Elijah Andrae

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Semiconductor Process, Quality, and Yield | DOE, metrology, cleanroom fabrication, statistical modeling

PROFESSIONAL SUMMARY

Data science graduate (Mathematics minor) with hands-on ISO 6 cleanroom process experience. Wrote 26 cleanroom SOPs, each checked off by lab staff, and designed, ran, or analyzed four factorial experiments in JMP, finding that the deposition tool, not the recipe, was the largest source of thickness variation. Builds Python models and simulations from messy operational data and tests them on held-out data. Portfolio includes extended project write-ups, fabrication images, and code. US citizen; ready to relocate.

SKILLS

Cleanroom Processing: ISO 6 and ISO 4 cleanroom gowning and operations, photolithography (spin coat, bakes, mask alignment, direct write, develop, dose optimization), thermal oxidation, thermal evaporation and lift-off, wet etch, multilayer alignment, photomask layout (CleWin, KLayout), SU-8 molds and PDMS channels

Metrology and Characterization: stylus profilometry (Bruker Dektak), ellipsometry (Woollam), reflectometry (Filmetrics F20, F40), optical microscopy, Keithley 2450 source-measure unit, semiconductor probe station, oscilloscopes and photodetectors

Statistics and DOE: full factorial designs in JMP, ANOVA and reduced models, residual diagnostics and Box-Cox transforms, Tukey HSD and matched pairs, desirability optimization, regression and classification, censored maximum likelihood, discrete-event simulation

Programming and Tools: Python (pandas, NumPy, scikit-learn, PyTorch), R (tidyverse), SQL, JMP, Excel, Tableau, Git and GitHub, LaTeX, OR-Tools

CLEANROOM AND LABORATORY EXPERIENCE

Nanofabrication Cleanroom Labs (PHYS 495) - DOE-Driven Process Development

Sep 2025 - Dec 2025

PHYS 495 Nanofabrication, University of Oregon

- Wrote 26 standard operating procedures, each checked off by lab staff, qualifying for independent use of furnace, deposition, lithography, etch, and metrology tools in an ISO 6 (Class 1000) cleanroom; also trained to enter an ISO 4 (Class 10) cleanroom.
- Operated a Lindberg tube furnace, Laurell spin coater, two Angstrom thermal evaporators, Suss MJB4 mask aligner, LaserWriter direct-write lithography, and wet etch under full gowning.
- Designed, ran, or analyzed four factorial experiments (two 2^4, two 2^3) plus a 12-level exposure dose test, about 60 designed runs modeled in JMP.
- Identified the evaporator tool, not the recipe, as the largest source of thickness variation; suspected crystal-monitor drift on one tool, reported it to lab staff, and recommended logging the in-situ monitor on every run.
- Cross-checked thickness metrology across two reflectometers, an ellipsometer, and a stylus profilometer, and recommended a 115 mJ/cm² exposure dose from the profilometer-measured dose test.

Optical Systems & Interferometry Laboratory

Mar 2026 - Jun 2026

Independent Laboratory Sequence, 16 stations, University of Oregon

- Built and aligned free-space optical systems across a 16-station HeNe laboratory sequence, including a beam expander, optical isolators, a Michelson interferometer, and a scanning confocal Fabry-Perot cavity.
- Profiled the beam by pinhole scan, measured polarization states and photodiode rise times, and cross-checked optical power between a power meter and a photodiode method (within 13%).

Electronics Laboratory

Jan 2026 - Mar 2026

Independent Laboratory Sequence, University of Oregon

- Built and measured passive, diode, transistor, op-amp, and optoelectronic circuits across a 12-area independent lab sequence on oscilloscopes, function generators, meters, and a Keithley source-measure unit, comparing results with LTspice and QUCS simulation.
- Measured an LC resonance peak near 1.6 kHz, RC rise times that scaled with capacitance, and multimeter loading on a high-impedance divider, then measured the divider through a unity-gain op-amp buffer.

RESEARCH EXPERIENCE

Electrochemical Microbubble Devices: Fabrication, Characterization, and Stochastic Signal Applications

Mar 2026

Independent Research, Alemán Lab, University of Oregon

- Designed and fabricated microfluidic electrochemical devices across two prototype generations in a year-long independent project, drawing the photomask sets in CleWin with interlayer alignment marks and bond-pad routing.
- Fabricated six working prototypes with photolithography, thin-film metal deposition and lift-off, dielectric insulation, SU-8 molds, and PDMS channels on glass.
- Built a repeatable test protocol on a Keithley 2450 and semiconductor probe station with automated Python acquisition and logging: 80+ test runs across about 20 devices on four chips.
- Modeled the first-event time as a stochastic process, using censored maximum likelihood so trials with no event stayed in the data.

PROJECTS

Emergency Dispatch Capacity Simulation

Sep 2026

Independent research, extending DSCI 410L coursework

- Built a discrete-event simulation in Python from about 1.2 million public dispatch records to test staffing plans: one more midday van cuts the routine median wait by about half and closings without a van by about a third.
- Audited the record before modeling and estimated quantities it never logged, rebuilding van shifts and van-free times from the sequence of dispatches.
- Validated by fitting on May 2022 to 2023 and testing on 2024, with a typical miss of about 19%.

Used-Truck Deal Finder - Daily Listing Pipeline and Price Model Oct 2026 - Present

Independent project for an Erie-area dealership

- Built a daily Python pipeline for a dealership's used-truck buyer that scrapes about 450 private listings from Craigslist and Facebook Marketplace, screens out dealers and problem cars, and emails approved picks.
- Trained a gradient-boosted price model on about 1,300 area dealer listings (median error about 9% in 5-fold cross-validation) and limited picks to the price range where error stayed low.
- Wrote negation-aware text rules backed by regression tests built from real ads; on the first full run they removed 199 of 458 listings as dealer posts.

Superconductor Critical Temperature Modeling Mar 2026

- Trained a Random Forest regressor predicting critical temperature for 21,000+ superconducting compounds (test R^2 0.93); feature importance showed thermal-conductivity descriptors drove the prediction.
- Applied PCA and k-means clustering to the materials feature space to isolate regions containing high-temperature superconductors.

Resident-Assistant Shift Scheduler Oct 2024

- Built a constraint-optimization model in Python with OR-Tools that schedules on-call shifts across 12 staff teams under 8+ fairness and coverage constraints.
- Cut schedule building to seconds, an estimated 750+ administrative hours saved per year over manual scheduling.

WORK EXPERIENCE

Resident Assistant Sep 2023 - Jun 2026

University of Oregon Housing, Eugene, OR

- Conducted routine safety inspections and enforced safety policy across a 180+ resident facility over a three-year appointment; documented incidents to university standards.
- Served as on-call first response for medical, safety, and facilities incidents, coordinating with professional staff, facilities, and emergency services.

Learning Assistant - Applied Data Science for Social Justice Apr 2025 - Jun 2026

University of Oregon, Eugene, OR

- Led lab sessions and office hours across two academic years, guiding students through Python and pandas data cleaning, visualization, and analysis.
- Coached partner-facing presentations for a community stakeholder (White Bird Clinic).

Mathematics Paper Marker Mar 2025 - Jun 2026

University of Oregon, Eugene, OR

- Graded and gave written feedback across Linear Algebra, Mathematical Cryptography, and statistics coursework; worked with instructors on rubric adherence and grading consistency.

EDUCATION

University of Oregon 2022 - 2026

B.S. Data Science; Minors: Mathematics, Business Administration

- Dean's List: Spring 2025, Fall 2025
- Relevant coursework: Nanofabrication (A+), Machine Learning for Data Science, Probability and Statistics for Data Science, Stochastic Processes, Mathematical Methods of Statistics, Linear Algebra, Differential Equations

Cathedral Preparatory School 2018 - 2022

High school; Erie, PA