

Final Project

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1 INTRODUCTION

BIOLOGISTS have been aiming to understand bird migration for decades. Various custom hardware has been developed for doing this [1], however it is costly and requires capture and release of the bird. We are proposing the design, construction and deployment of a device that resides in a stationary location. This device is equipped with a microphone and microcontroller, and by using machine learning [2] [3] can detect and speciate various types of birds. The device will also be able to record various types of environmental data for cross-correlation with bird density in post processing. After the successful implementation we desire to make a time series bird density heat map.

completely stand alone. In addition it should have a wireless uplink/downlink to transmit data to and from a computer.

REFERENCES

- [1] Bird Tracking Hardware. <https://atstrack.com/animal-class/avian.aspx> [Accessed June 22, 2019]
- [2] Stowell, Wood, Pamua, Stylianou, Glotin "Automatic acoustic detection of birds through deep learning: the first Bird Audio Detection challenge" <https://arxiv.org/pdf/1807.05812.pdf>
- [3] Ilyas Potamitis, "Deep learning for detection of bird vocalisations" <https://arxiv.org/pdf/1609.08408.pdf>
- [4] CMSIS NN Software Library <https://www.keil.com/pack/doc/CMSIS/NN/html/index.html>

2 MACHINE LEARNING ON THE EDGE

Machine learning and AI have been popular topics in the last couple of years, especially the use of neural nets in classification algorithms. It has not been until recently that these applications have moved into edge compute, meaning processing has to be run on the device, rather than the cloud. We propose to design a NN (Neural Network) that can be run on a STM32 microcontroller. This is a rapidly expanding field and there are various software implementations [4].

3 HARDWARE

The hardware will need to be battery powered in order to collect data over extended periods of time. It should be inexpensive so it becomes feasible to deploy many devices and should be