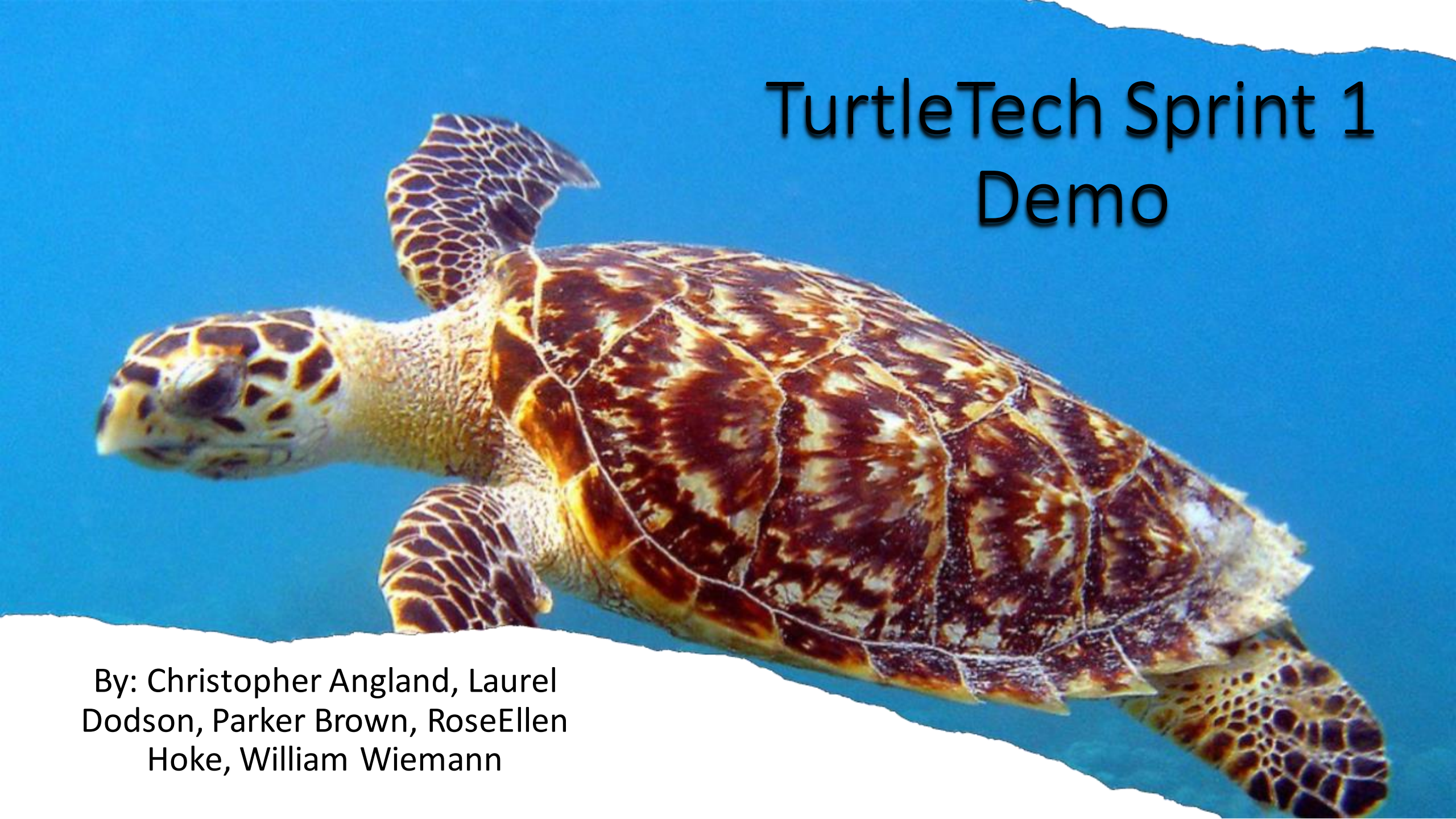
TurtleTech Sprint 1 Demo



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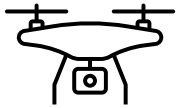
Goals of TurtleTech



Sprint 1

- Create first drafts of all documentation
- Get a basic understanding of the Nvidia Jetson Nano
- Power on the Jetson Nano and accomplish initial steps for communication.
- See a test flight

Sprint 2

- Improve the current neural network and by the end of the sprint have it deployed on the Nvidia Jetson Nano Dev kit for testing purposes

Sprint 3

- Produce a functioning neural network system on a Nvidia Jetson device that identifies aerial turtle images against non-turtle images in real-time.

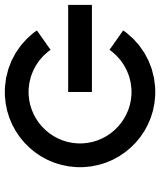
What have we done?

Documentation

Finished the first drafts of the documentation

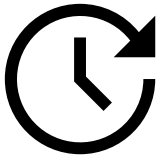
Understanding

Attended a test a flight to understand the big picture of this project



Performance

Powered on the Jeston, to gain an understanding on how the system works



Next Steps

Brainstormed ideas on how to improve and fix the overheating problems with the Jetson

Milestones

Test Flight

Attended a test flight at Ormond Beach with Northrop Grumman

Arial Photos

Received turtle photos from the drone

Nvidia Jetson

Received the Jetson device, powered it on and flashed the developer kit image onto the board

Benefit

TurtleTech provides researchers with sensor and data collection technology that affords them full insight into the sea turtle lifecycle from birth to maturity without disrupting habitat. This information will be vital to understanding risks to the population and useful in informing conservation policies.

PROBLEM DEFINITION

Currently, the TurtleTech drone and camera are able to capture pictures of the ocean and shoreline while in flight, but the system is unable to analyze the captured images, in order to identify turtles within the photos, and thus track turtle behaviors and migrations.

In order to resolve this problem, we are creating a neural network that will run on the Jetson Xavier board, deployed on the drone, and analyze captured images while in flight, to select probable turtles within the images.

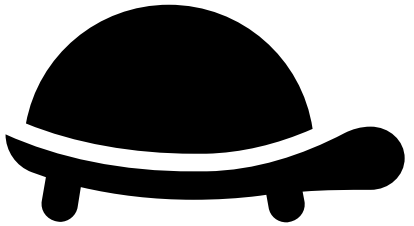
DESIGN CONSIDERATIONS AND CONSTRAINTS

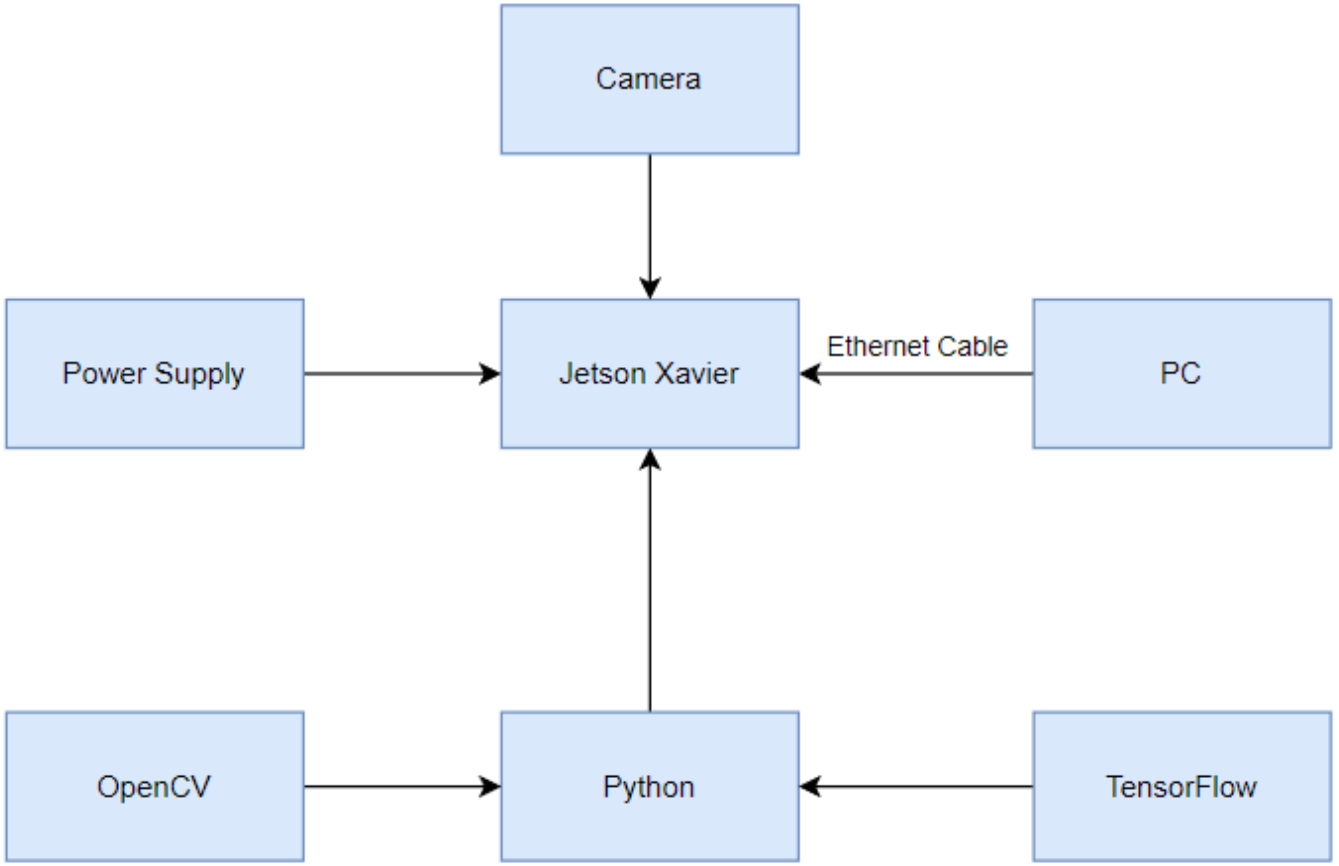
The jetson is stored in a secure environment and a password is needed to access Jetson data

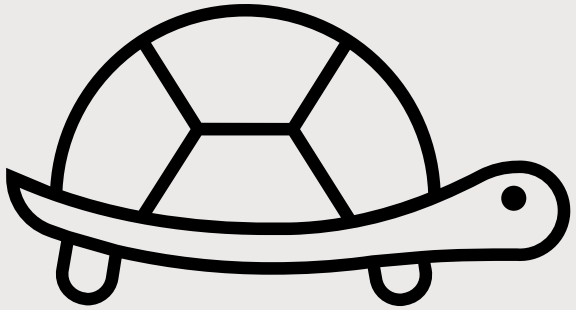
Low camera quality provides the image recognition software with obscure photos of turtles

Physical storage limits the number of photos that can be taken

SYSTEM ARCHITECTURE

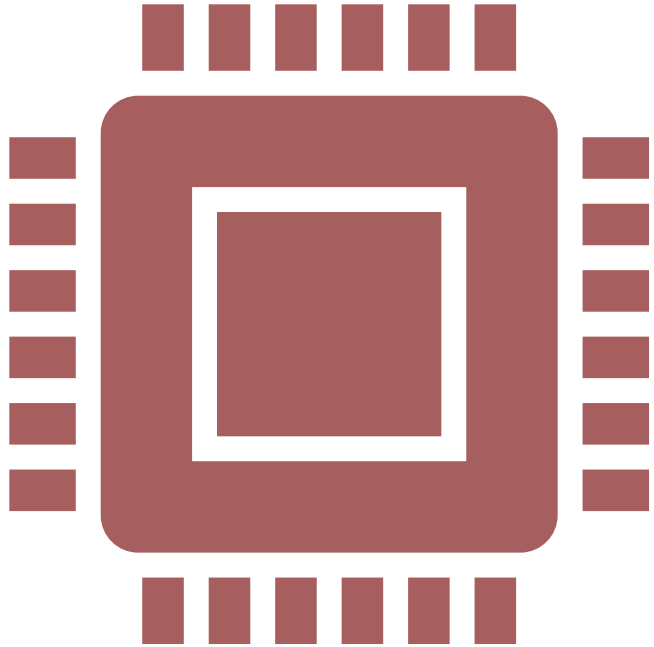






SUB-SYSTEM DESIGN

- Image files are embedded with timestamps
- OpenCV is used for real time image recognition
- TensorFlow is used for machine learning



CURRENT SOFTWARE

Main Software Tools:

Ubuntu	Currently we are using Nvidia Jetson Nano Dev with Python 3.6 to load the programs we write onto the Jetson board.
VS Code	We are using Python 3.8 as the primary coding language for creating the neural network, and ensuring backwards compatibility. This includes making use of image labelers and models of neural networks available on GitHub.
Jetson Nano Developer Kit	As with all teams, we will be posting our software on GitHub as well. This includes making use of image labelers and models of neural networks available on GitHub.
Tensor Flow 3.6	
labelImg	

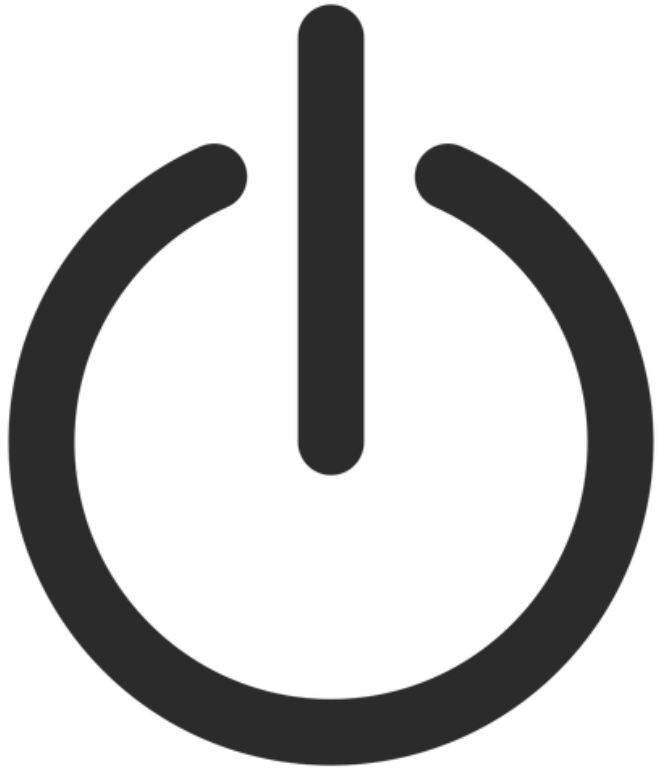
CURRENT ISSUES

- Payload Hardware issue – potential fix in progress

  Jetson processor shuts off after 15 mins

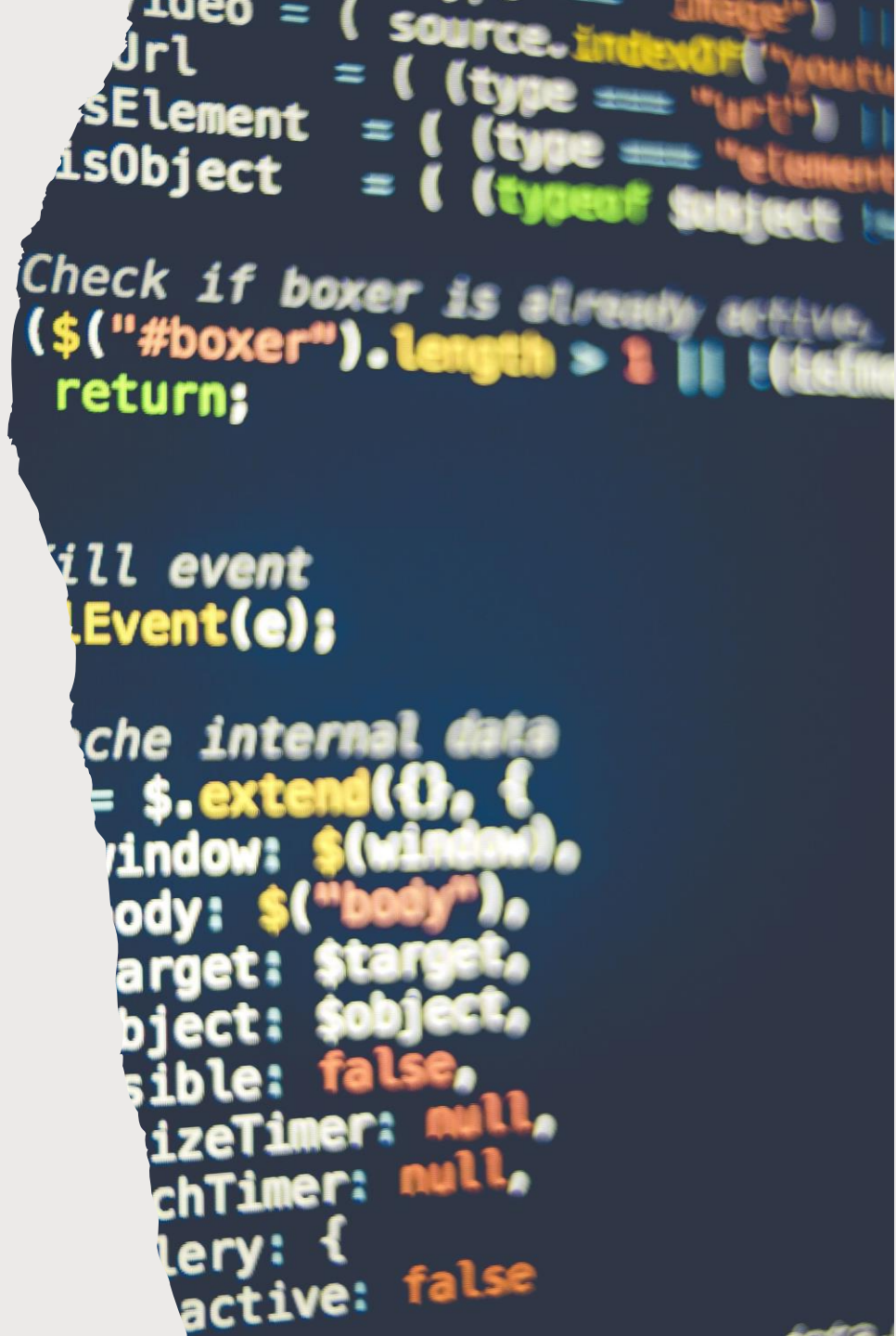
- Flight software issue (the aircraft is with the manufacturer currently)

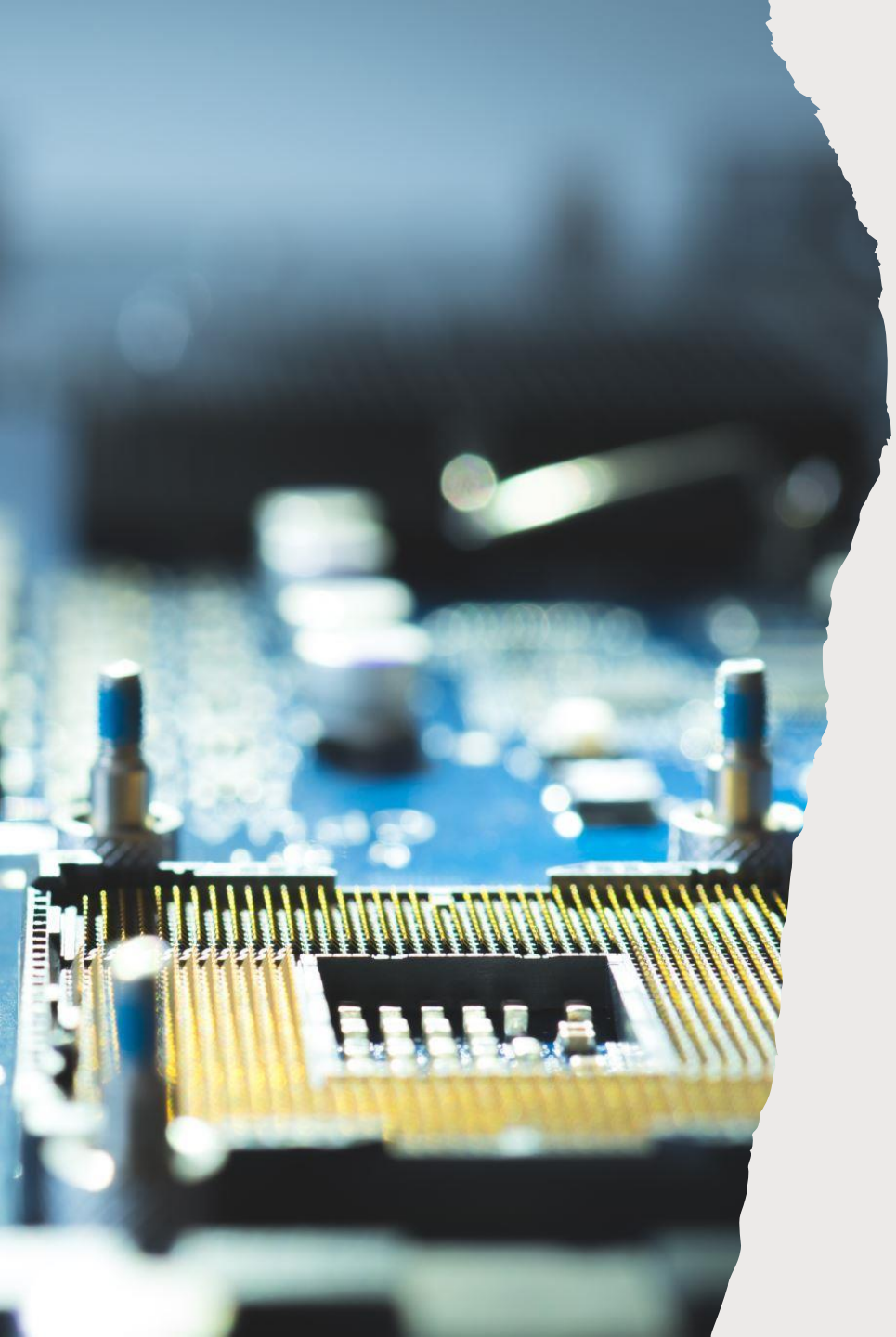
  Can't conduct test flights or get hands on with the aircraft or payload



LESSONS LEARNED(SOFTWARE)

- Flash the Nvidia Jetson Nano Dev using a micro-SD card using Etcher
- Labeled images using an image labeler (https://github.com/tzutalin/labelImg)
- Communicating from Host to Target system





LESSONS LEARNED (HARDWARE)

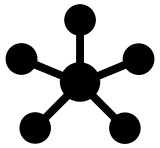
- Shutdown issues is (most likely) not thermal based
  - Test done in thermal worst-case scenario
- Test plan for Jetson voltage threshold is made
  - Part(s) required have been requested
- Variations in operational thresholds for Jetson testbed & flight jetson processor
  - Jetson testbed operates at 5V, the flight processor requires 12V.

TIMELINE

Sprint 1

- Complete Initial Documentation
- Power on the Jetson
- Accomplish initial steps for communicating with the Jetson
- Compiled all necessary tools to start working on the project

Sprint 2



- Get the Jetson to stop shutting off after 15 minutes
- Produce a functioning neural network on a small scale

Sprint 3

- Produce a functioning neural network system on a Nvidia Jetson device that identifies aerial turtle images against non-turtle images in real time.


QUESTIONS??