

---

---

# Science Research Internship: Firefighting Drone Project

*University of Maryland Aerospace Engineering  
Department- Unmanned Vehicle Research  
laboratory*

Laura Canseco

---

---

## Metareasoning Project

- Swarming- group of UAVS that communicate with each other during flight under changing conditions
  - UAV- unmanned aerial vehicle
- Communication between multiple drones assigned to one task
- Testing different algorithms in changing communication levels

## Firefighting Drone Project

- Hardware setup of Metareasoning
- Establishing communication between two drones
- Implementing CBAA<sup>1</sup> Algorithm

---

<sup>1</sup>Brunet, Luc, Han-Lim Choi, and Jonathan How. "Consensus-based auction approaches for decentralized task assignment." *AIAA guidance, navigation and control conference and exhibit*. 2008.

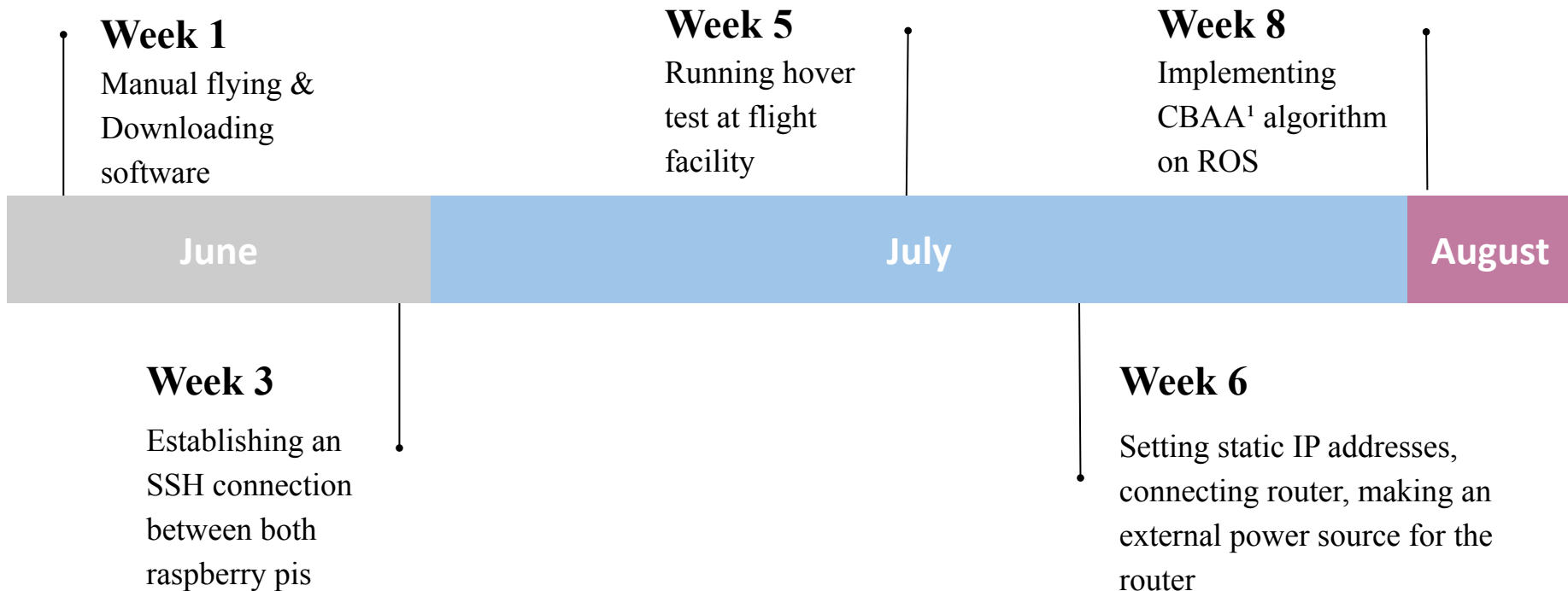
# My Role

- Figuring out how to connect the drones and run python scripts on them
- Run flight testing
- Maintenance of Drones and Materials
- Use Robot Operating System (ROS) to run the CBAA<sup>1</sup> algorithm on drones
- Attend meetings for the Metareasoning Project and and take notes

---

<sup>1</sup>Brunet, Luc, Han-Lim Choi, and Jonathan How. "Consensus-based auction approaches for decentralized task assignment." *AIAA guidance, navigation and control conference and exhibit*. 2008.

# Chronology of Internship

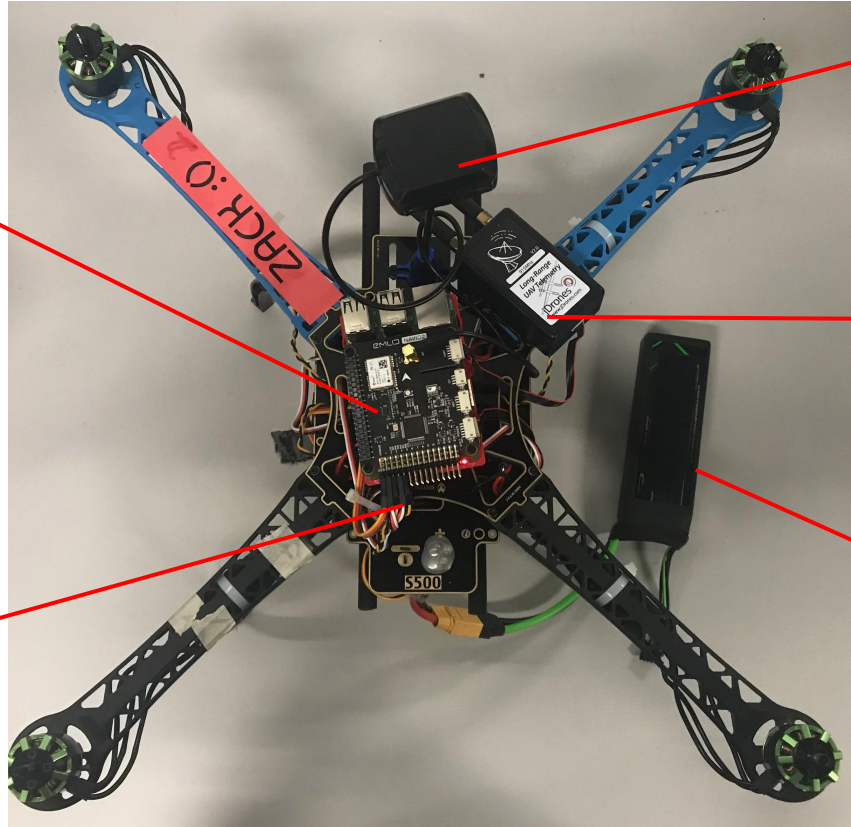


<sup>1</sup>Brunet, Luc, Han-Lim Choi, and Jonathan How. "Consensus-based auction approaches for decentralized task assignment." *AIAA guidance, navigation and control conference and exhibit*. 2008.

# Drone Specs

Raspberry Pi 3  
B+ and Navio2  
autopilot  
controller

Onboard wifi for  
interdrone  
communication



GPS

Telemetry radio for  
GCS (Ground Control  
Station)

4 cell lipo battery

# Procedures Learned

1. Preparing drones for flight
2. Running python scripts on drones and sending messages
3. Using ROS to run CBAA
4. Flying drones manually
5. Battery Charging and Storage
6. Calibrating Drones on Mission Planner

```
lauracanseco — ssh pi@192.168.1.6 — 91x34
Last login: Thu Jul 25 11:16:48 on ttys000
sh(base) Lauras-Air:~ lauracanseco$ ssh pi@192.168.1.6
pi@192.168.1.6's password: 
```

```
Last login: Thu Jul 25 11:16:48 on ttys000
sh(base) Lauras-Air:~ lauracanseco$ ssh pi@192.168.1.6
pi@192.168.1.6's password:
Linux Cody 4.14.95-emlid-v7+ #1 SMP PREEMPT Mon Feb 4 15:59:56 MSK 2019 armv7l

# # # # # ## #####
## # # # # # # # #
# # # # # # # # #
# # # # # # # # #
# # # # # # # # #
# # # # # # # # #
# # # # # # # # #
# # # # # # # # #
# # # # # # # # #
# # # # # # # # #

STEP 1:
Choose your vehicle and ArduPilot version using emlidtool
(Please, read carefully all options and select appropriate one for either Navio 2 or Navio+)
- sudo emlidtool ardupilot

STEP 2:
Set your GCS IP
- sudo nano /etc/default/ardupilot
- sudo nano /etc/default/arduplane
- sudo nano /etc/default/ardurover
- sudo nano /etc/default/ardusub

STEP 3:
Reload configuration by issuing these commands
- sudo systemctl daemon-reload

Launch, and enable on boot
- sudo emlidtool ardupilot

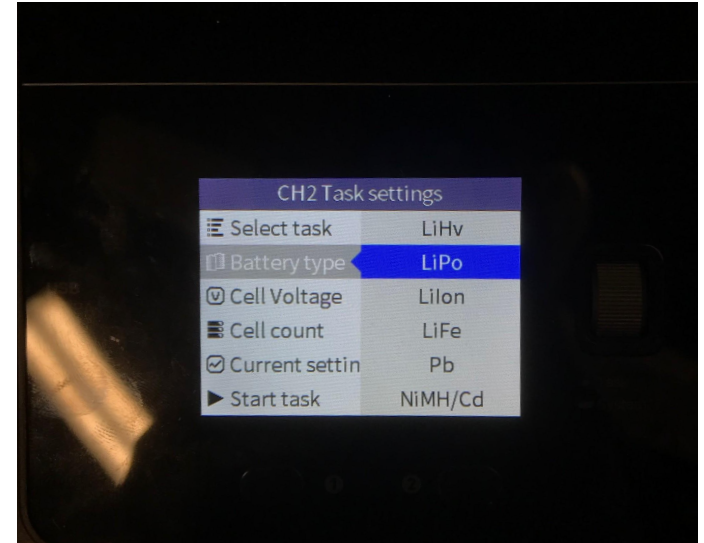
IMPORTANT:

To show this message one more time type "sudo emlidtool ardupilot help"

* Documentation: https://docs.emlid.com/
Last login: Tue Jul 16 13:14:29 2019 from 192.168.1.104
pi@Cody:~$ 
```

# Mistakes I Made

1. Soldering on the wrong part of a wire twice
2. Charging the battery on “lipo high” not “lipo” → led to swelling
3. Accidentally ripping off a wire on the battery connector
4. Crashing an autonomous drone into a moving car (My team and I’s mistake)
5. Accidentally cutting my fingers on the props



# Lessons I Learned

- Ask QUESTIONS
- Communicating well with your labmates
- Being patient when something doesn't work out
- Don't be afraid to drop an idea for a new one
- Being confident in my own abilities



# Acknowledgements

Thank you

1. Dr. Huan Xu
2. Sharan Nayak
3. Dr. Krug
4. Mr. Lee