Jack Defay

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EDUCATION

Princeton University: Incoming PhD student in Computer Science

Cornell University: B.S. Electrical and Computer Engineering May 2022. **GPA 3.8**
Relevant Coursework:

- Nanotechnology, Microelectronics, Probability and Inference, Power Electronics, Operating Systems, Machine Learning, Design with Microcontrollers, Foundations of Robotics, Network Systems, Fast Robots

RELEVANT EXPERIENCES

Collective Embodied Intelligence (CEI) Lab, Cornell University (avg 15 hrs/week) **Jan 2020 - Present**

- Worked under Dr. Kirstin Petersen and Dr. Jake Peters studying the swarm intelligence of honeybees and robotic applications of these strategies. Developed a 2D flow sensor.
- https://cei.ece.cornell.edu/

Reality Robotics Lab (RRL), Dartmouth College (40 hrs/week) **May 2021 - Aug 2021**

- Worked under Dr. Alberto Quattrini Li on graph-based coordination strategies for multirobot exploration.
- https://rlab.cs.dartmouth.edu/home/

Design with Microcontrollers Teaching Assistant, Cornell University (7 hrs/week) **Aug 2021 - Dec 2021**

- Grade lab reports and assist teaching labs by helping students debug hardware and software.
- https://people.ece.cornell.edu/land/courses/ece4760/

Rapid Prototyping Lab Technician (5hr/week) **Feb 2019 - May 2021**

- Serviced and operated 11 3D printers, 2 laser cutters and a CNC router for project teams and research groups.

Cornell University Unmanned Air Systems, Electrical Subteam (10 hrs/week) **Oct 2018 - Dec 2020**

- Designed, prototyped and programmed circuit boards for onboard systems, especially the power distribution board and unmanned ground vehicle.
- Co-lead Aug 2019 - June 2020. Was the final say on if the plane was electrically ready for flight.

ENGINEERING PROJECTS

Photogrammetry Scanning Museum Artifacts **Jan 2022 - May 2022**

- Used open source photogrammetry software to 3D scan museum artifacts with household equipment.
- Created 3 high resolution 360 3D scans and full scale 3D printed replicas of the artifacts for the Cornell Archeology department and Johnson Museum.

Advanced Microcontrollers Final Project **May 2022**

- Worked in team of 3 to create real time anaglyph 3D (retro red-blue 3D) video stream with accompanying depth map.
- Wrote bulk of the code in Verilog with a user interface in C and documented with a website.

RRL Multirobot Exploration **June 2021 - Aug 2021**

- Wrote graph-based multirobot exploration algorithm in ROS and simulated it on a realistic 2D simulator called Stage.
- Applied rendezvous strategies to reduce inefficiencies in exploration and make the algorithm more robust to different types of environments.

CEI Lab Thermistor Flow Sensor V2 and Array **Aug 2020 - Sept 2020**

- Continued work towards our goal of observing the scent-fanning behavior of a swarm of honeybees. Developed an array of 1D flow sensors focusing on deployability in the field to gather data during limited field season
- Iterated on design of original sensor towards original goal of 2D surface flow sensing.
- Collected data and learned how to run honeybee experiments at Liddell Field Station in preparation for the following summer.

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CEI Lab Thermistor Flow Sensor V1 **Feb 2020 - July 2020**

- Developed thermal surface flow sensor to measure the airflow generated by a swarm of honeybees.
- Presented work at the LSAMP & ESMI Symposium at Cornell.

Cuair Power Distribution Board **Dec 2019 - May 2020**

- Evaluated new power requirements of subsystems on large fully autonomous RC aircraft. Discussed requirements with team members across mechanical and software teams.
- Designed PCB power distribution board (PDB) to step down power from 2 onboard batteries to various levels for different subsystems. Included hot swap controller and input protections.

Liv: Wearable Health Assistant **Feb 2020**

- Semifinalists in the annual Cornell University Makeathon on a team of five.
- Led the electrical design of our wrist mounted IoT device with integrated LCD display, speaker, GPS, rechargeable battery and wifi interface. Pairs with personal profile on web server and sends alert SMS messages along with GPS location and critical health information to preset caregivers and emergency services.

TECHNICAL SKILLS

- Programming: C, Java, Python, Matlab, ROS, Assembly, HTML
- Microcontrollers: Arduino, Raspberry Pi, Atmel, ARM, PIC32, FPGA
- CAD: Solidworks, Altium, CorelDraw, Blender
- Rapid Prototyping: 3D Printing, Laser Cutting, Machining, Soldering

AWARDS

- Gordon Wu Fellowship Feb 2022
- Nominated for CRA Outstanding Undergraduate Researcher Award, 1 of 4 nominated by Cornell Oct 2021
- Dartmouth Academic Summer Undergraduate Research Experience (ASURE) Summer REU June 2021
- Cornell Louis Stokes Alliance for Minority Participation (LSAMP) Summer REU June 2020
- Placed 2nd in Massachusetts State Science and Engineering Fair (MSSEF) and received Distrigas company science award of excellence, 2018 secondary school administrators award, 2018 Edward T. Liston award Apr 2018
- Wentworth Institute of Technology scholarship from MSSEF Apr 2017

PUBLICATIONS

- *"A Customizable, Low-Cost Alternative for Distributed 2D Flow Sensing in Swarms"* - Springer: Artificial Life and Robotics

CONFERENCES PRESENTATIONS

- DARS-SWARM 2021 held virtually from Kyoto, Japan June 2021
- The Leadership Alliance VLANS 2021 July 2021
- LSAMP-ESMI Virtual Symposium Aug 2022

PRESS

- 3D scanning project featured in CNN, Nature, and the Smithsonian. May 2022

REFERENCES

- Dr. Kirstin Petersen, Assistant Professor, Electrical and Computer Engineering, College of Engineering, Cornell University, kirstin@cornell.edu, +1 607-280-1138
- Dr. Hunter Adams, Lecturer, Electrical and Computer Engineering, College of Engineering, Cornell University, vha3@cornell.edu, +1 717-304-0047