

Levi Burner — Ph.D. Student

University of Maryland, College Park, MD

✉ lburner@umd.edu • Google Scholar

Education

University of Maryland

Ph.D. in Electrical and Computer Engineering, GPA: 3.97/4.0
Certificate in Computation and Mathematics for Biological Networks

Advisors: Prof. Yiannis Aloimonos and Dr. Cornelia Fermüller

Selected Coursework: Adaptive, Stochastic, Nonlinear, and Optimal Control; Statistical Pattern Recognition; Random Processes; Computational and Mathematical Analysis for Networks Across Scales

College Park, MD

2019–Present

2020–2022

University of Pittsburgh

B.S. in Electrical Engineering, GPA: 3.82/4.0
Concentration in Communications and Signal Processing

Selected Coursework: Linear Control Systems; Image Processing; Analog and Digital Communications; Intro to Theoretical Math; Honors Linear Algebra

Pittsburgh, PA

2014–2018

Honors and Awards

- **Maryland Robotics Center Graduate Research Assistantship** University of Maryland, Summer 2023 - Spring 2023
- **Google Open Source Peer Bonus for contributions to MuJoCo** Google, April 2023
- **Outstanding Teaching Assistant Award** University of Maryland, ECE, Fall 2022 - Spring 2023
- **Future Faculty Fellow** University of Maryland, Spring 2023–Present
- **Computation and Mathematics for Biological Networks Fellow** University of Maryland, Fall 2020–Spring 2022
- **Dean's Fellowship** University of Maryland, Fall 2019–Spring 2020
- **Outstanding Graduate in Electrical Engineering** University of Pittsburgh, Fall 2018
- **Swanson School of Engineering Dean's List** University of Pittsburgh, Fall 2015–Fall 2018
- **Most Points, Best System Design, Best Technical Paper** IARC American Venue, Georgia Tech, 2018
- **3rd place in ECE Senior Design** Swanson School of Engineering Design Expo, Spring 2018
- **Most Points, Best System Design** IARC American Venue, Georgia Tech, 2017

Research Interests

Perception and Robotics Group

Control Theoretic Computer Vision Algorithms for the Adaptive, Robust Control of Robotic Systems

University of Maryland

Current Projects:

- Robust Flight Through Moving Gaps using Time-to-Contact
- Independent Motion Estimation using the Curvature of Intensity Gradient Manifolds
- Adaptive Visual Inertial Estimation of Object Pose without Photometric Matching
- EVIMO3: An Event Camera Dataset with Independently Moving Objects Propelled by Humans

Publications and Technical Reports

Burner, L., Sanket, N. J., Fermüller, C., and Aloimonos, Y. (Sep. 2022). **TTCDist: Fast Distance Estimation From an Active Monocular Camera Using Time-to-Contact**, *Accepted to ICRA 2023*. [Link](#)

Burner, L., Mitrokhin, A., Fermüller, C., and Aloimonos, Y. (May, 2022). **EVIMO2: An Event Camera Dataset for Motion Segmentation, Optical Flow, Structure from Motion, and Visual Inertial Odometry in Indoor Scenes with Monocular or Stereo Algorithms**, *ArXiv Technical Report*. [Link](#)

Burner, L., (December, 2021). **On Continuous Time Lucas-Kanade Tracking using Lessons from Adaptive Control**, *ENEE765: Adaptive Control Semester Project* [Link](#)

Burner, L., (December, 2020). **Optimal Stochastic Control of Linear systems Driven by Neural Dynamics**, *ENEE762: Stochastic Control Semester Project* [Link](#)

Miller, A., Burner, L., Becker, E., Misra, R., Saba, A., and Berti, L. (2018). **A Novel UAV for Interaction with Moving Targets in an Indoor Environment**. *IARC Symposium on Indoor Flight Issues*. [Link](#) (Won Best Technical Paper)

Burner, L., and Sharma, N. (2018). **A Wearable Sensing System to Estimate Lower Limb State for Drop Foot Correction**. *Ingenium: Undergraduate Research at the Swanson School of Engineering*, 16-20. [Link](#)

Miller, A., and Burner, L. (2017). **Aerial Robot Design for Ground Robot Interaction and Navigation without Landmarks**. *IARC Symposium on Indoor Flight Issues*. [Link](#)

Presentations

The Advantages of a Control Theoretic Approach to Monocular Computer Vision <i>Maryland Robotics Center Student Seminar</i> Levi Burner	College Park, MD October, 2022 Slides
Fast Active Monocular Distance Estimation from Time-to-Contact <i>Maryland Robotics Center Research Symposium</i> Levi Burner, Nitin J. Sanket, Cornelia Fermüller, Yiannis Aloimonos	College Park, MD May, 2022 Poster
An Explainable and Efficient Representation of the Location of Objects in a Scene <i>COMBINE Annual Symposium on Network Biology</i> Levi Burner, Yiannis Aloimonos	College Park, MD May, 2022 Poster
Interpreting ANN's that Predict Illusory Motion using Network Science <i>COMBINE Annual Symposium on Network Biology</i> Levi Burner, Cornelia Fermüller	College Park, MD May, 2021 Poster
A Novel UAV for Interaction with Moving Targets in an Indoor Environment <i>International Aerial Robotics Competition Symposium Presentation</i> Aaron Miller, Levi Burner, Liam Berti, Evan Becker, and Ritesh Misra (equal contribution)	Atlanta, Georgia July 2018 Slides
6 Degree of Freedom Autonomous UAV <i>Swanson School of Engineering's Design Exposition, Poster Session</i> Levi Burner, Liam Berti, Long Vo, Ritesh Misra (equal contribution)	Pittsburgh, PA April 2018 Poster
Navigation and Control for an Autonomous Multirotor in an Indoor Environment <i>Pennsylvania Automated Vehicle Summit 2018, Student Poster</i> Aaron Miller, Levi Burner, Liam Berti (equal contribution)	Pittsburgh, PA April 2018 Poster
Functional Electrical Stimulation Control and IMU-Based Limb Angle Estimation <i>Science 2017 Undergraduate Research Poster Reception</i> Levi Burner, Dr. Nitin Sharma	Pittsburgh, PA October 2017 Poster
Aerial Robot Design for Ground Robot Interaction and Navigation without Landmarks <i>International Aerial Robotics Competition Symposium Presentation</i> Aaron Miller, Levi Burner (equal contribution)	Atlanta, Georgia July 2017 Slides

Service

Reviewer for: Robotics and Automation Letters, Transactions on Pattern Analysis and Machine Intelligence, Automatica, Signal Processing Letters, ICRA (2022, 2023), Frontiers in Robotics and AI, The Visual Computer

Student Ambassador for Perception and Robotics Group **Maryland Robotics Center**
Represent research group during tours and outreach events *Spring 2023–Present*

Editorial Assistant to the Editor of Rapid Communications **Automatica**
Assist Professor André Tits in handling editorial duties for the Rapid Publications of Automatica *Fall 2020–Present*

TA Training and Development Fellow **University of Maryland**
Lead workshops for all GTA's and mentored incoming GTA's *Fall 2020–Spring 2021*

Terp's in Space Mentor

Mentor undergraduates to design and propose an experiment for the International Space Station

University of Maryland

Spring 2021

Technical Director of Undergraduate Robotics Club

Guided growth from 40 to 80 members total, grew funding from 4 to 15 thousand per year

University of Pittsburgh

Spring 2016–Spring 2018

Teaching

Teaching Assistant

University of Maryland

CMSC 477: Robotics Perception and Planning

Spring 2023

Heavily involved in the design of a CMSC477, the final course in UMD's first offering of an Undergraduate Robotics Minor. The course will be taught by my advisor Professor Yiannis Aloimonos.

Anonymous student feedback:

- "Levi was the best TA i have ever had. He was very knowledgeable and was easy to approach as well as good at giving advice/answers."
- "Levi was always very encouraging of questions and gave great answers to questions."

ENEE 408I: Capstone Design Project: Autonomous Control of Interacting Robots

Spring 2020 – Spring 2023

During the summer of 2020, applied for and received \$13,000 dollars of funding with Dr. Gilmer Blankenship to redesign course for online presentation during the COVID pandemic. Redesigned the course again in the summer of 2021, with completely custom robots, for the upcoming in-person courses. Dr. Blankenship retired at the end of Spring 2022, and I have continued teaching the course with Dr. Shihab Shamma.

Anonymous student feedback:

- "Levi was one of the best TAs I've had at UMD, he was very knowledgeable on the subject and super helpful. He also helped in a way that helped you learn ... I feel like I got a lot better at troubleshooting issues on my own thanks to his help."
- "Levi Burner is one of the all time greatest TAs ... approachable to help students work through issues while still proactively helping them realize how they can solve their own problems ... one of those rare people who's sociable while at the same time extremely smart and helpful, and I'm thankful we had him for a TA."
- "Levi is an incredible TA. He's knowledgeable, approachable, and clearly cares about every student. Give him a raise."
- "You are likely one of the 2 top TAs I've had at this university. It is rare for me to ask a deep question of a TA and get a thoughtful, deep, and informative response. I strongly appreciate what you have done for the course."
- "I have never had a TA so engaged in the course and so ready to help at the drop of a hat. He was amazingly impressive at helping us troubleshoot problems and learn new topics throughout the class."

ENEE 661: Nonlinear Control Systems

Spring 2021

- "TA was very effective at answering questions via Piazza and his efforts helped much during the course."

ENEE 440: Microprocessors

Fall 2020

- "Levi was a fantastic TA. Always quick to reply and extremely knowledgeable."
- "Responsive to emails, took time to look through tricky issues, ... allowed for meetings outside of his normal office hours."

ENEE 324: Engineering Probability

Fall 2019

- "Levi always made it a pleasure to come to the early discussion time! He was always very helpful and willing to help"
- "Levi is a great TA and knows his stuff. Really enjoyed going to discussion as he was very helpful."

Industry Experience

Naval Research Laboratory

Student Trainee Electrical Engineer

Developed software infrastructure for research in space robotics using MuJoCo, C++, and Python

Washington D.C.

July 2021–February 2022

Carnegie Robotics LLC

Software Engineer I

Software Engineering Intern

Designed electronics and software for multi-camera systems operating in extreme environments. Contributions include: Buildroot based Linux system for NVIDIA Jetson, microphone pipeline with wide dynamic range (50-100 dBA), ChibiOS STM32 firmware with USB connectivity, comprehensive release testing framework, solutions for complex Android WebRTC issues.

Pittsburgh, PA

January 2019–July 2019

June 2018–December 2018

KLC Electronics

Embedded Software Developer, part-time

Lake Havasu City, AZ

June 2012–January 2019

Programmed Microchip PIC based embedded systems for utility grade wind turbines ranging in size from 60 to 750 kW

Rockwell Automation

Embedded Software Engineering Co-Op

Developed methods for memory bus signal integrity evaluation and run-time tests of low-level CPU functions for a safety certified industrial controller. Co-led a team that developed an interactive checker playing robot for recruiting events.

Mayfield Heights, OH

May 2016–December 2016

Undergraduate Research

NSF Center for Space, High-performance, and Resilient Computing

Hardware-in-the-loop Simulation of CubeSat Flight Control

Collaboration with Christopher Manderino advised by Prof. Alan George

Gallium Nitrate (GaN) FET DC Circuit Breakers for Space

Worked under Dr. Ansel Barchowsky to design prototype through simulation and identify failure modes

University of Pittsburgh

August 2018–March 2019

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May 2017–November 2017

Sharma Lab: Neuromuscular Control and Robotics

Wearable Sensing System to Estimate Lower Limb State

Worked under Dr. Nitin Sharma on lower-limb state estimation using six IMUs for correction of foot drop

University of Pittsburgh

May 2017–August 2017

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Selected Undergraduate Projects

Recreation of the 1972 Magnavox Odyssey

Collaboration with Dr. Zachary Horton

2018–2019

Recreated the first video game console (Magnavox Odyssey) using only analog circuitry. Led to a special collaboration with Smithsonian National Museum of American History to attempt operation of 1967 prototype.

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International Aerial Robotics Competition (IARC) Mission 7

Team Co-Founder with Aaron Miller, Electronics and Controls Team Lead

July 2016–August 2018

Co-founded team that combined contributions from over 30 students. Designed and demonstrated a 5 kg UAV with 6 cameras capable of autonomous interaction with moving targets using only onboard perception.

In 2017, received 2 out of 6 awards at the American Venue for most points and Best System Design. In 2018, received these awards again, along with Best Technical Paper, for a total of 3 out of 6 awards.

My technical contributions, including robust computer vision and control techniques, are documented on this [Project Page](#).

Select Documentation: [Technical Postmortem](#), [Club Project Page](#), [2018 Technical Paper](#)

News and Press Releases: [Pittwire](#), [SSOE Annual Report 2017: Page 15](#), [Pittsburgh Tribune](#), [Swanson School of Engineering News 2017](#), [Unmanned Systems Technology](#)

UAV with 6 Controllable Degrees of Freedom

Member of 4 person team

Senior Capstone Project

January 2018–May 2018

Designed an autonomous UAV with a special rotor configuration to increase the controllable degrees of freedom from 4 to 6. Won 3rd place in ECE at Pitt's senior design exposition

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Technical and Soft skills

- **Programming Languages:** *Experienced:* Python, C, Matlab *Capable:* ARM assembly, C++, Go
- **Software:** *Experienced:* MuJoCo, OpenCV, ROS, SciPy, NumPy, ChibiOS *Capable:* PyTorch, Buildroot, L^AT_EX
- **CAD:** *Capable:* KiCad, SolidWorks *Beginner:* Altium Designer, Eagle, LTSpice
- **Embedded Platforms:** *Experienced:* NVIDIA Jetson, PIC, STM32
- **Other:** *Capable:* Electronics design, PCB rework, multirotor design, rapid prototyping

References

- Dr. Yiannis Aloimonos
- Dr. Cornelia Fermüller
- Dr. André Tits

Professor, University of Maryland
Research Scientist, University of Maryland
Professor, University of Maryland