

Counter-Detection System for UAV Airspace

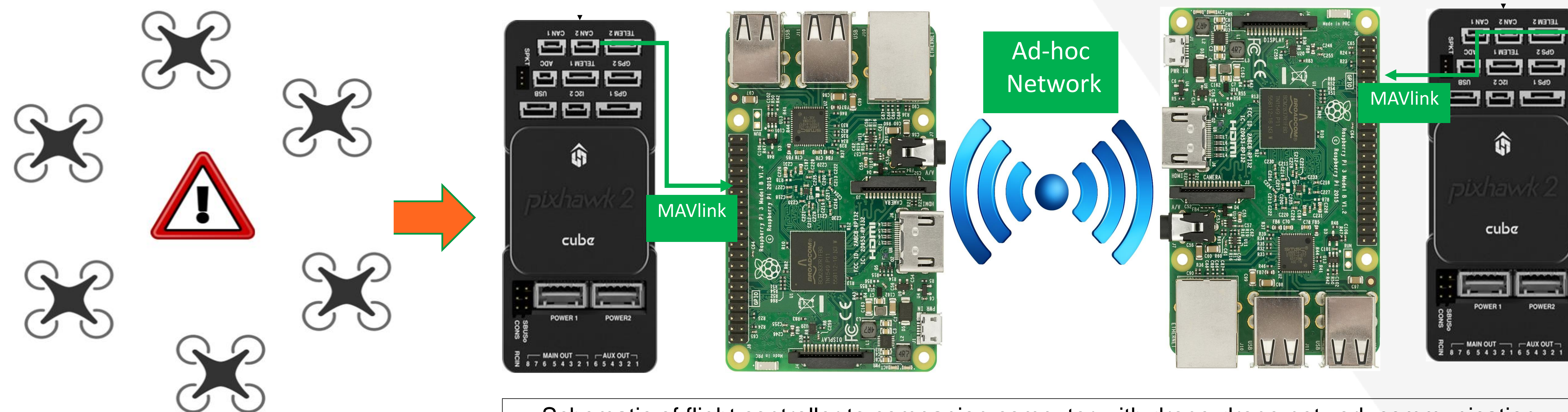
to Provide Counter-Autonomy

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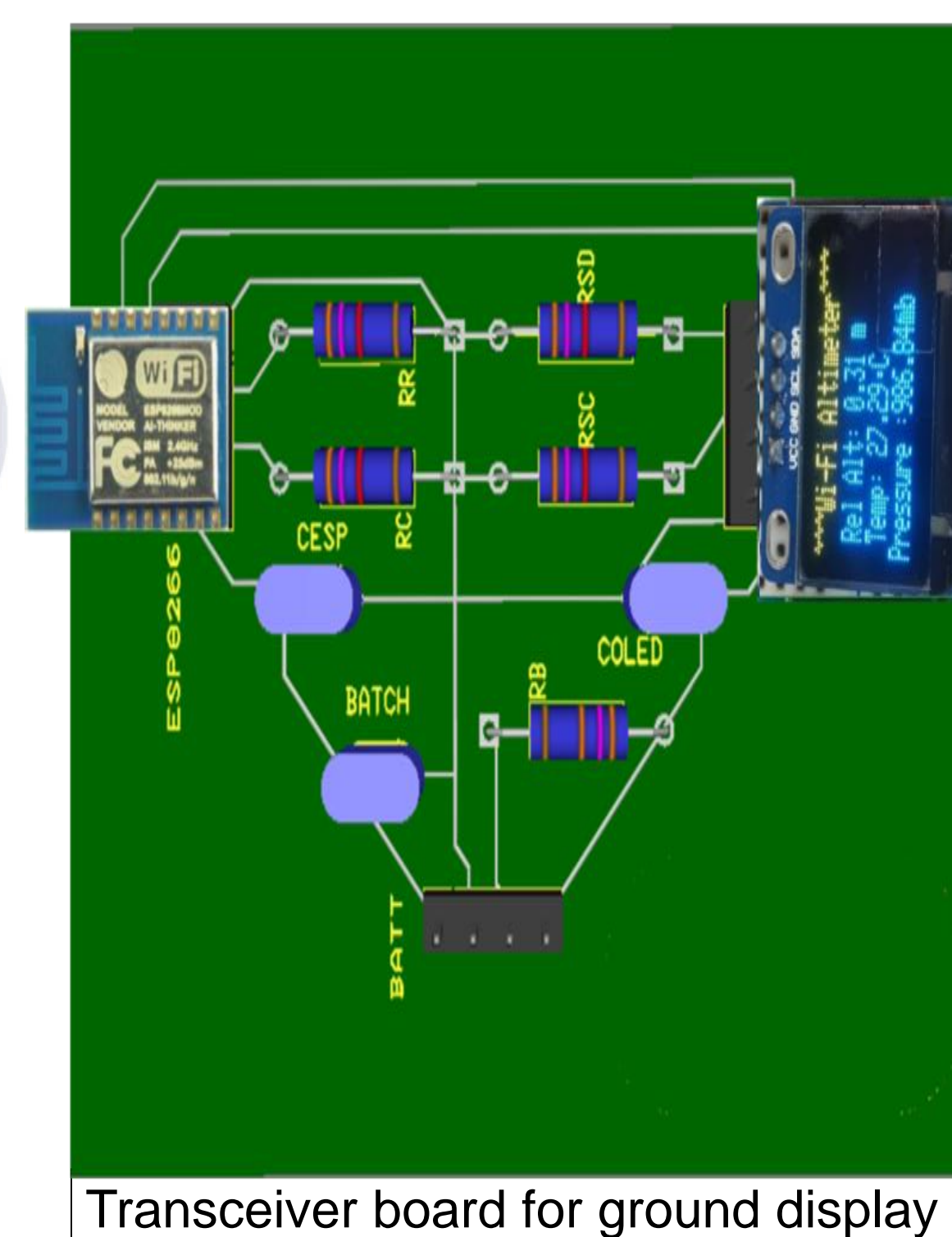
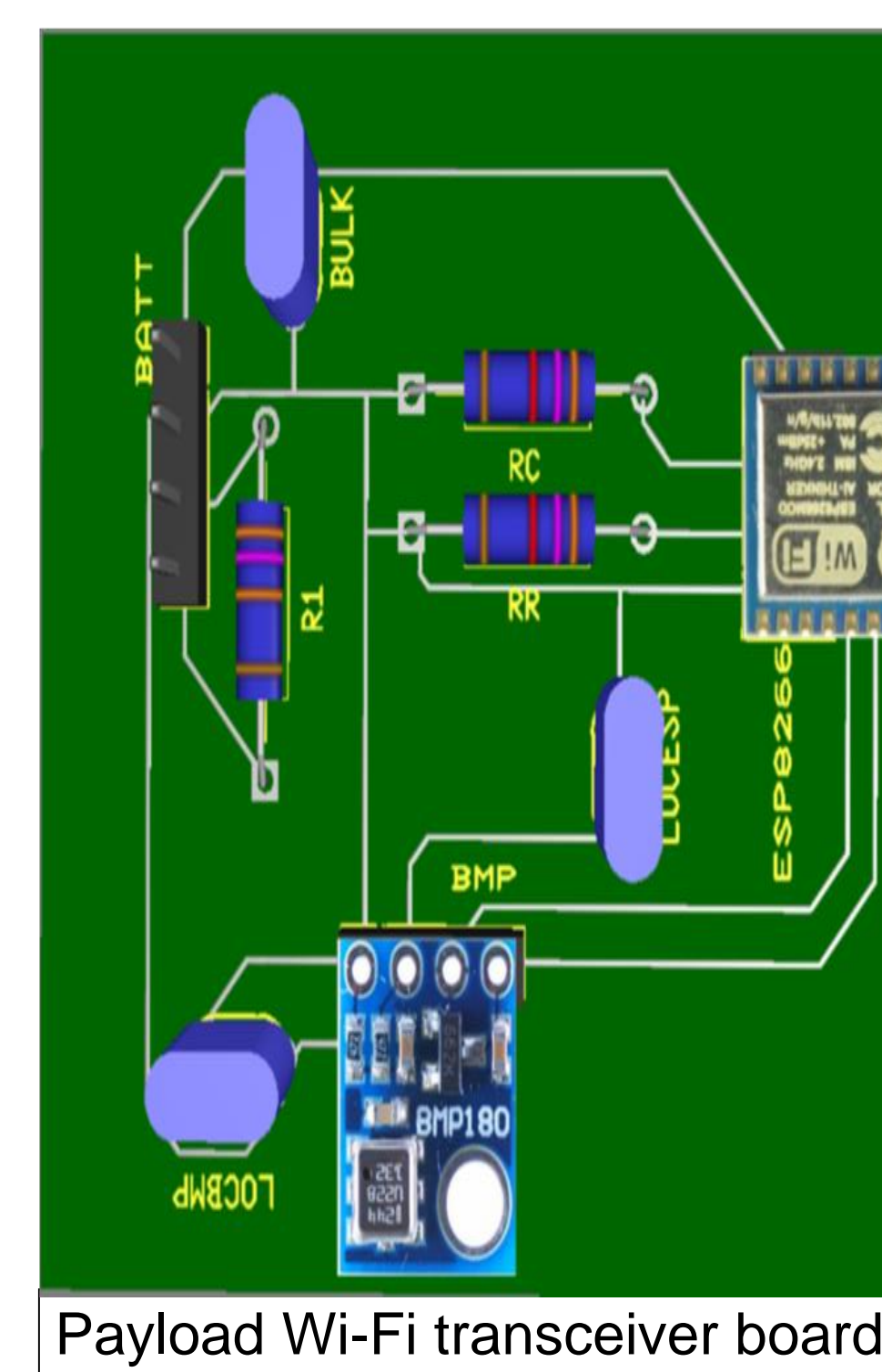
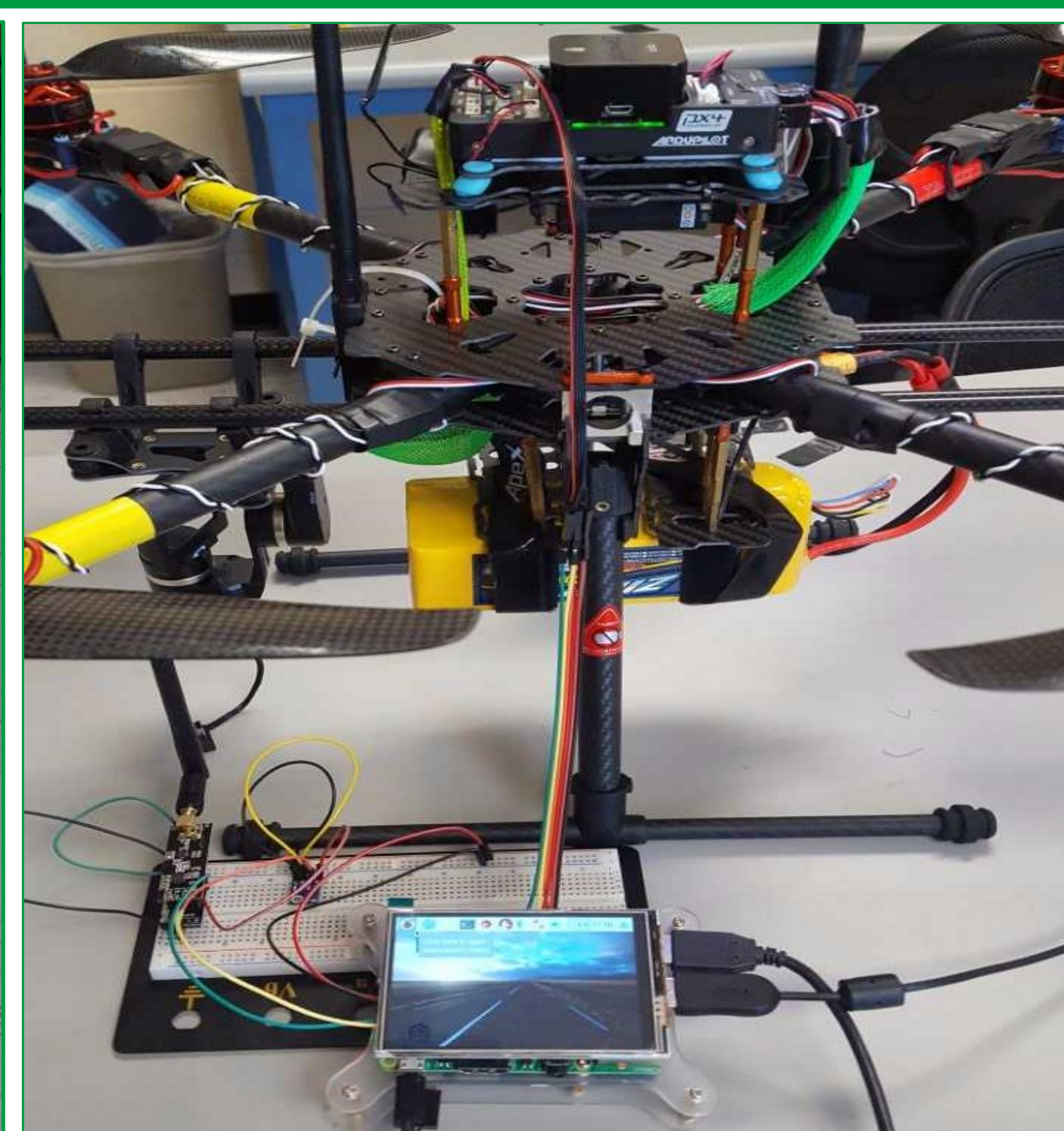
Project Synopsis

- **Rockwell Collins (2017-2018) P.I: Dr. Prakash Ranganathan**
- Goal 1.** Focus on the development hardware and software necessary to deploy autonomous fleets of Unmanned Aerial Vehicles (UAVs). Specific focus given to the purpose of counter-autonomous security and detection. This is achieved through development swarm technology providing dynamic geo-fencing using ad-hoc drone-drone communication networks.
- Goal 2.** Develop heterogeneous sensor based artificial intelligence for rogue drone detection. Will require development of ground based sensors, UAV payload sensors, and conglomeration of sensor data to the appropriate training of artificial intelligence algorithms.
- Goal 3.** Establish the role of UND Electrical Engineering research capabilities and form strategic partnerships with UAV and autonomous systems industries.



Schematic of flight controller to companion computer with drone-drone network communication

Implementation Test Bed



Hardware

- Tarot 650 custom quadcopter builds
- Pixhawk 2.1 w/ Intel Edison processor
 - Open source APM/PX4 flight stack
 - Associated sensors/telemetry
 - HERE GNSS
- DJI Matrice 100 + SDK
- Scansweep Lidar systems
- Raspberry Pi companion computers
- Long range communication components
- Custom PCB designs (payload and GCS)

Future Directions

- Data security and encryption for secure swarm data transmission
- Big data analysis, machine learning, and data stream processing
- Counter-drone detection schemes
 - Hardware and Software development
- UAS payload hardware and software
 - Heterogeneous payload sensor AI
- Deployable distributed autonomy
- Industrial applications of distributed UAV autonomous systems
 - Drone package delivery, agriculture, defense, infrastructure security
- Cellular command/control of UAV swarm

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