Drones for Humanity

2.0

Milestone Five

March 2020

By: Michael Mascari

Table of Contents

1 Team Information

1.1 Names and Emails of Project Members

Name	Email	Position
Michael Mascari	mmascari2017@my.fit.edu	Programmer (Computer Vision/AI)
Ballard Barker	bbarker2017@my.fit.edu	Project Manager/ Structures
Matthew Backert	mbackert2017@my.fit.edu	Systems Engineer
Nicholas Davis	davisn2017@my.fit.edu	Avionics/ Propulsion/ Aerodynamics
Brendan Sanders	bsanders2017@my.fit.edu	Production/ Structures
CJ Gagni	cgagni2019@my.fit.edu	Avionics
Justin Williams	justin2017@my.fit.edu	Propulsion
Hamdan Alblooshi	halblooshi2016@my.fit.edu	Propulsion

1.2 Faculty Advisor

The CS faculty advisor for the project is Dr. Debasis Mitra. dmitra@cs.fit.edu

1.2.1 Faculty Advisor Meeting Dates

- Saturday March 13th

1.3 Client

The client is the project team ourselves.

1.3.1 Client Meeting Dates

- Thursday, February 18th
- Thursday, February 25th
- Thursday, March 4th
- Thursday, March 11th

1.3.2 Client Feedback

- Client is very happy with all progress made. Client was not happy to find out that the provided camera does not interface with OpenCV as a way to get video feed into the neural network.

2 Project Details

2.1 Progress of Milestone 4

Task	Completion %	To do
1: Connect all physical components (Camera and Raspberry Pi)	100%	none
2: Set up data stream from camera to neural network	100%	none
3: Evaluation Results	N/A	There was confusion on what bureaucracy was needed for this milestone. Dr. Chan does not want Evaluation results this milestone.
4: GPS Signaling	N/A	Still waiting on the Aerospace team to be ready for this task
5: Senior Showcase Poster	100%	Still waiting on Aerospace contribution, but CS contribution is completely done.

2.2 Discussion of Tasks in Milestone 5

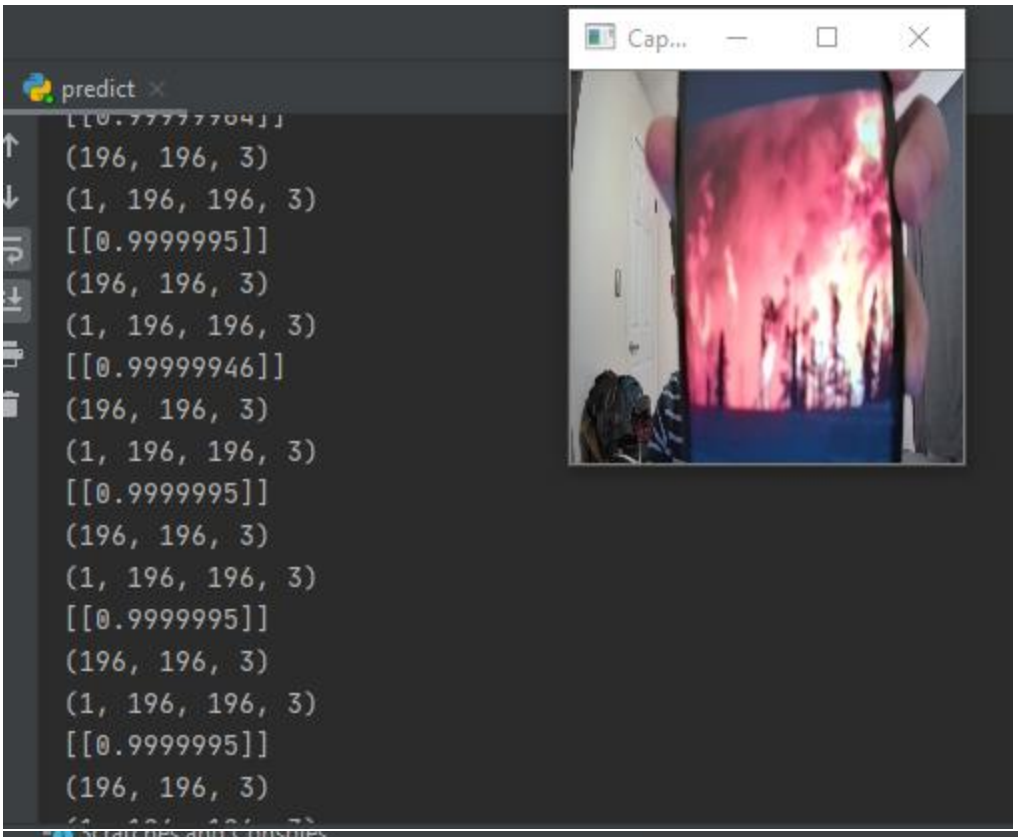
Task 1: Connect all physical components (Camera and Raspberry Pi)

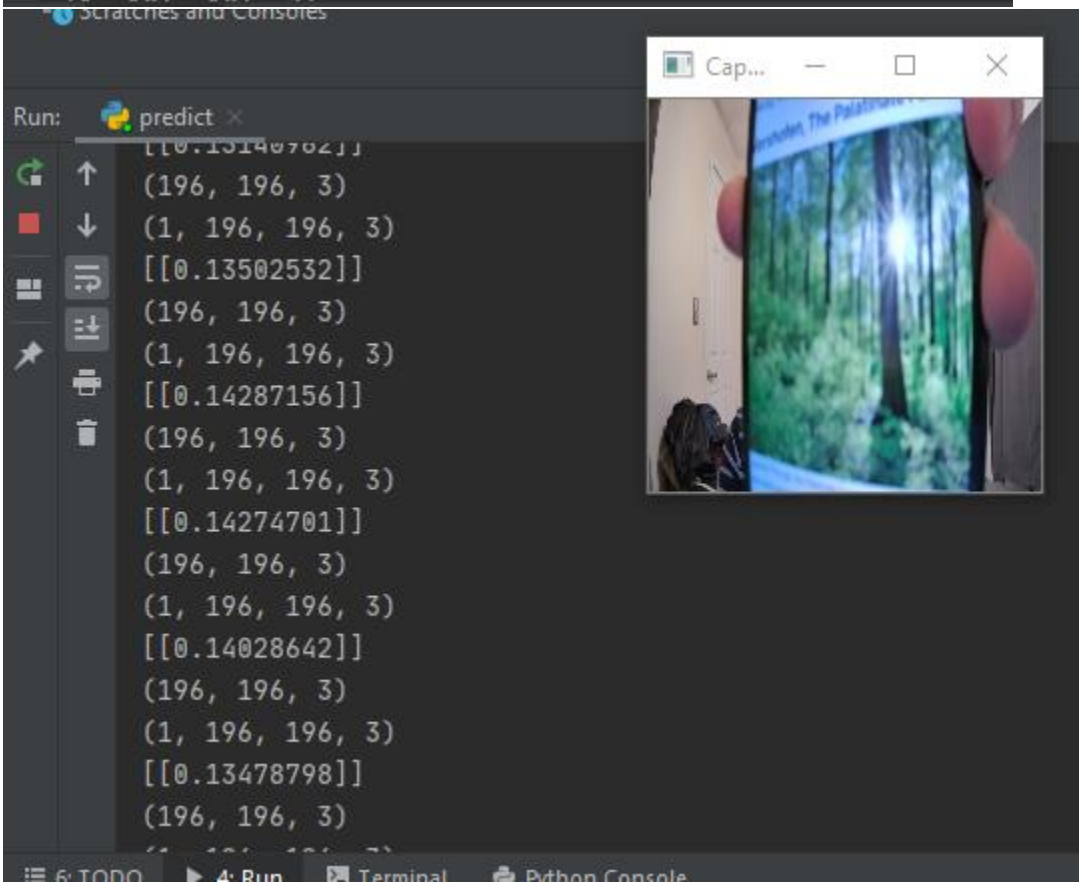
In an attempt to save on the precious computer specs of a Raspberry Pi, I compiled and saved the neural network as an h5 file so the datasets do not need to be loaded on the Pi and so the Pi does not need to compile the neural network itself.

The Raspberry Pi is fully functioning with NOOBS installed as the OS. PyCharm was also installed to run the neural network program in a virtual environment because OpenCV can be very fickle outside of environments.

Task 2: Set up data stream from camera to neural network

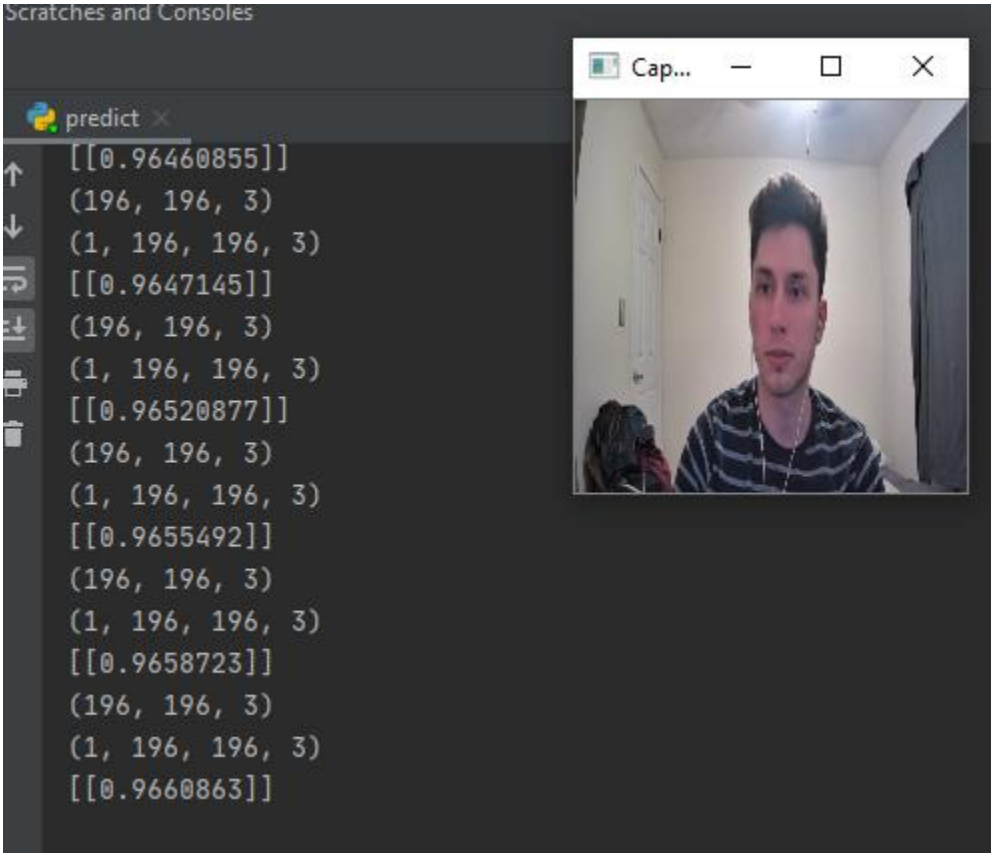
This task was pretty fun. The camera that was provided through funding (GoPro Hero 3) Does not behave like a webcam when interfacing with OpenCV. Despite a long time of research, no method was found to bridge this flaw. A replacement camera was found (make and model unknown) that works very well. Here are two photos of the camera being used to classify images the neural network has never seen. The closer the floating point number is to 1, the more confident the neural network is that it is looking at a forest fire:


predict
Cap...
(196, 196, 3)
(1, 196, 196, 3)
[[0.9999995]]
(196, 196, 3)
(1, 196, 196, 3)
[[0.99999946]]
(196, 196, 3)
(1, 196, 196, 3)
[[0.9999995]]
(196, 196, 3)
(1, 196, 196, 3)
[[0.9999995]]
(196, 196, 3)
(1, 196, 196, 3)
[[0.9999995]]
(196, 196, 3)


Run:
predict
Cap...
(196, 196, 3)
(1, 196, 196, 3)
[[0.13502532]]
(196, 196, 3)
(1, 196, 196, 3)
[[0.14287156]]
(196, 196, 3)
(1, 196, 196, 3)
[[0.14274701]]
(196, 196, 3)
(1, 196, 196, 3)
[[0.14028642]]
(196, 196, 3)
(1, 196, 196, 3)
[[0.13478798]]
(196, 196, 3)
6: TODO
4: Run
Terminal
Python Console

Task 3: Evaluation results

I know there is nothing to show as evidence for this task, but I did however change the overall way the program should be evaluated. After a conversation with an actual machine learning scientist that works for Vadum, it was brough to my attention how accuracy is not as important as functionality. If the neural network is optimized for accuracy, that can cause the drone to have many false negatives which is where it sees a fire but does not send a signal out to a firefighter because the drone did not think it saw a fire. Therefore, the neural network has been trained to have a bias toward fire to hopefully remove the possibility of a fire going undetected. This can be seen by a photo of myself being shown to the neural network and it classifies me as a fire. (the 0.96 value is how confident the neural network is that the image is a fire).



Task 4: Set up GPS Chip signaling

At the beginning of the project, the aerospace students told me that my last task would be “send the location of the drone to a ground user using the GPS chip” They did not tell me anything about something called GroundControlQ at that time, and now instead of doing some simple GPIO, I have to use an API which might not even work. I need them to send me the final details about how we are using this program before I can try to work with it.

Task 5: Create poster for senior design

Not much to say here. The poster is well under way. Just waiting for the aerospace students to finish.

2.3 Plan for Milestone 6

Task 1: Set up GPS signaling

Hopefully, aerospace team will be ready soon.

Task 2: Find Raspberry Pi limitations

Find if the Raspberry Pi is able to handle the full data stream for a prolonged period of time, if not find a way to decrease framerate of data stream.

Task 3: Bureaucratic responsibilities for senior showcase

Anything that Dr. Chan is asking for the completion of the project. Including but not limited to a poster, a demo, updated website, an e-book, evaluation results, and anything else.

3 Faculty Advisor Tasks

3.1 Faculty Advisor Feedback

Task 1:

Task 2:

Task 3:

Task 4:

Task 5:

Faculty Advisor Signature: _____ Date: _____

3.2 Student Grade and Advisor Signature

Faculty Advisor: detach and return this page to Dr. Chan (HC 214) or email the scores to pkc@cs.fit.edu

Score (0-10) for each member: circle a score (or circle two adjacent scores for .25 or write down a real number between 0 and 10)

Michael Mascari	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10

Faculty Advisor Signature: _____ Date: _____