

# Daniel Blackburn

danielrb@u.washington.edu  
(605) 940-0458

## EDUCATION

### University of Washington

2015 | PhD in Physics

Member of ATLAS experimental collaboration at CERN

Adviser: Professor Henry Lubatti, lubatti@u.washington.edu

2011 | MS in Physics

### Iowa State University

2008 | BS in Physics; minor in Mathematics

2008 | BS in Chemistry

## RESEARCH EXPERIENCE

Overview: The ATLAS experiment works in the space of Big Data. Protons are collided at a rate of 20 million collisions per second. Pattern recognition of each event takes about 15 seconds of computer processing and storage is about 3 MB after compression.

Data flow is kept in check with online filters that select potentially interesting physics events, keeping only 300 events per second. With these filters, the scope of the data problem is limited to 5,000 terabytes per year.

### ATLAS Exotics Group

*Took on a leading data analysis researcher role in search for exotic physics signatures of long-lived neutral particles*

Developed pattern finding algorithm to identify decays of long-lived particles in the muon spectrometer. Brought algorithm into central ATLAS production

- Identified and fixed modes of failure, improving signal identification by 50%
- Studied computing performance and reduced processing time by a factor of 0.15
- Incorporated algorithm into ATLAS production system, facilitating collaboration by allowing any ATLAS member to make use of this physics signature
- Defined criteria to maximize the statistical significance of found patterns

Established statistical models for measuring upper limits of new physics phenomena

- Leveraged data-driven techniques to determine background rates
- Determined rate of hypothesized signal; quantified statistical and systematic errors

Communicated results through internal talks to ATLAS subgroups, internal ATLAS analysis notes, and academic publications

### ATLAS Muon Software Group

Prepared diagnostic tools to understand the quality of muon pattern recognition algorithms. These tools were used to evaluate performance of software upgrades, hardware upgrades, and bug fixes.

## ATLAS Data Quality Group

Updated muon data quality tools after a two year data-taking hiatus. Data quality tools were used to confirm good software performance in simulated events and good detector performance during live data collection. The data quality tools verify proper detector performance, a key ingredient in assuring clean data collection.

## SKILLS

Research experience with scientific computing, Monte Carlo simulation, statistical data analysis and data mining, pattern recognition, and big data grid computing  
Programming experience: Java, C++; Previous experience: Python, Bash, Matlab  
Other technologies:

SVN, LaTeX

ATLAS grid computing tools: PANDA, a proprietary system for storing and processing large collections of data - similar to HADOOP

ROOT: C++ interpreter for big data processing, statistical analysis, visualization, and storage

## WORK EXPERIENCE

### [2011-2015] CERN laboratory

*Research Assistant*

Conducted data analysis for long-lived particle search for the ATLAS experiment

### [2008-2011] University of Washington

*Teaching Assistant*

Taught introductory physics tutorials and laboratories, instructed advanced undergraduate physics laboratories, and graded for graduate student courses

### [2005-2007] Iowa State University

*Teaching Assistant*

Taught introductory chemistry recitations and laboratories

## PRESENTATIONS & AWARDS

*Searches for dark matter and signs of Composite Higgs with the ATLAS detector*

- Talk on behalf of the ATLAS collaboration at Lake Louise Winter Institute, 2015

U.S. DOE-INFN (Italy) visiting scholar at University of Rome Tor Vergata, Sept-Oct 2014

## SELECTED PUBLICATIONS

*Search for long-lived, weakly-interacting particles that decay to displaced hadronic jets in proton-proton collisions at  $\sqrt{s} = 8$  TeV with the ATLAS detector*

Published: Phys. Rev. D 92 (2015) 012010 [arXiv:1504.03634]

*Search for pair-produced long-lived neutral particles decaying in the ATLAS hadronic calorimeter in pp collisions at  $\sqrt{s} = 8$  TeV*

Published: Physics Letters B 743 (2015) 15-34 [arXiv:1501.04020]

*Standalone vertex finding in the ATLAS muon spectrometer*

Published: JINST 9 (2014) P02001 [arXiv:1311.7070]

*Triggers for displaced decays of long-lived neutral particles in the ATLAS detector*

Published: JINST 8 (2013) P07015 [arXiv:1305.2284]

*Search for Weakly-interacting, Long-lived Particles that Decay to Displaced Hadronic Jets in Proton-Proton Collisions at  $\sqrt{s}=8$  TeV with the ATLAS Detector*

PhD Thesis: CERN-THESIS-2015-306 [<http://cds.cern.ch/record/2136434>]