NOAH ZIPPER

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EDUCATION

University of Colorado, Boulder
Ph.D. - Physics (3.88 GPA)

2025

Relevant Coursework

- High performance/throughput computing, machine learning, neural networks and deep learning, MapReduce, NoSQL, stream processing, datacenter scale computing, Markov processes, algorithms

University of Michigan, Ann Arbor
B.S. - Physics (3.74 GPA)

2018

EXPERIENCE

University of Colorado, Boulder / CMS Experiment, CERN
Boulder, CO / Geneva, Switzerland

Postdoctoral Researcher — May 2025 – Present
- Developed MLOps CI/CD pipelines for automated training, hardware deployment, and monitoring of ML models in high-throughput physics environments
- Guided research projects and mentored multiple junior graduate and undergradute students

Graduate Researcher — June 2019 – May 2025
- Built real-time anomaly detection algorithms using unsupervised deep learning on FPGAs for event selection at nanosecond latency [1,3,4]
- Conducted precision measurements of rare B particle decays to probe lepton flavor universality violations [2]
- Measured and modeled particle identification efficiencies using multivariate classification and likelihood fits [5,6]
- Implemented high-speed particle tracking logic in Vivado HLS for real-time hardware-level reconstruction
- Designed scalable data acquisition systems as part of future detector upgrades for long-lived particle identification
- Collaborated with $\mathcal{O}(100)$ researchers across US, Europe, and Asia in a fast-paced, results-driven environment, leading weekly data-driven discussions, presenting technical updates, and contributing to high-impact decision-making on large-scale projects

Lawrence Livermore National Laboratory
Livermore, CA

Summer Research Scholar — June 2018 – August 2018
- Developed Bayesian estimation and Markhov Chain Monte Carlo models in MATLAB for photon temperature estimation and hardware diagnostics
- Analyzed X-ray spectra from relativistic electron plasmas to model photon energy distributions in laser wakefield acceleration experiments

ACHIEVEMENTS

- American Physical Society 4 Corners Harry Lustig Award Finalist for outstanding graduate-level research (2024)
- CU Boulder GPSG Student Travel Grant Recipient (2024)
- National Science Foundation GRFP Honorable Mention (2020)
- American Physical Society DPP Student Travel Grant Recipient (2018)
- James B. Angell Scholar (2018)

SKILLS

- **Programming Languages**: Python, C++, Shell Scripting, MATLAB, LaTeX, Mathematica, HLS, VHDL
- **Programming Tools**: Numpy, Pandas, Git, Gitlab CI/CD, Docker, Singularity, Dask, Condor, SQLite
- **Machine Learning Packages**: scikit-learn, PyTorch, Keras/QKeras, Tensorflow, XGBoost, MLOps, hls4ml

SELECTED PUBLICATIONS & TALKS

1. N. Zipper, *Real-Time Anomaly Detection in the CMS Experiment*, Fast Machine Learning for Science Conference 2024, West Lafayette, Indiana, USA, October 2024.
2. N. Zipper, *Precision Flavor Measurements and Real-Time Anomaly Detection at the CMS Detector*, APS 4 Corners Meeting 2024, Flagstaff, Arizona, USA, October 2024.
3. CMS Collaboration, "2024 Data Collected with AXOL1TL Anomaly Detection at the CMS Level-1 Trigger," *CMS Detector Performance Summary* (2024), cds.cern.ch/record/2904695.
4. N. Zipper, *Testing a Neural Network for Anomaly Detection in the CMS Global Trigger Test Crate during Run 3*, Topical Workshop on Electronics for Particle Physics 2023, Geremeas, Sardinia, Italy, October 2023.
5. CMS Collaboration, "Search for electroweak production of charginos and neutralinos at $\sqrt{s} = 13$ TeV in final states containing hadronic decays of WW, WZ, or WH and missing transverse momentum," *Phys. Lett. B* **842**, 137460 (2023), arXiv:2205.09597.
6. CMS Collaboration, "Search for higgsinos decaying to two Higgs bosons and missing transverse momentum in proton-proton collisions at $\sqrt{s} = 13$ TeV," *JHEP* **2022**, 14 (2022), arXiv:2201.04206.

PROJECTS

Kaggle March Machine Learning Mania
- Predicted matchup outcomes in the NCAA men's and women's basketball tournament using deep learning tools, as well as analyzed the historical performances of college programs over time to project impact on future performance (git)