

Alan WILSON

Ph.D., experimental high energy physics

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The basics

As a physicist and a curious human, everyday I collaborate with colleagues to identify and understand structure in data and communicate our findings widely.

Education

- 2011 **Ph.D. Physics**, *University of Michigan*, Ann Arbor.
- 2003 **M.S. Mathematics**, *University of Michigan*, Ann Arbor.
- 1999 **B.S. Mathematical Sciences**, *University of Washington*, Seattle.
- 1999 **B.S. Computer Engineering**, *University of Washington*, Seattle.

Proficiencies & technical interests

	Almost every day	Occasionally	Fading memories
programming	<ul style="list-style-type: none">○ C++○ Python○ ROOT+RooStats+TMVA○ numpy+scipy+matplotlib	<ul style="list-style-type: none">○ SQL variants○ Mathematica and Matlab○ shell scripting○ C & ASM for μ-controllers	<ul style="list-style-type: none">○ Javascript○ Lisp dialects○ PHP○ Perl
command line	git/svn, tmux/screen, emacs, ssh/rsync, etc.		<i>the usual Linux stuff</i>
statistics	fitting, statistical tests, likelihoods, Bayesian vs. frequentists		<i>quantifying with limited knowledge</i>
machine learning	supervised learning, boosted decision trees	<i>co-authored paper: training BDTs with weighted events</i>	
publishing	L ^A T _E X+beamer, HTML/CSS, Photoshop/Illustrator/Gimp/Inkscape		<i>things should look nice</i>
extra topics	(social) network structure, coding theory, and compression		<i>graduate course projects</i>

Research & Hardware Experience

- 2011–present **Post Doctoral Research Fellow**, *ATLAS Experiment*, CERN, Geneva, Switzerland.
 - As part of the largest experiment in the world, I contributed to the Higgs discovery (specifically, via $H \rightarrow ZZ \rightarrow 4\ell$) and to measurements involving multiple leptons, including the rare decay $Z \rightarrow 4\ell$.
 - Wrote readable, modular, and accurate analysis code to run in batch (Condor) and on the Grid
 - Developed many tools for efficiently specifying, building, and sharing plots
 - Primary editor for at least one paper as well as internal documents
 - Developed a framework for defining “unit tests” of numerical quantities in documents
 - Constructed event visualizations in various forms
 - Tested new detectors as part of a hardware installation team
 - Controlled experiment-wide data acquisition when on shift, reacting quickly but thoughtfully to solve faults.

- 2009–2010 **Graduate Student Research Assistant**, *DØ Experiment*, Batavia, Illinois.
- Thesis topic: a search for new physics via the $Z(\rightarrow \ell\ell)\gamma + \text{missing } E_T$ final state. This is a niche topic, so I had the entire analysis largely to myself including
 - exploring the theory and experimental sensitivity with simulation,
 - estimating backgrounds with data-driven methods, and
 - using statistics to quantify constraints on theory imposed by the observation.
 - Expert role managing Monte Carlo simulation jobs: responding to my colleagues requests and translating them into tested job specifications, submitting the jobs, and monitoring the results.
 - DAQ shifts: online control, monitoring, and problem solving for the data taking of a large experiment
- 2005–2008 **Graduate Student Research Assistant**, *ATLAS Experiment*, Univ. of Michigan, Ann Arbor.
- Primary contributor to large preparatory documents on (diboson) physics sensitivity before data was available.
 - Wrote machinery for calculating confidence regions for coupling measurements.
 - Working in a small team with an engineer and undergraduate I constructed the gas monitor chamber for the muon tracking system of ATLAS.
 - Applied boosted decision trees to particle identification tasks (electron id. and b-tagging) becoming a local expert on the ATLAS software framework
- 2004–2005 **Research Assistant**, *ATLAS Experiment*, Univ. of Michigan, Geneva, Switzerland.
- Validated muon reconstruction software, presented systematic comparison of algorithms, and identified faults
 - Commissioning of 40 large muon detectors, involving
 - leading a team of five undergraduates to complete assembly and testing,
 - managing logistics of the lab space when our supervisor was away, and
 - training to operate cranes and becoming an expert in the gas mixing and distribution system.
- 1994–1999 **Research Assistant**, *Space Sciences, Geophysics*, Univ. of Washington, Seattle.
- Built testing platforms for DAQ hardware and software used on balloon and satellite experiments.
 - Literature summaries and simulations of coded aperture imaging using X-rays.

Teaching

- 1999–2003 **Graduate Student Instructor**, *Mathematics*, University of Michigan, Ann Arbor.
Courses: precalculus, calculus I & II, and differential equations
- 1998–1999 **Teaching Assistant**, *Computer Science and Engineering*, Univ. of Washington, Seattle.
Courses: Discrete Structures, Introduction to Computer Graphics, and Digital System Design

Publications

- paper “Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC”, *Phys. Lett. B* 716 (2012) 1-29
- paper “Search for $Z\gamma$ events with large missing transverse energy in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV”, *Phys. Rev. D* 86, 071701(R) (2012)
- publication “The ATLAS Experiment at the CERN Large Hadron Collider.” *JINST* 3 S08003 (2008)
- publication “Expected Performance of the ATLAS Experiment - Detector, Trigger and Physics.” CERN-OPEN-2008-020 (2009), arXiv:0901.0512
- paper “Drift time spectrum and gas monitoring in the ATLAS Muon Spectrometer precision chambers.” *Nucl. Instrum. Methods A* **588**, 347 (2008).
- paper “A Multivariate Training Technique with Event Reweighting.” H.-J. Yang, T. Dai, A. Wilson, Z. Zhao and B. Zhou, *JINST* 3:P04004,2008

Other interests

- hobbies electronics and photography – small analog and microcontroller projects, darkroom work
- culture cooking, travel, hiking, and wandering – seeing, smelling, touching, and tasting the world