# Jason T. Barkeloo

Particle Physics, Machine Learning, Data Modeling

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## Experience

### Data Analysis

- Solo analyzer searching for very rare physics processes in one of the world's largest datasets
- Improved experimental reach by 30% through the design, optimization, and implementation of a neural network for signal-background discrimination
- Mined over 100 TB of ATLAS data to search for indications of rare processes using a C++ framework and distributed computing
- Created custom Python scripts to slim down datasets fully leveraging local computing cluster resources using HTCondor batch processing techniques
- Successfully implemented multiple data-driven background techniques for more accurate Monte Carlo modeling
- Set an upper 95% confidence level statistical limit on the production rate of the process $t \to q\gamma$, the world's best limit on $t \to c\gamma$

### Detector Modeling and Optimization

- Developed Geant4 Monte Carlo simulations for comparison to real world electron test beam studies
- Cost optimization of the electromagnetic calorimeter for the future International Linear Collider using machine learning methodologies, including predictive regression based on machine learning techniques

### Lasers and Optics

- Assisted in the construction and implementation of a tapered amplifier system for atomic cooling and trapping experiments
- Constructed frequency locked diode laser systems for use in a variety of experiments using Rubidium vapor
- Two years maintaining multiple optics tables inlcuding daily adjustments to account for vibrational drift

### Other Experience

- Teaching Assistant for undergraduate laboratories and discussion sections for classes of 30 or more students
- Laser Physics Teaching Assistant at Miami University instructing on the construction and use of diode laser systems

## Education

**University of Oregon** — *Eugene, OR*

Doctorate of Philosophy in Physics — *June 2020*

- **Dissertation**: Search for the Flavor-Changing Neutral Current, $t \to q\gamma$, in Top Pair Events Using the ATLAS Detector
- **CERN (European Organization for Nuclear Research)**, Geneva, Switzerland — *July 2016- July 2017*

**Miami University** — *Oxford, OH*

Master of Science in Physics — *May 2012*

- **Thesis**: Investigation of Electromagnetically Induced Transparency and Absorption in Warm Rb Vapor by Application of a Magnetic Field and Co-propagating Single Linearly Polarized Light Beam

**Wittenberg University** — *Springfield, OH*

Bachelor of Science in Physics, Minor in Mathematics and Computational Science — *May 2010*

## Select Publications

**Correcting for Leakage Energy in the SiD Silicon-Tungsten ECal** — *March 2020*

arXiv:2002.04100 [physics.ins-det]

**Design and construction of cost-effective fail-safe tapered amplifier systems for laser cooling and trapping experiments** — *2014*

American Journal of Physics 82(8), 805-817

**310 additional publications as a member of the ATLAS Collaboration** — *May 2017 - present*

## Skills

**Computing and Software** Python, Linux, SQL, Mathematica, MATLAB, Git, Rucio, HTCondor, Microsoft Office Suite, LaTeX, GIT, JIRA, TWIKI

**Competencies** Machine Learning, Data Analysis, Algorithm Development, Data Visualization, Applied Physics