JACK LAWRENCE

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Machine vision and operations engineer looking to outperform the current generation of engineers by applying a physics-based mindset to novel machine learning tools, vision systems, and data-dense research, with a focus on curating a healthy and happy team.

SKILLS

Programming:	Python, PyTorch, Tensorflow, GitHub, C/C++, Qt, Arduino, LaTeX, MATLAB, Mathematica, Teach Pendant
Software:	Fushion360, SolidWorks, OnShape, Cin7 Core, *mvme*, Microsoft Office, Google Suite, Atlassian Suite, UpKeep, Notion, Asana, Connected Components Workbench, Adobe Photoshop, waveSharp (RegiStax6), AutoStakkert!3, KStars
Experimental:	Optical Systems, γ-Ray Spectroscopy, HPGe Detector Upkeep & Maintenance, Solar Telescope Configuration & Maintenance, Background Subtraction and Signal Tuning, Data Acquisition System Development, NIM/VME System Design, Vacuum and Cryo System Design
Other:	Electrical Fault Diagnosis and Repair, QA Testing, Network Configuration, Computational Image Processing, Signal Tracing, Supervised and Unsupervised ML Construction, Monte Carlo Simulation, Dead-time Measurement, 3D Design and Printing, PLC Configuration

EXPERIENCE

Interim Vision and Operations Engineer — **Feb 2025 - Present**
UnitX Labs — Santa Clara, CA, USA

- Design end-to-end custom machine vision inspection solutions for manufacturers (auto, battery, cosmetics, etc)
- Build technical proposals for 40+ customers, including physical assembly and CAD
- Build deep clustering algorithms for improved defect detection and defect labeling assignment with tensorflow
- Train neural networks (AI) for defect detection and dimensional analysis
- Write and test Python-based image filtering scripts for enhanced defect discrimination
- Troubleshooting communication between software, cameras, light controllers, and PLCs
- Design and build demos to showcase automated machine vision systems with robotic arm and PLC integration for trade shows and customer visits
- Oversee inventory management including implementation, receiving, packing, shipping, stocktakes, and RMA
- Conduct QC and benchmark tests on cameras, light controllers, and IPCs for predeployment and defective returns
- Manage lab and hardware stations for ease-of-use
- Manage employee amenity services, including lunch and dinner delivery, office pantry stock, equipment requests
- Plan company off-site and on-site adventures, including travel, group activities, and lodging

Vision Technician — **Nov 2023 - Feb 2023**
UnitX Labs — Santa Clara, CA, USA

- Test lenses, filters, and wavelengths for optimal image capture
- Create Proof of Concept presentations detailing project-specific machine vision inspections
- Configure customized industrial PCs (IPCs), outfit with various storage and processing capacity
- Write SOPs for POCs, Inventory tracking, RMA testing, and QC workflows
- Assist hardware team in design and rapid protoyping of new equipment and products
- Compile RMA and QC information into shared Google sheets and detailed reports
- Order and configure new-hire equipment
- Assist with new-hire training for Service, Solutions, and Operations teams
- Establish and cultivate customer relations
- Track time and update project status/information daily

DAQ System Developer - SULI Sponsorship — **May 2023 - Sept 2023**
Lawrence Livermore National Laboratory - Nuclear Criticality Safety Division — Livermore, CA, USA

- Utilized custom neural networks trained with real and simulated data for accurate dead-time corrections and background subtraction for neutron multiplicity measurments

- Developed DAQ system with reduced dead-time and live data-analysis capabilities for spectroscopy, multiplicity measurements, and fission-product yield detection (Lāpaki)
- Configured DAQ software with PLC and irradiated sample transport system for time-synced spectroscopy
- Designed unique experiments with radiation detectors, scintillators and PMTs for DAQ system validation
- Took Cf-252 spectra in vacuum with silicon detector, PMT, and Gd-loaded liquid scintillator
- Took Co-60 spectra with liquid-nitrogen-cooled HPGe clover detector
- Measured coincidence of Na-22 through $\beta+$ decay with liquid-nitrogen-cooled HPGe detectors
- Maintained and repaired detectors and vacuum equipment
- Cooled detectors with liquid nitrogen daily to maintain a noise-free signal environment
- Kept detailed notes of all tasks performs to track issues and changes, as well as increase project reproducibility
- Compiled DAQ system development and experiments into a detailed report submitted to the DOE through SULI
- Edit and provide feedback for group research papers and reports
- Attended weekly lectures from research groups around the laboratory

Astronomy Instrumentation Engineer - Undergrad Research **Oct 2022 - April 2023**
Morehead Planetarium & Science Center Chapel Hill, NC, USA

- Stationed and calibrated an H-Alpha telescope on Morehead Planetarium roof-deck for UNC-sponsor stellar research and public education
- Implemented a Raspberry Pi and virtual desktop to remote control batch image capture with KStars
- Implemented AutoStakkert!3 stacking and waveSharp (RegiStax6) wavelet filtering to produce consistently high resolution images
- Designed custom circuitry and servo system for remote telescope etalon tuning
- Built GUI for remote precision etalon tuning
- Built contrast and brightness filters in Photoshop for normalized image enhancement
- Designed telescope enclosure with Fushion360
- Constructed telescope enclosure with servo-controlled hood for protection from the environment
- Built a manual for system operation
- Built and presented my project poster at the UNC 2023 Celebration of Undergraduate Research Symposium

DAQ Software Developer - DSTI Sponsorship **May 2022 - Aug 2022**
Lawrence Livermore National Laboratory - Nuclear Criticality Safety Division Livermore, CA, USA

- Developed DAQ system for Lāpaki and NeutronStars
- Improved detector readout capability through added spectroscopy windows
- Increased DAQ system flexibility to streamline the unification of multi-detector systems
- Cooled detectors with liquid nitrogen daily to maintain a noise-free signal environment
- Built and delivered slide presentation at DSTI Summer 2022 Research Symposium

Bakery Sales and Service Lead **Jan 2022 - May 2022, Aug 2022 - Feb 2023**
Great Harvest Bread Co. Chapel Hill, NC, USA

- Managed opening, midday, and closing shifts
- Oversaw daily cleaning, register count, and inventory tracking to ensure a smooth shift transition and optimal hygiene
- Prepared bakery and deli ingredients, mixed recipes, kept regular attention of baking equipment in adherence with health codes to deliver fresh goods
- Baked cafe treats in accordance with company standards to ensure product repeatability
- Developed a reliable customer base and built a welcoming environment for patrons and team members

DAQ Software Developer - Undergrad Research **Jan 2021 - May 2022**
Triangle Universities Nuclear Laboratory - LENA & The Tandem Laboratory Durham, NC, USA

- Developed open-source DAQ software (*mvme*) to improve flexibility and usability for LENA at TUNL
- Performed comparative dead-time tests between mvme and MIDAS nuclear DAQ software
- Constructed efficient, clock-synced data streams from detectors to NIM modules to software
- Assisted a grad student in research with Alpha spectroscopy
- Assisted in designing a small-footprint, electrically isolated vacuum chamber
- Became the TUNL point of contact for modern nuclear DAQ software (*mvme*)
- Presented research and DAQ progress weekly to TUNL board

EDUCATION

Bachelor of Science, Astrophysics*, University of North Carolina at Chapel Hill **Aug 2019 - May 2023**

*minor in English

TRAINING & CERTIFICATION

Machine Learning, Stanford University & DeepLearning.AI (ID RTBETC4ZVQL1) **Jan 2025**
Supervised Machine Learning: Regression and Classification (ID ECE4CZYJPANU)
Advanced Learning Algorithms (ID BQMYKWB6MF9B)
Unsupervised Learning, Recommenders, Reinforcement Learning (ID FLWZPO1N9WEY)

PUBLICATIONS

1 J.Garcia-Duarte, Y. Mishnayot, A. S. Tamashiro, **J. R. Lawrence**, and J. T. Harke, "Innovative dead-time correction and background subtraction for neutron multiplicity measurements using neural networks", Scientific Reports 14, Available online (here), 7579 (2024).

AFFILIATIONS AND VOLUNTEERING

SF Recreation and Parks Dept. Volunteer Program, Habitat Restoration Volunteer **Apr 2025 - Present**
A program where volunteers participate in a wide variety of restoration activities, such as planting and propagating native plants, controlling erosion, and monitoring wildlife habitat.

OutLoud Sports, Player, Volunteer **Aug 2023 - Present**
An LGBTQ+ sports league that fosters a safe community for queer athletes and hosts charity events for underprivileged members of the queer community

Platelet Donor at UNC Hospitals, Volunteer **Oct 2021 - May 2023**
30+ platelet (and plasma) donations to the UNC Hospital Surgical Center (I was chiefly motivated by emails following my appointments, described the patients who benefited from my donation!)

UNC Physics Foundations Seminary, External Liaison **Jan 2021 - Jan 2022**
A student-led organization hosting faculty and guest speakers to teach foundational physics topics, promoting understanding and engagement for both majors and non-majors

UNC Visibility in Physics, Student Member **Jan 2020 - May 2023**
An organization that aims to provide resources, advice, and an encouraging social atmosphere for underrepresented minorities and allies in the field of physics

UNC Society for Physics Students, Student Member **Jan 2020 - May 2023**
A chapter based society that exists to help students transform themselves into contributing members of the professional Physics community

UNC Running Club, Member, Travel Coordinator **Aug 2019 - May 2023**
A student-led club affiliated with the National Intercollegiate Running Club Association that connects a community of student runners, providing training and registration resources for affiliate and non-affiliate races