Machine learning model to monitor bird mannerisms (mating & alarm calls) using bird songs

# Abstract

This project proposes a machine learning model based on Convolutional Neural Networks (CNNs) to monitor bird mannerisms by identifying mating and alarm calls from bird songs. The model will be trained on a diverse dataset of labeled bird songs using transfer learning and data augmentation techniques to enhance its generalization across various species and acoustic environments. Successful implementation could enable autonomous audio recording devices to passively monitor bird populations, aiding ornithological research and wildlife conservation efforts. The study highlights the significance of interdisciplinary research in understanding and preserving avian biodiversity

# Introduction

Avian behavior and communication are integral components of ecological research, offering valuable insights into species interactions, breeding patterns, and environmental responses. Among the various aspects of bird behavior, the study of mating and alarm calls holds particular significance due to their critical roles in reproduction and survival. However, manual monitoring of bird mannerisms through field observation can be laborious, time-consuming, and often limited in scope.

In recent years, advances in machine learning, particularly Convolutional Neural Networks (CNNs), have demonstrated remarkable capabilities in audio classification tasks. In this context, this paper proposes a machine learning model utilizing CNNs to automatically detect and monitor bird mating and alarm calls from audio recordings of bird songs. By harnessing the power of AI, this research seeks to streamline avian behavior analysis and contribute to broader ornithological research and wildlife conservation efforts

# Back ground

As per sustainable development goal 15, “Life on land”, birds have a key part to play in the land eco-environment. Tracking their behaviors therefore would play an enormous role in preserving these species. This was the flash for this model. Through tracking their mating calls, ornithologists can be able to preserve the different species and through the alarm calls birds can be alarmed in case of any possible danger

We set the target audience as nature enthusiasts and ornithologists who would beneﬁt from a hands-on way to tell bird behavior merely by audible traits, as often in the wild it is difficult to identify bird behavior from songs of birds

This research uses supervised learning to fine tune an existing neural network to recognize bird sounds in order to identify bird behavior.

Note:

We only focused on two bird behaviors (alarm calls and mating calls)

**Rationale**

The rationale of using a Convolutional Neural Network (CNN) machine learning model in a project of bird behavior analysis using an audio dataset lies in the ability of CNNs to effectively extract features from spectrogram representations of audio data. Spectrograms are visual representations of the frequencies and their intensities over time, which are commonly used for audio signal processing tasks.

Ther fore Bird vocalizations can be thought of as a type of image, and CNNs can be used to identify patterns in these images. For example, CNNs can be used to identify the frequency, amplitude, and duration of bird vocalizations.

CNNs are efficient at processing images. This means that they can be used to analyze large audio datasets quickly and easily.

CNNs are accurate at classifying images. This means that they can be used to identify and classify bird behaviours basing on vocalizations with a high degree of accuracy.

In addition to these reasons, CNNs are also relatively easy to train. This means that they can be used to analyze bird behavior even if there is a limited amount of data available.

# Objectives of the model

1. To detect sound produced by birds during melting. Birds produce a chirping type of sound during melting. This is a generally happy sound to reassure other birds in its immediate flock, though if there is a raspy quality to the chirps, the bird may be getting stressed or upset.
2. To detect sound produced for protection. This is in form of alerting or alarm sound produced by birds in case of an external influence for example when they are attacked by the prey, the sound produced to alert or alarm other species is detected and recognized by the model. Birds produce screams type of noise when they detect danger and need protection.

# Dataset