Introduction:

Birds are a group of feathered, bipedal vertebrates endemic to all major landmasses. They play crucial roles in many ecosystems by eating smaller animals such as insects, serving as pollinators, and dispersing seeds; consequentially, their population and distribution has a significant impact in agriculture and nature conservation.

Problem:

Currently, the monitoring of bird population and distribution is done through a variety of ways, including bird banding where birds are captured, banded, and released, and through crowd sourced photography.[i] These methods are largely manual, are not suited for remote areas, and suffer from availability bias. Monitoring birds through optical or acoustic sensors is an ongoing area of research. Previous work has demonstrated the applicability of decision trees in this area, however, deep-learning based approaches offer a chance for improved accuracy.[ii]

Proposal:

This project will develop a small system with an acoustic sensor that can identify birds by their song. Audio data will be preprocessed and analyzed using traditional and deep learning methods. Information about the bird songs including frequency and duration will be gathered and used to analyze bird population and/or activity, a CNN-based vision model will be used to classify the bird species.

Commercial Application:

The proposed acoustic sensor system for bird monitoring offers substantial commercial opportunities across various sectors. First, in agriculture, this technology can aid in precise pest management by detecting specific bird species known for either controlling pest populations or being a significant agricultural pest themselves.

Secondly, the system has significant potential in the conservation and environmental management sectors. By providing accurate, real-time data on bird populations, it assists in the effective management of protected areas and wildlife reserves, informing conservation strategies and habitat preservation efforts.

Finally, the data collected in these sensors can be offered to researchers, governmental agencies, and non-profit organizations engaged in ecological studies and monitoring, providing a continuous stream of revenue.

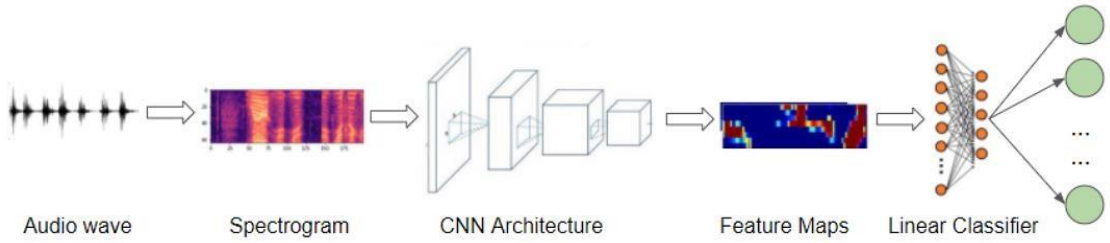
Methodology:

Datasets of birdsongs will be identified, collated, and used to train an audio sample classifier. Bird songs will focus on species relevant to the pacific northwest, with the potential to expand the scope to the entirety of the continental U.S. time and funding permitting.

https://www.kaggle.com/datasets/vinayshanbhag/bird-song-data-set

https://www.kaggle.com/c/birdsong-recognition

https://data.gov.au/dataset/ds-dga-1bcc5cc5-7f90-4542-bdc8-93898e8108e4/details



[i] M.R. Fuller et al . Raptor Survey Techniques. US Fish and Wildlife Service (1987)
[ii] Ueno Y. et al. EXPERIMENTAL SIMPLE JUDGMENT BETWEEN EXISTENCE AND NON-EXISTENCE AND EVALUATION OF BREEDING STAGE OF GOSHAWK USING SOUND ANALYSIS Journal of Japan Society of Civil Engineers Ser G (2017)