JONATHAN WAPMAN

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RESEARCH INTERESTS

Parallel Computer Architectures, Collaborative Autonomy, Robotics, Graph Analytics, Machine Learning, Control Systems

EDUCATION

University of California, Davis — In Progress
Ph.D., Electrical and Computer 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

NVIDIA Research — Mar. 2020 – June 2020
Architecture Research Intern

- Modeled the performance of load-balancing and data locality for graph analytics and sparse linear algebra using a cycle-accurate hardware simulator based on NVArchSim as part of the "Symphony" project in DARPA's Software-Defined Hardware Program.
- Contributed to the Symphony programming model emulator ("Symphonic CUDA") and hardware simulator ("SymSim") as part of a team of approximately 10 researchers and software engineers.

University of California, Davis: Owens Research Group — 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 and an explicit data orchestration programming model in collaboration with NVIDIA as part of DARPA's Software-Defined Hardware program.
- Exploring the tradeoffs between load balancing and locality for sparse linear algebra workloads.

- Implemented the HITS graph ranking algorithm in CUDA and the Gunrock open-source parallel graph analytics library, now used as part of NVIDIA's open-source RAPIDS CuGraph data analytics library.
- Co-Administrator of a Slurm compute cluster with 15+ users and 4x multi-GPU compute nodes.

NASA Jet Propulsion Laboratory June 2018 – Sept. 2018
Guidance & Control Intern
PI: Dr. Swati Mohan, Dr. Laura Jones-Wilson

- 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
PI: Dr. Ryan Goldhahn

- Researched and simulated decentralized signal detection algorithms, information-exchange schemes, and motion strategies for chemical plume identification and localization using fully-autonomous robotic swarms.
- Developed a decentralized implementation of a false discovery rate (FDR) detector.
- Created a Python program to enable simulation, analysis, and visualization of collaborative, autonomous swarm scenarios.

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.

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%.
- Regularly met with laboratory scientists, engineers, and technicians to ensure that the measurement device was accurate, easy-to-use, and reliable.

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
Research Assistant

- 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.
- Volunteered as a technical assistant and photographer for the 2016 UC Davis Roboplay Challenge Competition

TEACHING EXPERIENCE

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

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

CONFERENCE PRESENTATIONS

J. Wapman et al., “Gunrock GPU Graph Analytics,” UC Davis Industrial Affiliates Conference, May-2019. Poster.

J. Wapman et al., “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, May-2018. Poster. Award: Best Undergraduate Poster.

J. Wapman, P. Ray, B. Kailkhura, and R. Goldhahn, "Chemical Plume Detection with Collaborative, Autonomous Sensor Networks," in 2018 Signal and Image Sciences Workshop, Livermore, CA, United States, 2018. Poster.

D. Yankelevich, J. Bec, J. D. Wapman, and L. Marcu, "Multichannel solid state photodetection system for low-cost fluorescence lifetime spectroscopy (Conference Presentation)," in Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XVI, San Francisco, United States, 2018, p. 15. Presentation.

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

AWARDS

Outstanding Senior in Electrical Engineering (1 per year)	2018
Best Undergraduate Poster, UC Davis Industrial Affiliates Conference	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, Beginning Spanish, Beginning German

Programming Languages

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

Tools & Frameworks

OpenCV, NumPy, Numba, Git, Gunrock, Googletest

Programs

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

COURSEWORK

Graduate

- Applied Numerical Linear Algebra (ECS 230)
- Computer Architecture (EEC 270)
- Embedded Computing Systems (EEC 284)
- Linear Systems (EEC 250)
- Modern Parallel Computing (EEC 289Q, Planned: Winter 2020)
- Nonlinear Systems (EEC 251)
- Optimal Control (MAE 298)
- Reinforcement Learning (EEC 289A)

- VLSI Digital Signal Processing (EEC 281)

Undergraduate

- Algorithm Design and Analysis (ECS 122A)
- 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)