

Brian Pollack

CONTACT INFORMATION

Chicago, IL 60611
Website: pollackscience.com

Email: brianleepollack@gmail.com
GitHub: github.com/brovercleveland

CAREER INTERESTS

Data analysis, visualization, and software development.

EDUCATION

Northwestern University

June 2009 - May 2015

Ph.D. in Experimental Particle Physics (May 2015)
Thesis: *The Search for the Higgs Boson and New Resonances Decaying to a Z Boson and a Photon*
Advisor: *Mayda Velasco*
GAANN Fellowship for 2011-2012 Academic Year

Carnegie Mellon University

September 2005 - May 2009

B.S. in Physics with College Honors
Additional Major in Philosophy

RESEARCH EXPERIENCE

Mu2e Experiment, Fermilab, Northwestern University

May 2015 - Present

Postdoctoral Fellow

Data Analysis, Visualization, Software Development

- Development of parallelized and/or GPU-accelerated data analysis software for Mu2e magnetic field mapping. Creation of semi-analytic parametric model of 3D magnetic field for use with field mapping and with offline physics reconstruction. Modeling method applies physics-based solutions to magnetic vector fields with simultaneous, three-dimensional curve-fitting and parameter estimation.

<https://github.com/brovercleveland/Mu2E>: Mostly Python

http://pollackscience.com/mu2e_pages/Mau10_fits.php: Data Visualization

- C++ software development and refactoring for magnetic field implementation in main software framework for Mu2e experiment.

<https://cdcv.s.fnal.gov/redmine/projects/mu2eofflinesoftwaremu2eoffline>

- Simulation and analysis of rare background processes for Mu2e. Charged particles may become trapped in magnetic bottles that arise due to complicated interplay between magnetic fields and physical geometry. Decay products can lead to potential unwanted contamination of the signal region. Generated novel visualization techniques to better understand complex particle kinematics.

Compact Muon Solenoid, Large Hadron Collider, CERN

June 2009 - May 2015

Research Assistant

Data Analysis

- Lead researcher for the Higgs to Z+photon decay search, applying and updating novel methods of background estimation in environments that have unknown or unreliable theoretical predictions. Use of nonlinear functions to model and fit data, generate monte carlo simulations, and classify and reduce systematic errors associated with competing functional forms.

https://github.com/brovercleveland/HZG_Analyzer: C++ and Python

<https://github.com/brovercleveland/BiasAndLimits>: Mostly Python

- Renovated and maintained Northwestern data storage C++ classes and framework for use with any CMS analysis, improving class inheritance to mimic physical similarities for subatomic particles.

<https://github.com/NWUHEP/ntupleProducer>: C++

Hardware Development

- Created characterization and calibration software in MATLAB for quantifying fiber optic response after exposure to varying levels of radiation, and produced a non-linear model for use in real-time data acquisition. Software suite was then automated with a simple interface such that it was easily operated by undergraduate students.

https://github.com/brovercleveland/AOH_MATLAB: MATLAB and Python

Argonne National Laboratory

June 2010 - September 2010

Research Assistant, P.I.: Jose Repond

- Developed and constructed prototype resistive plate chamber (RPC) detector for use in future particle accelerators. Programmed data visualization software for imaging charged particle tracks within the detector volume.

Jefferson Laboratory

June 2008 - September 2008

Research Assistant, P.I.: Rolf Ent

- Produced simulated data for a proposed electron-proton collider. Ran analysis over simulation to detail average momentum transfer given varying center of mass energies.

PROJECTS

Scikit-HEP

Open-source Python software package, bringing cutting edge data analysis tools to particle physicists. Contributed the visualization and histogramming/density estimation modules. Included unit tests, automatic documentation, coverage, and support for many different Python versions.

<http://scikit-hep.org/index.html>

TEACHING EXPERIENCE

Northwestern University

- **CIERA Programming and Data Analysis Course**

Summer 2016

Collaborator

Part of interdisciplinary team (High Energy Physics, Astronomy, Geophysics). Goal is to create a 2-week course to teach Python-based data analysis to incoming graduate students. Those who complete the course will earn a data analysis certificate.

- **130-1: College Physics, Lecture** **Fall 2010**
Teaching Assistant, Instructor: Arthur Schmidt
- **135-3: General Physics, Lab** **Winter 2011**
Teaching Assistant, Instructor: David Taylor
- **130-3: College Physics, Lecture** **Spring 2011**
Teaching Assistant, Instructor: Andy Rivers
- **130-2: College Physics, Lecture** **Winter 2015**
Teaching Assistant, Instructor: Andy Rivers

Lectured weekly recitation of 100-150 students. Held office hours, graded problem sets and exams. Lecture topics included basic mechanical systems, translational and rotational kinematics, motion under gravitational and spring potentials, electricity and magnetism, classical and

quantum mechanical optics and waves, special relativity. Lab topics included optics and waves.

SELECTED
PUBLICATIONS AND
PUBLIC RESULTS

1. B. Pollack *et al.*, “Bayesian Blocks in High Energy Physics: Better Binning made easy!” Submitted, Computer Physics Communications [arXiv:1708.00810 [hep-ex]].
2. S. Feher *et al.*, “Mu2e Solenoid Field Mapping System Design,” IEEE Transactions on Applied Superconductivity, vol. 28, no. 3, pp. 1-5, April 2018
3. S. Chatrchyan *et al.* [CMS Collaboration], “Search for high-mass Z-gamma resonances in e+e-gamma and mu+mu-gamma final states in proton-proton collisions at sqrt(s)=8 and 13 TeV,” J. High Energ. Phys. (2017) 2017: 76 [arXiv:1610.02960 [hep-ex]].
4. S. Chatrchyan *et al.* [CMS Collaboration], “Search for a Higgs boson decaying into a Z and a photon in pp collisions at $\sqrt{s} = 7$ and 8 TeV,” Phys. Lett. B **726**, 587 (2013) [arXiv:1307.5515 [hep-ex]].
5. S. Chatrchyan *et al.* [CMS Collaboration], “Search for a Higgs boson decaying into $\gamma^*\gamma \rightarrow \mu^+\mu^-\gamma$ with dilepton mass below 20 GeV in pp collisions at sqrt-s = 8 TeV,” CMS-PAS-HIG-14-003.
6. M. Hempel *et al.*, “Measurements of the Performance of a Beam Condition Monitor Prototype in a 5GeV Electron Beam,” NIM-A, (2016)
7. C. Adams *et al.*, “Design, Construction and Commissioning of the Digital Hadron Calorimeter - DHCAL,” Journal of Instrumentation, Volume 11, July 2016 [arXiv:1603.01653].
8. Co-Author for 300+ Experimental High Energy Physics publications:
<http://inspirehep.net/author/profile/B.Pollack.1>

SELECTED
PRESENTATIONS

1. “Modeling Magnetic Fields using Helical Solutions to Maxwell’s Equations”
American Physical Society, April Meeting, April 2018, Columbus, Ohio (upcoming).
2. “Histogram Binning with Bayesian Blocks”
American Physical Society, Division of Particles and Fields, August 2017, Fermi National Accelerator Laboratory.
3. “Mu2e Solenoid Field Mapping System”
American Physical Society, Division of Particles and Fields, August 2017, Fermi National Accelerator Laboratory.
4. “Mapping and Tracking our B-Fields”
Mu2e Collaboration Meeting, Plenary Talk, July 2016, Fermi National Accelerator Laboratory.
5. “Heavy Higgs Searches from CMS”
BF2015: Brookhaven Forum 2015: Great Expectations, a New Chapter, 7-9 Oct 2015, Upton, NY.
6. “Characterisation of BCM1F lasers”
Workshop on CMS Beam Conditions, Radiation Monitoring and Luminosity Systems, April 2013, DESY Zeuthen, Germany.

ANALYTICAL
SKILLS

Programming

Python (Expert), C++ (Proficient), HTML, MATLAB, Mathematica

Math and Statistics

Optimization Hypothesis Testing, Error Estimation, Parameter Estimation