an initial sense of plausibility.

Leveraging this realism, *Synthetic Ornithology* is presented as ambiguously accurate, without explicitly stating its fictional nature; in this context, listeners are prompted to hear the generated output less as purely artistic and more as a genuine forecast, engaging with it in relation to real-world experiences rather than comparing it to other creative works. This facilitates an affective response termed 'appropriateness' that Schulte-Fortkamp et al. explain reacts to the level of congruency between a scheme and a real-world situation [4]. The presentation of the work as ambiguously accurate aligns the work with parafiction [3]. Parafictional art engages with narratives that are presented as true, with an aim to 'softly' deceive the viewer (or listener) and are realised through framing a work of fiction as plausibly true. Synthetic Ornithology is unique in engaging with hyperreal and parafictional approaches from an audio focused practice.

2.1 Interactive Experience

Synthetic Ornithology takes an underutilised approach to instrument interfaces in the NIME context, eschewing 'playability' and embodiment in interaction that is challenging with ML [2], for familiar interface elements and generative text that influence how the sonic content is perceived by the audience. The interaction is quite simple, focusing on a map-based interface and iOS-inspired rolling data and time selection widgets. The generative text uses ChatGPT and a structured prompt including details of the scenario selected by the audience to create a narrative that bridges real-world events with the speculative future scenario.

[1] https://xeno-canto.org/
[2] https://www.macaulaylibrary.org/
[3] https://www.patriciapiccinini.net/a-show.php?id=2021-Tallinn

Fig. 2. The wall mounted touchscreen interface for user interaction

2.2 Musical and Aesthetic Aims

Traditionally, soundscape composition focuses on capturing, editing, and layering field recordings to emphasise the environment's musical qualities. Synthetic Ornithology extends these techniques into speculative territory by:

- Decomposing the real soundscape into discrete sonic features (e.g., geophony, biophony, anthropophony) within the training dataset.
- Recomposing or synthesising new environments based on the user's selected parameters.
- Highlighting the ways in which climate data can shape or "tune" the sonic palette of a future environment.

By positioning the project within a speculative framework, the experience shifts from mere documentation of the present or past, to a creative audition of possible ecological futures.

3 Performance Notes

As an interactive installation, Synthetic Ornithology has no fixed beginning or ending. While active but not in use, the installation has two modes. Both modes show a popup on the screen inviting user interaction. One mode autonomously selects locations in Australia, chooses a date and time, along with suggested climate conditions, and generates the resulting soundscape and text from that scenario, repeating this until it is interrupted by the audience. The second mode, designed for presentations requiring a quieter version, is silent until the audience interacts with the interface.

3.1 General requirements

The installation is flexible and can be installed in a small room. A white walled gallery space is preferred, but not required. The space does not have to be totally enclosed, and can be as small as 2.5 * 2.5 m.

The installation requires two printed vinyl sheets to be applied to the walls. Where the walls are not white, posters can be printed instead. The suggested size for the prints is 80 cm × 140 cm, but these can be scaled up for larger spaces.

3.2 Technical requirements

The requirements for this installation are:

- 1 Multi-touch screen (22 inch or larger) wall mounted.
- 1 basic computer with audio output and wired internet (platform/OS is flexible, Core-i5 CPU or equivalent).
- 1 wired internet connection.
- 2 speakers, preferably wall mounted.

4 Media Links

The video link below shows a screen capture of the interactive process from the installation, including the audio output. As the audio is generated by the EAGLE model, its output is somewhat unpredictable and technically limitless. The audio link below connects to a webpage showing audio pairs of recorded and generated media using the same location, time and climate metadata. This highlights both the models capacity to generate accurate and believable soundscapes, as well as the unique variations it can create.

- Video: https://vimeo.com/1073767625/d9a3262810
- Audio https://fred-dev.github.io/Synthetic_ornithology_results/

5 Ethical Standards

This artistic research was undertaken as part of the authors' research at Deakin University, and supported by funding and research opportunities from within the organisation. All contributing work was granted ethical clearance where relevant (this only relates to an anonymous survey to evaluate generated audio). I am not aware of any conflicts of interest and no human or animal participants were harmed in the making of this work.

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References

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