Jack Defay

jd6058@princeton.edu

EDUCATION

Princeton University: 2nd year MSE Computer Science. Expected Graduation May 2024. **GPA 3.8**
Relevant Coursework:

- Collective Control of Multiagent Systems, Advanced Computer Networks, Computer Vision

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

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

RELEVANT EXPERIENCES

Princeton Visual AI Lab **Sept 2023 - Present**

- Worked under Prof. Jia Deng to build a benchmark dataset for relative 6D pose estimation of multiple unknown objects.
- https://pvl.cs.princeton.edu/

Self Organizing Systems Research Group **Sept 2022 - Sept 2023**

- Worked under Prof. Radhika Nagpal to build a school of robot fish which collectively sense and move with purely implicit, visual, underwater communication.
- https://ssr.seas.harvard.edu/

Collective Embodied Intelligence (CEI) Lab, Cornell University **Jan 2020 - Aug 2022**

- Worked under Prof. 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/

Design with Microcontrollers Teaching Assistant, Cornell University **Aug 2021 - Dec 2021**

- Grade lab reports and assist teaching labs by helping students debug hardware and software errors.

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.
- https://cornellrpl.wixsite.com/cornellrpl

Cornell University Unmanned Air Systems, Electrical Subteam **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.

CEI Lab Honey Bee Tracking **May 2022 - Aug 2022**

- Designed experiment to validate the design of a solar powered microchip “honeybee backpack” used to record bulk trajectory data of honeybee foraging. Led team to carry out 3 week field experiment and collected about 300 honeybee trajectories for analysis.

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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 **Feb 2020 - Sept 2020**

- Developed thermal surface flow sensor with the 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.

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.

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

- Princeton Gordon Wu Fellowship in Engineering Feb 2022
- Nominated for CRA Outstanding Undergraduate Researcher Award Oct 2021
- Dartmouth Academic Summer Undergraduate Research Experience (ASURE) 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 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
- *"Characterization of the Design Space of Collective Braitenberg Vehicles"* - DARS 2022 conference proceedings

CONFERENCES PRESENTATIONS

- DARS 2022 Nov 2022
- DARS-SWARM 2021 June 2021
- The Leadership Alliance VLANS 2021 July 2021
- LSAMP-ESMI Symposium Aug 2022

PRESS

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