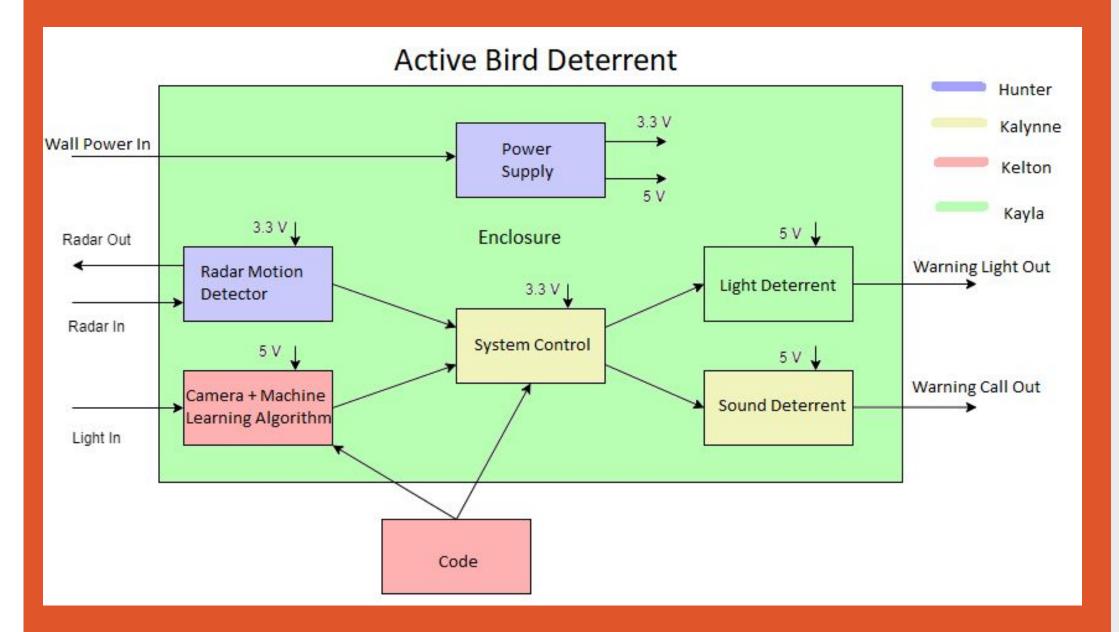# ENGINEERING REQUIREMENTS

The System will...

- *Accuracy:* Identify a bird flying and will not respond to something other than a bird flying at it.

- *Machine Learning Dataset:* Generate a dataset of at least 100 relevant original pictures of birds flying toward a camera and 500 total variations of those pictures (flipped, rotated, resized, mirrored, etc...) including the originals.

- *Effective:* Utilize deterrent methods proven to alter birds flight paths.

- *Marketability:* Be reported as something a user wants to buy after taking into account cost, usability, and setup.

- *Mountable & Compact:* Be smaller than 3600 cm3 and have an outdoor mounting mechanism.

- *Outdoors:* Operate in the temperature range of 0 to 100°F and not allow water to enter the enclosure.

- *Power Consumption:* Not exceed an average power consumption of 5W and will not draw more than 12W instantaneously.

- *Sensor Redundancy:* Detect and respond to motion when the camera is obstructed.

TOP LEVEL BLOCK DIAGRAM

ACTIVE BIRD DEFENSE
Putting an end to bird window collisions!

INTRODUCTION

The purpose of this device is to prevent bird-window collisions. When the device detects a bird flying towards a window, the device will alert the bird to allow it to change its flight path away. To accomplish this, the design utilizes two main sections, a sensors/detection section and a deterrents section.
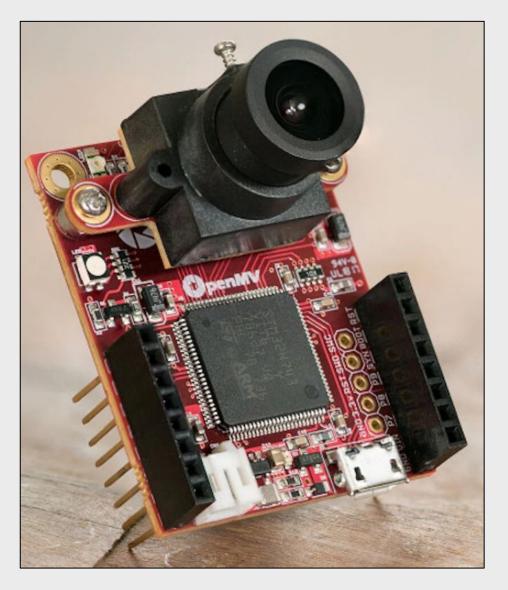
o To detect birds flying at the system, the system utilizes a doppler radar motion detector supported by a machine learning powered camera.

o To prevent birds from colliding with a window, the system utilizes a speaker that plays a bird warning call to signal the bird that there is danger nearby. It also utilizes a bright light to alert the bird to the location of the danger.

DETECTION: SENSOR DESIGN

MOTION SENSOR

The Motion Sensor PCB is designed around Infineon's BGT60LTR11AIP doppler radar MMIC. Its main purpose is to allow the radar chip to interface with the microcontroller.

o It does this by converting all voltages (signals and power) to and from 1.5V and 3.3V (for the sensor chip and microcontroller respectively).

OPENMV H7 CAMERA

The OpenMv H7 Camera module is used to detect a bird flying towards the system. If detected, it alerts the system to enable deterring methods to disrupt the bird's flight path away from the window.

To train the camera, we needed a database of images to train the camera to identify if an object is a bird. Our database contains various images of birds flying and various images without birds. Once the dataset was established, the platform Edge Impulse was used to compile an algorithm that the camera uses to distinguish birds from not birds.

DETERRENT DESIGN

AUDIO AMP AND SPEAKER

This PCB rests on the Control PCB and uses a LM386 audio amplifier to amplify signals sent from the microcontroller that drive the speaker.
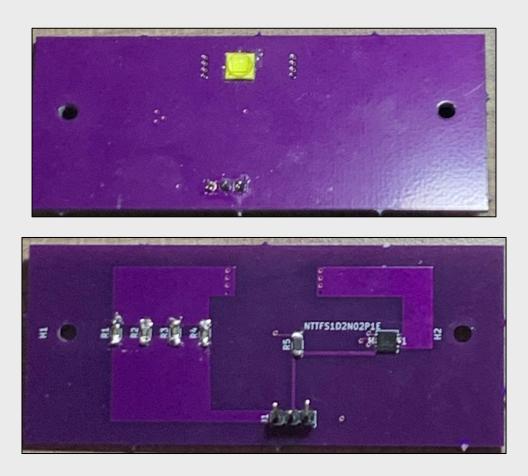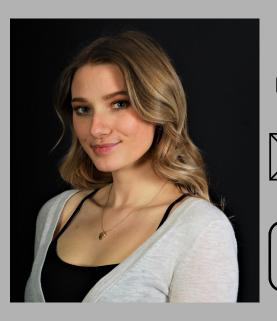
Strobe Light PCB

When the control light signal from the system control is received, the MV camera has detected the presence of a bird flying towards the device and it turns on the LED, helping aid in deterring birds away.

PROBLEM STATEMENT

Up to one billion birds die each year in the United States due to collisions with windows and research shows that 54-76 percent of window collisions are fatal.

Why: In daylight, birds see reflections of vegetation or see through the glass to potted plants or vegetation on the other side. At night, nocturnal migrants crash because they fly into lighted windows

PROJECT WEBSITE　　PROJECT GITHUB

THE TEAM

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ACTIVE BIRD DEFENSE
Ending Bird Window Collisions