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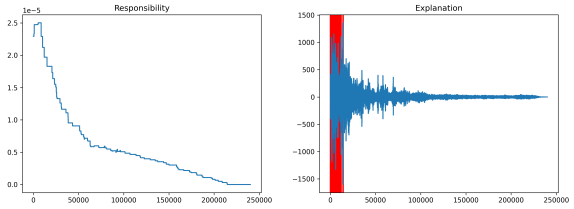
# Validating Few-shot Bird Vocalisation Detection through Causal Explanations

Nico García-Peguinho[1], David Kelly[2], Melane Navaratnarajah[2],
Hana Chockler[2] and Anna Xambó Sedó[1]
[1]Centre for Digital Music, Queen Mary University of London, UK, n.a.garcia-peguinho@qmul.ac.uk
[2]Department of Informatics/King's College London, UK




(a) Causal responsibility for "blues" (b) Contrastive explanation for "blues"
Figure 1: Removing frequencies in red causes misclassification to "classical" despite the signal retaining blues perceptual qualities, revealing the model's reliance on narrow feature sets.

***Index Terms*—** Bioacoustics, Explainable AI, Few-shot Learning, Causal Explanations, Biodiversity Monitoring

## I. INTRODUCTION

Biodiversity monitoring using deep learning on bioacoustic data is limited by sparse labeled data. Few-shot learning addresses this, but raises the question: *to what extent do these models learn meaningful acoustic features or exploit spurious patterns?* We investigate whether REX, a causal explainability method, can identify which acoustic features few-shot models rely on. We validate this on DCASE 2024 Task 5 bird vocalisations [1] before exploring Sensing the Forest natural recordings from Alice Holt forest, UK.

## II. REX

REX [2] is a tool for explainble AI (XAI) based on actual causality [3]. Unlike popular XAI tools such as LIME [4] or SHAP [5], which produce *saliency maps* measuring feature contribution, REX finds causal explanations by isolating input features required to reproduce the original classification. These isolated features are a *sufficient cause* for that classification. We adapt and apply REX to audio data for the first time. Figure 1 shows a preliminary example of our interpretability method applied to a genre classification model, highlighting the frequencies classified as "blues".

## III. SENSING THE FOREST

Sensing the Forest is a project exploring arts, science, and climate change. Two DIY, solar-powered, off-grid audio recorders [6] were deployed in Alice Holt forest to capture soundscape recordings over a year, aiming to support biodiversity monitoring and climate awareness through community science [7]. This motivates our need for interpretable, validated models before applying bird vocalisation detection to the Sensing the Forest dataset.

## IV. APPROACH

We will train prototypical networks on DCASE 2024 Task 5 BirdVox data using the official baseline system [8]. We will then apply REX to the trained model to identify minimal sufficient spectral-temporal features for bird event detection. Critically, we validate whether identified causal features align with established ornithological acoustic features, ensuring the model learns meaningful rather than spurious patterns.

## V. EXPECTED RESULTS & SIGNIFICANCE

We expect causal feature visualisations and audio examples revealing which frequency-time regions drive bird event detection. This represents the first application of REX to bio-acoustic event detection, providing an interpretable validation framework for few-shot models on bio-acoustic audio data.

## VI. ACKNOWLEDGMENTS

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