

Elijah Nunez

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SUMMARY

PhD candidate in Chemical Engineering with research experience applying Raman spectroscopy, process analytical technology, chemometrics, and machine learning to bioprocess datasets. Develops reusable Python libraries for spectral preprocessing, model development, validation, and scientific reporting. Academic work includes LWR, PCA, PLS, model comparison, held out validation, residual review, automated testing, Git workflows, code review, **modular package architecture**, CI workflows, example notebooks, user guides, and **documentation pipelines**. Research connects **mammalian cell culture**, fermentation, bioreactor measurements, and process understanding. Presents technical findings clearly to faculty, process researchers, engineers, and graduate peers. Independent work is paired with practical collaboration, literature review, and careful communication of model limitations. Prepared to contribute reliable **scientific software** and data driven analysis across pharmaceutical manufacturing research.

EDUCATION

PhD Candidate in Chemical Engineering

2028

Rutgers University GPA: 0

New Brunswick, New Jersey

***Coursework:** Process analytics, bioprocess engineering, statistical modeling, scientific computing*

Bachelor of Science in Chemical Engineering

2023

University of Delaware GPA: 0

Newark, Delaware

***Coursework:** Chemical engineering, transport phenomena, process control, data analysis*

TECHNICAL SKILLS

- **Python Development:** Python, NumPy, pandas
- **Scientific Modeling:** LWR, PCA, PLS
- **Machine Learning:** Scikit learn, model validation, predictive modeling
- **Spectroscopy:** Raman spectroscopy, spectral preprocessing, multivariate spectra
- **Bioprocessing:** Bioreactors, fermentation, mammalian cell culture
- **Process Analytics:** PAT, process monitoring, process understanding
- **Software Quality:** Unit testing, automated testing, test fixtures
- **Source Control:** Git, branching, code review
- **Package Engineering:** Modular architecture, reusable libraries, package documentation
- **Delivery Automation:** CI/CD, continuous integration, documentation pipelines
- **Scientific Communication:** Technical presentations, user guides, example notebooks
- **Data Analysis:** Large scientific datasets, reference measurements, residual analysis

SKILLS

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|-----------------|--------------------|----------------------|-----------------------|
| • Python | • Modular Packages | • LWR | • PAT |
| • Git | • CI/CD | • Chemometrics | • Bioreactors |
| • Code Review | • PCA | • Machine Learning | • Scientific Datasets |
| • Documentation | • PLS | • Raman Spectroscopy | |

EXPERIENCE

PhD Researcher, Process Analytics

September 2024 - Present

University Research Lab

New Brunswick, New Jersey

Conducts supervised **process analytics** research using Raman spectra, bioreactor measurements, reusable Python software, and scientific documentation. Supports laboratory colleagues through shared packages, review practices, model validation, literature analysis, and technical presentations.

- Built Raman preprocessing utilities for bioreactor studies, clarifying links between spectra and process parameters.
- Created modular **Python** packages for **PCA**, **PLS**, dataset assembly, and validation across laboratory projects.
- Maintained shared **Git** workflows with **code review** and unit tests for six graduate researchers.
- Compared held out samples and residuals, documenting model limits before multidisciplinary research presentations.

- Reviewed Raman, **chemometrics**, PAT, cell culture, and bioprocess literature for analysis recommendations.
- Presented software demonstrations to faculty and peers, incorporating feedback into shared research workflows

Researcher, Spectroscopy Machine Learning

January 2024 - August 2024

Academic Research

New Brunswick, New Jersey

Completed supervised **spectroscopy** research using multivariate spectra, reference measurements, Python modeling, Git based review, automated tests, and reproducible notebooks. Compared predictive approaches and translated results into accessible technical guidance for fellow researchers.

- Analyzed multivariate spectra and reference measurements, comparing predictive approaches in **Python**.
- Implemented **LWR**, PCA, PLS, and **machine learning** experiments through reusable functions.
- Tested core transformations against verified examples before interpreting model behavior and results.
- Organized Git repositories and peer review, resolving reproducibility and package structure issues.
- Compared validation results, residual patterns, accuracy, and practical limits across candidate models.
- Delivered a reproducible notebook and presentation that guided another researcher through analysis steps

Graduate Project Researcher, Bioprocess Software

September 2023 - December 2023

Course Project

New Brunswick, New Jersey

Completed a supervised graduate project focused on Python package architecture for simulated fermentation and bioreactor time series. Connected modular software, multivariate analysis, CI workflows, testing, documentation, and user focused scientific communication.

- Designed a **Python** package for simulated **fermentation** and bioreactor time series analysis.
- Separated ingestion, preprocessing, modeling, and reporting into documented modular components.
- Configured CI checks for automated tests after repository changes and corrected failures before review.
- Explored process variable relationships with multivariate analysis and recorded interpretation assumptions.
- Prepared an example workflow and user guide covering installation, inputs, validation, and outputs.
- Demonstrated package use to classmates, linking repeatable analysis with practical software habits

PROJECTS

Raman Process Monitoring Study 📅 2024

Connected Raman spectroscopy, PAT concepts, and bioreactor measurements through a reusable analysis workflow. Results helped frame process parameters, validation limits, and communication needs for future laboratory studies.

Scientific Python Package Workflow 📅 2023

Created a practical package structure for simulated fermentation data, with modular functions, CI testing, documentation, and a user guide. Class demonstrations made reproducible analysis easier for fellow researchers.

LEADERSHIP & AWARDS

- Graduate Research Fellowship, 2025
- Best Student Poster Finalist, Process Analytics Symposium, 2026
- Dean's Graduate Scholar Recognition, 2024
- Graduate Peer Mentor, Quantitative Research Methods, 2025 - 2026

CERTIFICATIONS

- Machine Learning with Python, Coursera 📅 2024
- Scientific Python Testing and Git, University Continuing Education 📅 2025

PROFESSIONAL AFFILIATIONS

- Member, Graduate Bioprocess Research Forum, 2024 - 2026
- Graduate Peer Mentor, Quantitative Research Methods, 2025 - 2026

LANGUAGES

- English (Native)
- Spanish (Proficient)

ADDITIONAL INFORMATION

Work Status : Authorized to work in United States. No sponsorship required.

REFERENCES

AVAILABLE ON REQUEST