Emma McLaughlin

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SUMMARY OF QUALIFICATIONS

- Systems-oriented thinker with experience designing scalable databases, guiding colleagues through adoption of these new technologies, and anticipating downstream impacts to ensure usability and sustainability for both technical and non-technical teams
- Strong leadership, communication and research analysis skills with 5+ years experience analyzing large-scale datasets using statistical/machine learning methods, developing Monte Carlo simulations, and presenting complex findings to diverse audiences, and 3+ years leading analysis teams in long term projects
- 3 years experience providing data analysis support for commissioning and 24/7 operation of large, multi-system experimental physics detector on particle collider at Brookhaven National Lab

EDUCATION

Ph.D. Candidate in Physics, *Columbia University* — est. grad. May 2026

B.S. in Applied Physics, *Providence College* — May 2020

TECHINCAL SKILLS

Database Management (PostgreSQL, SQL, schema design) – Programming Languages (Python, C++, Bash) – Statistical & Machine Learning Analysis and Data Visualization (Pytorch, NumPy, pandas, scikit-learn, SciPy, ROOT, Matplotlib, seaborn, Grafana) – 24/7 Operations Support – Control & Monitoring Systems (Grafana, Ignition SCADA) – Automation & DevOps (Git, Jenkins, shell scripting, cron jobs for automated data collection)

TECHNICAL EXPERIENCE

Graduate Research Assistant, *Columbia University* — 2021 – present

- Led two task forces (4 and 8 scientists) to successful completion and publication of 1-2 year long physics analyses with high-volume data using statistical/ML methods including work with highly correlated measurements and iterative Bayesian unfolding and Python, SQL, Pandas, C++, and the ROOT framework
- Updated sPHENIX Monte Carlo simulation, scripting and analysis integration codebases (60+ commits), including low-level waveform reconstruction and analysis using least squares fit to a template function and geometry updates, with optimizations for time complexity and scalability to 10s of billions of events
- Presented new research findings biweekly to groups of 10–40 experts using MS Office/Google applications, tailoring content to multi-level and diverse audiences
- Managed multiple concurrent projects, including real-time electronic device testing, weekly data quality assurance, statistical model and software codebase development, and long-term (1–2 year) physics analyses

Particle Physics Detector On-call Expert, *sPHENIX Experiment, Brookhaven National Lab* — 2023 – present

- Built and maintain detector state database logging and real-time monitoring data visualization using Python, PostgreSQL, and Grafana (3 years of continuous operation)
- Independently investigated a suspected hardware failure in analog-to-digital converter readout boards to finding a firmware issue and enabling a software patch to avoid hardware replacement with approx. $3M savings
- Serve as on-call subsystem expert responsible for 24/7 consistent operation of the sPHENIX calorimeters

Public Programs Academic Administration Fellow, *Zuckerman Institute, Columbia University* — 2024-2025

- Built Airtable database of contacts from NYC schools, community organizations, public housing to streamline program promotion and track participation of targeted communities

NASA Space Apps Challenge Graduate Student Mentor, *Barnard Computational Science Center* — 2025

- Provided technical data analysis and creative guidance to undergraduate team using NASA Earth data
- Scheduled workshop review of statistical and ML analysis techniques, including Iterative Proportional Fitting for sparse data, random forest and RNN models, and provided technical guidance for successful random forest exoplanet classification project

PROFESSIONAL EXPERIENCE

Career Initiatives for Women in Physics, *Columbia University* — 2022

- Organized sessions on career paths for women in physics with four alumni/faculty members, created opportunity for informal discussions, and facilitated more formal Q&A sessions attended by 15-20 students and postdocs

Climate, Diversity and Inclusion Committee Member, *Columbia University* — 2021-2022

- Led town hall on advisor-advisee relationships and co-led session on mental health, each engaging 30-50 participants across the department

SELECTED GRANTS AND AWARDS

Best Poster Award, International Conference on the Initial Stages of High-Energy Nuclear Collisions — 2025

JETSCAPE collaboration's Graduate Fellowship Award funded via the NSF — 2021

NSF Graduate Research Fellowship Program Honorable Mention Awardee — 2020

Goldwater Scholar - The Barry Goldwater Scholarship and Excellence in Education Foundation — 2019