RAPHAEL ISAAC ELSPAS

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EDUCATION

B.S. Computer Engineering *2014-2017*
University of Maryland, College Park, MD Dean's List every semester of college, GPA: 3.8

M.S. Computer Science *2019-2022*
Georgia Institute of Technology, OMSCS GPA: 4.0

WORK EXPERIENCE

Applied Physics Lab, Johns Hopkins University, MD *Oct 2023 – Present*
Software Engineer

- Model wargame fighter jet trajectories in C++ with real-time behavioral analysis mapped onto the globe.
- Code REST API in Java to filter Kafka messages between a scalable number of Docker containers.

Northrop Grumman, Baltimore, MD *June 2018 – August 2023*
Principal Software Engineer (T3)

- Design complex graph algorithms to track dynamic metadata of the quantum wafer manufacturing process.
- Architect full-stack C# .NET app with Oracle DB to augment Manufacturing Execution System with DLLs.
- Write Oracle SQL queries for 1000+ tables and maintain schema consistency between dev, staging and prod envs.

Lead Software Engineer: Space Architecture Genetic Algorithms (SAGA)

- Use Genetic Algorithms to quickly find near-optimal solutions to large orbital satellite constraint problems.
- Lead team to architect backend for modularity/decoupling and optimize simulation to improve runtime.

Rotation 3: Firmware Test Engineer (T2)

- Write C hardware drivers and automate verification tests, to save 9hrs/board of manual radar verification.
- Code firmware bootup tests for Fiber Optic connected FPGA with in-house testing framework.
- Write tests using driver API for FRU, EEPROM, I2C, IPMB, and PCIe switch.
- Present in annual symposium on methods of detecting code duplication across classified/unclassified boundaries.
- Rewrite 200+ C file codebase to make 3 independent programs share consistent utility code base.
- Mentor summer intern to Autobuild and sign code with githooks and Jenkins build environments.

Rotation 2: FPGA Designer

- Design system architecture of beam-forming FPGA.
- Reverse engineer proprietary serial protocol to enable fast communication between FPGAs and radar ADCs.
- Code test-bench of FPGA interface to ADC in Verilog and VHDL and debug with Questasim and Vivado.
- Perform throughput analysis to determine max bandwidth and subband count for FPGA BlockRAM and DDR4.

Rotation 1: Cyber Software Engineer (T1)

- Code distributed detection engine in C++ to use machine learning to classify attacks on imbedded systems.
- Develop frontend in Python and backend in C to launch attacks from local computer onto multiple remote target airborne systems simultaneously.
- Automate injection of generic attack payload into address space of another program to hide malicious activity.
- Write Docker configurations and Jenkins pipelines to deliver production rpms (for CentOS).
- Use of git and JIRA for code review and resolving merge conflicts.

World Juggling Federation, Los Angeles, CA *Jan 2021 – Present*
Webmaster

- Deploy endpoint and build PHP REST API to allow querying of data from WJF Competitions.
- Build elegant searchable competition data table with JS, CSS and HTML.
- Maintain versioning of WordPress, plugins, commerce, and scripts running in background on pages.

iCardioAI, Los Angeles, CA *Jan 2018 – July 2018*
Co-Founder

- Classify echocardiograms (ultrasound videos) with ML computer vision models and Many to One RNNs.
- Sanitize terabytes of video to be HIPAA compliant using CV2 Python library to remove patient data in frame.
- Y-Combinator Finalist

Northrop Grumman, Annapolis Junction, MD *June 2017 – August 2017*
Cyber Software Engineering Intern

- Analyze rootkit behaviors and develop rootkit detection methods for the Linux kernel v3.6-v4.12.
- Design kernel-level rootkit that hides processes and code rootkit detector LKM that looks for syscall table hooks.
- Plan and coordinated off-site events for 50+ interns as intern social coordinator.

CourseHunter, Startup at the University of Maryland, College Park, MD *May 2016 – February 2017*
Co-Founder

- Develop LAMP web application across 24 universities that notifies students when classes become available.
- Write PHP REST API and backend that interacted with SQL DB and integrate Braintree payment API.
- Attract 1000+ users and 600+ successful enrollments in less than a year.
- Win 1st place and $3,500 in UMD Shark Tank, and 2nd place and $7,500 in Pitch Dingman at UMD.

Northrop Grumman, McLean, VA *June 2016 – August 2016*
Operations Management/Software Engineering Intern

- Research processes to reduce cost and time in software development by using automation tools. Process presented to president of company and corporate board and will spawn action items in the next business quarter.
- Design and build SharePoint templates for use across company sector.

NASA, Greenbelt, MD *June 2015 – August 2015*
Signals Engineering Intern

- Configure software defined radio (GNU Radio) for weather radar in Global Precipitation Measurement mission.
- Code Python scripts to automate bootup tasks on embedded system & to send commands to/from temp. sampler.

TEACHING EXPERIENCE

University of Maryland Baltimore County, MD *January 2024 – Present*
Adjunct Faculty for CMSC313 – Computer Organization and Assembly

- Lecture 2.5 hours a week to 40 students on digital logic, computer architecture and assembly language.
- Design course content, homework, projects and quizzes and formalize documents in LaTeX.
- Assign grading tasks to TAs & regularly hold meetings to discuss student success.

STEM Academy, John's Hopkins Applied Physics Lab *January 2024 – Present*
Co-Instructor for Python II

- Design coursework for after-school high school coding bootcamp object-oriented Python and control flow.
- Co-Instruct class of 20 students with Co-teacher, assist in

Georgia Tech, Remote *May 2023 – August 2023*
TA for CS6515 – Graduate Algorithms

- Grade proofs for dynamic programming, graph algorithm, max-flow, and NP-complete reduction problems.

University of Maryland, College Park, MD February 2016 – December 2016
Undergraduate Teaching Fellow (TA), ENEE140, C for Electrical Engineering, Fall 2016

- Create lesson plans and lecture in classroom for twice a week for 16 weeks to teach C syntax, IO, and algorithms.
- Write and grade exams and hold office hours to answer questions 1 on 1 with students.

7th Grade Teacher, CPSS240, Service-Learning Practicum, Spring 2016

- Design 1 hour per week class curriculum for a semester to teach STEM principles using robotics.
- Teach class, monitor and guide break out groups in robotics design and aide in computer programming.

Laboratory Teaching Fellow (TA), ENES100, Introduction to Engineering Design, Spring 2016

- Instruct 6 teams of 5-8 students each in lab session with best practices & electrical and software design choices.
- Assist in mechanical & electrical design of teams' autonomous sand rovers, explaining engineering concepts.
- Film 3-part video series used in course material to teach techniques and pitfalls of debugging Arduino code.

RESEARCH EXPERIENCE

REU Transportation Electrification, University of Maryland, College Park, MD *June 2014 – August 2014*
Mechanical/Electrical Engineering Research Intern

- Research solder replacement (TLPS) for transportation power electronic systems that can withstand high temperatures and high power densities.
- Analyze structural properties of TLPS by building, thermally cycling, and inspecting modules with the material.

- Model high power rectification circuit with SolidWorks and use Ansys to simulate thermal cycling.
- Write 7 page technical report detailing findings formatted according to IEEE standards.
- Present poster and slides to CEO and CTO of Genovation Cars.

Department of Materials Science and Engineering, University of Maryland *February 2014 – August 2014*
Material Science Energy Researcher

- Publish paper in Nature journal regarding the construction of transparent dissolvable conductive batteries.
- Investigate microwave synthesized multipurpose carbon nanotubes derived from ferocene.
- Compose presentation slides and research papers investigating 1) ALD alumina nano-glue for sulfur batteries, 2) manufacture process of ALD reactivation layer for sulfur batteries and 3) synthesis of printable conductive ink.

High School Science Research Program, (HSSRP), Department of Nanotechnology, UCLA *June 2011 – August 2011*
Summer Research Intern

- Conduct research in the production and application of graphene (nanomaterial) for use in transistors.
- Utilize Chemical Vapor Deposition Machine, Transmission Electron Microscope, and Raman Spectroscope.
- Collaborate with research team to create research poster and presented findings to sponsors of program.

PUBLICATIONS

Chen, Jinbo, Xiaogang Han, Zhiqiang Fang, Fan Cheng, Bin Zhao, Pengbo Lu, Jun Li, Jiaqi Dai, Steven Lacey, Raphael Elspas, Yuhao Jiang, Detao Liu, und Liangbing Hu. "Rapid Dissolving-Debonding Strategy for Optically Transparent Paper Production," *Scientific Reports* 5, no. 17703 (2015). 11 December 2015. https://www.nature.com/articles/srep17703.

PROJECT EXPERIENCE

Stock Portfolio Optimization, Machine Learning for Trading, CS7646, Georgia Tech *February 2021 – April 2021*
Software Engineer:

- Train random forest model to optimize portfolio yield, selecting indicators and balancing ratios of chosen stocks.
- Build market simulator which scrapes historical data and retroactively calculates simulated portfolio value.

Genetic Algorithm Fuzzer, CS6340, Georgia Tech *August 2020 – September 2020*
Software Engineer:

- Finds the input to a generic program that cause it to generate a divide by zero error.
- Instruments each assembly instruction with LLVM to document coverage during dynamic mutation analysis.
- Random inputs generated from seed mutate and most unique become seeds of next gen. to increase coverage.
- Delta algorithm finds shortest such input that still fails.

Multithreaded File Server & Distributed File System, CS6200, Georgia Tech *September 2019 – November 2019*
Software Engineer:

- Design & Code multithreaded file server and multithreaded client in C using pthreads, mutexs and signaling.
- Included caching layer in separate client process that shared cached files cross-process via shared memory.
- Design & Code multithreaded distributed file system in C++ that updates and shares remote files via gRPC.

Senior Capstone - Rehabilitation Robot, ENEE408I, University of Maryland *September 2017 – November 2017*
Software Engineer:

- Goals: Make a robot capable of following specific people and that could respond and react to voice commands.
- Integrate USB camera to seek out and detect different shapes and colors worn on the ankles of people to follow.
- Use OpenCV Python library for filtering photos, masking, and shape and color detection.
- Developed a byte level serial protocol to communicate between Arduino and Linux processor.
- Used Amazon's Alexa API to accept voice commands and respond accordingly by robot changing direction, following a new person, or ask to dial 911, for example.

JHacks Hackathon, MLH, University of Maryland, College Park, MD *February 2017*
Software and Electrical Engineer:

- In 24 hours, design and build wearable technology that reduces injury and improves technique while exercising.
- Interface Arduino with Android app over Bluetooth to collect and manage data from onboard sensors.
- Win 2 awards: 1st place in overall competition and Booz Allen "Game Changing" Award with $250 prize.

Solenoise, Player Piano Project, www.raphaelelspas.com/solenoise *June 2016 – August 2016*
Software and Electrical Engineer:

- Design and build mechanism that can be placed on top of a piano to robotically play any MIDI formatted song.
- Develop translation software and compression algorithm to store songs on Arduino flash (limited memory).
- Solder and assemble circuit containing an array of transistors and sixty solenoids "fingers".

Network and Web Vulnerabilities, Dpt. of IT, University of Maryland, College Park, MD *March 2016 – April 2016*
Security Engineer:

- Exploit SQL injection vulnerability to expose and report usernames and vending funds in UMD database.
- Discover 50+ unsecured webcams on buildings, hallways, and classrooms on University of Maryland campus.
- Build a GUI with the Google Maps API to interact with all unsecured cameras on campus to present findings.

Over Sand Vehicle Project, University of Maryland, College Park, MD *January 2015 – May 2015*
Group Project Leader:

- Design and build autonomous vehicle that could navigate a sandy terrain, find, lift and weigh magnetic rock.
- Follow tight design constraints and specifications while staying within a $350 budget.
- Win 1st place in end of semester competition.
- Schedule agendas for 8 person weekly group meetings and assign tasks to 4 subgroups and each individual.

SKILLS

Languages: Bash, C, C++, C#, Cmake, Go, Java, Javascript, Makefile, OCaml, PHP, Prolog, Python, Ruby, SQL, VHDL, Verilog, x86 Assembly
Frameworks/Toolchains: Apache webserver, Django, Docker, Express.js, git, LAMP, LLVM, MERN, .NET, NGINX, Postgres, yum/rpm.
GUI Tools: Bitbucket, Eclipse, IDA Pro, Jenkins, JIRA, PSpice, QuestaSim, Vivado, VS code, SolidWorks
Undergraduate Coursework: Algorithms; AI; Computer Systems Security; Reverse Engineering; Operating Systems; Object Oriented Programming 1, 2; Organization of Program Languages; Discrete Structures; Databases; Signal and System Theory 1, 2; Computer Architecture 1, 2; Hardware Security; Digital Logic Design and Lab; Analog Circuit Analysis and Lab; Calculus 1-3; Differential Equations; Linear Algebra; Physics 1, 2.
Graduate Coursework: Grad OS, Info-Security, DBs, Software Analysis, Machine Learning For Trading, Software Arch & Design, Grad Algorithms, High Performance Computing, Analytical Modeling

ACTIVITIES

Volunteer Religious Educator, Manhattan Jewish Experience	August 2021-May 2022
Gabbai at Mount Sinai Jewish Center, Manhattan, NYC	October 2020-February 2021
Host at Moishe House Without Walls—facilitate Jewish event planning/programming	December 2018-October 2020
Education committee of Kesher Georgetown Synagogue	June 2019-March 2020
Member of Tau Beta Pi—Engineering Honor Society	May 2017
Tutor and Tutor Manager for Math (up to calculus 3), CS (programming, algorithms)	January 2017-Present
Lead Prison Jewish High Holiday Services at Morgantown, WV and Allenwood, PA	October 2015-October 2017
Volunteer Robotics Educator at MLK middle school	February 2016-June 2016
Manager of Shabbat Crew (Sodexo)—University of Maryland Hillel	February 2016-May 2016
Waiter for Shabbat Crew (Sodexo)—University of Maryland Hillel	February 2015-May 2016
Varsity Starboard Rower on Maryland Crew team (Ranked 3rd on team of 30 rowers)	September 2014-March 2015
Member of Terps Racing—Baja Powertrain Team (SAE car manufacturing)	February 2014-June 2014
Member of Phi Theta Kappa Honor Society	August 2013