JONATHAN WAPMAN

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RESEARCH INTERESTS

Parallel Computer Architectures, GPU Programming, Graph Analytics, Machine Learning, Autonomous Systems, Robotics, Control Systems

EDUCATION

University of California, Davis Expected June 2020
Master of Science, Electrical Engineering
Advisor: Professor John Owens
Research Focus: GPU-Accelerated Graph Algorithms
GPA: 4.00/4.00

University of California, Davis Mar. 2018
Bachelor of Science, Electrical Engineering
GPA: 3.96/4.00

RESEARCH EXPERIENCE

University of California, Davis: Owens Laboratory Dec. 2018 – Present
Graduate Student Researcher
PI: Professor John Owens (Dept. of Electrical and Computer Engineering)

- Researching methods to map GPU graph algorithms and load-balancing methods to reconfigurable GPU hardware in collaboration with NVIDIA as part of DARPA's Software-Defined Hardware program.
- Exploring the relationships between load balancing and locality for sparse workloads, and the programming models used to express sparse algorithms on both general-purpose and domain-specific hardware.
- Implemented the HITS graph ranking algorithm in the Gunrock parallel graph analytics library, now used as part of NVIDIA's open-source RAPIDS CuGraph data analytics library.

NVIDIA Research June 2021 – Sept. 2021
Architecture Research Intern

- Explored producer/consumer dataflow programming models in CUDA, with the goal of simplifying warp specialization, expanding GPU asynchrony, and exposing opportunities for future hardware acceleration.

NVIDIA Research Mar. 2020 – June 2020

Architecture Research Intern

- Modeled the performance of load balancing and data locality for graph analytics on a streaming, explicit data orchestration GPU architecture ("Symphony") using a cycle-accurate hardware simulator based on NVArchSim.
- Contributed to development of the Symphony programming model emulator ("Symphonic CUDA") and hardware simulator ("SymSim").

NASA Jet Propulsion Laboratory June 2018 – Sept. 2018

Guidance & Control Intern

- Developed control algorithms and software drivers to enable automated position and attitude control of a planar air-bearing platform used for CubeSat formation flying, pointing, and rendezvous experiments.
- Formulated and executed a series of laboratory tests to fully characterize the planar platform's physical properties, software performance, and position-control capabilities. Extensive data analysis performed using MATLAB.
- Planned publication covering the platform's design, performance capabilities, and applications to future CubeSat missions.

Lawrence Livermore National Laboratory Mar. 2018 – June 2018

Computational Engineering Intern

- Researched and simulated decentralized signal detection algorithms, information-exchange schemes, and motion strategies for chemical plume identification and localization using fully-autonomous robotic swarms.
- Created a Python module to enable development and analysis of collaborative, autonomous swarm scenarios, which was used by LLNL scientists and for a 3D visualization collaboration with UCSD.

University of California, Davis: Yankelevich Laboratory Jan. 2017 – Mar. 2018

Research Assistant

PI: Professor Diego Yankelevich (Dept. of Electrical Engineering)

- Developed low-cost, automated hardware and software systems to capture, analyze, and display data for fluorescence lifetime imaging applications to guided surgery, using C++ and Python on a Raspberry Pi.
- Presented at the 2018 Undergraduate Student Research Showcase to UC Regents, CA lawmakers, CEOs, and alumni.

PROFESSIONAL EXPERIENCE

Eclipse Rocketry Design Team Nov. 2017 – Mar. 2018

Software Developer

- Designed object-detection algorithms to identify ground-level targets from onboard a rocket during launch. Algorithm executed using C++, OpenCV, and the Yolo v2 neural network running on an Nvidia TX1.
- Worked with a team of seven other students to set project goals, coordinate logistics, and prepare regular presentations and reports.

University of California, Davis: Silva Laboratory Sept. 2016 – June 2017
Software Developer

- Designed circuitry and programmed an Arduino for a digitally-controlled syringe with a team of three students. Used as a low-cost alternative for microfluidic educational and research projects.
- Achieved performance comparable to a $2000 industrial digitally-controlled syringe for less than $150.

Lawrence Livermore National Laboratory: National Ignition Facility June 2017 – Sept. 2017
Engineering Intern

- Created a sensor and LabView virtual instrument used to measure and track the capacitance of over 4000 high energy density capacitors for preventative maintenance. Achieved accuracy within 3% and repeatability within 1%.

Varian Medical Systems June 2016 – Sept. 2016
Engineering Intern

- Designed PCBs and software used to validate Multi-Leaf Collimator (MLC) motors for radiation therapy machines.
- Programmed a GUI-based application to allow engineers to interface with MLC motor test equipment. Features include telemetry data visualizations, command sequence entry, and debugging tools.

UC Davis C-STEM Center Jan. 2016 – June 2016
Technical Volunteer

- Created teaching materials for middle-school students to learn basic coding and robotics concepts.
- Developed code examples for Arduino robotic platforms such as line-following and maze-solving procedures.

TEACHING EXPERIENCE

University of California, Davis Mar. 2018 – Sept. 2019
Teaching Assistant – Senior Capstone Design (EEC 136 A/B)

- Assisted students and project teams with circuit design/layout, embedded device programming, project management, and quarterly written reports.

PUBLICATIONS

Wapman, J. D., Sternberg, D. C., Lo, K., Wang, M., Jones-Wilson, L., and Mohan, S. “Jet Propulsion Laboratory Small Satellite Dynamics Testbed Planar Air-Bearing Propulsion System Characterization.” Journal of Spacecraft and Rockets, Vol. 58, No. 4, 2021, pp. 954–971. https://doi.org/10.2514/1.A34857.

CONFERENCES

"Gunrock GPU Graph Analytics," UC Davis Industrial Affiliates Conference.
Poster May 2019

"Chemical Plume Detection with Collaborative, Autonomous Sensor Networks," 2018 Signal and Image Sciences Workshop at the Lawrence Livermore National Laboratory.
Poster — May 2018

"Rocket Imaging Payload: Identification of Ground-Based Targets using Contour Detection and Neural Networks with Bluetooth-Enabled Inertial Measurement Unit," UC Davis Industrial Affiliates Conference.
Award: Best Undergraduate Poster
Poster — May 2018

"Multichannel solid state photodetection system for low-cost fluorescence lifetime spectroscopy," Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XVI.
Contributed Slides, Presentation by Dr. Diego Yankelevich — Apr. 2018

"Low-Cost Data Collection Systems for Fluorescence Lifetime Spectroscopy Imaging," *UC Undergraduate Research Ambassador Showcase".*
Presentation — Feb. 2018

AWARDS

Outstanding Senior in Electrical Engineering (1 per year)	2018
Fred Fuchslin Memorial Scholarship (1 per year)	2017
Robert Murdoch Memorial Scholarship (1 per year)	2017
Dean's List – 10 Quarters	2014 – 2018
Pedrozzi Scholarship	2014
Eagle Scout with Bronze Palm	2013

SKILLS

Languages

Fluent English, Intermediate German, Beginning Spanish

Programming Languages

C, C++, CUDA, Python, MATLAB, LaTeX, Verilog, Bash

Tools & Frameworks

OpenCV, NumPy, Numba, Git, Gunrock, Googletest, Jekyll

Programs

LabView, Simulink, Eagle, Linux, MacOS, Windows, Microsoft Office

COURSEWORK

Graduate

- Artificial Intelligence (ECS 170)
- Computer Architecture (EEC 270, EEC 271)
- Embedded Computing Systems (EEC 284)

- Linear Systems (EEC 250)
- Nonlinear Systems (EEC 251)
- Numerical Applied Linear Algebra (ECS 230)
- Optimal Control (MAE 298)
- Performance Optimization (EEC 289Q)
- Reinforcement Learning (EEC 289A)
- VLSI Digital Signal Processing (EEC 281)

Undergraduate

- Computer Architecture (EEC 170)
- Control Systems (EEC 157A)
- Design of Coffee (ECM 1)
- Differential Equations (MAT 22B)
- Digital Systems I/II (EEC 180 A/B)
- Discrete Math (ECS 20)
- Electromagnetics I/II (EEC 130 A/B)
- Linear Algebra (MAT 22A)
- Parallel Computer Architectures (EEC 171)
- Probabilistic Analysis (EEC 161)
- Signals & Systems (EEC 150A)