

# Alan WILSON

*Ph.D., experimental high energy physics*

## 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. Computer Engineering**, *University of Washington*, Seattle.
- 1999 **B.S. Mathematical Sciences**, *University of Washington*, Seattle.

## Proficiencies & technical interests

	Almost every day	Occasionally	Dabble in or dated
PROGRAMMING	<ul style="list-style-type: none"> <li>○ C++</li> <li>○ Python</li> <li>○ ROOT+RooStats+TMVA</li> <li>○ numpy+scipy+matplotlib</li> </ul>	<ul style="list-style-type: none"> <li>○ SQL variants</li> <li>○ Mathematica and Matlab</li> <li>○ shell scripting</li> <li>○ C &amp; ASM for <math>\mu</math>-controllers</li> </ul>	<ul style="list-style-type: none"> <li>○ Javascript</li> <li>○ Lisp dialects</li> <li>○ PHP</li> <li>○ Perl</li> </ul>
COMMAND LINE	git/svn, tmux/screen, emacs, ssh/rsync, etc.		
STATISTICS	fitting, statistical tests, likelihoods, Bayesian vs. frequentist, etc.		<i>the usual Linux stuff</i>
MACHINE LEARNING	supervised learning, boosted decision trees (BDTs)		<i>quantifying level of knowledge</i>
PUBLISHING	LaTeX+beamer, HTML/CSS, Photoshop/Illustrator/Gimp/Inkscape		<i>paper: training BDTs with weighted events</i>
EXTRA TOPICS	network structures, coding theory, compression		<i>things should look nice</i>
INDEP. STUDY	Andrew Ng's machine learning, Bill Howe's data science, etc.		<i>graduate course projects</i>
			<i>Coursera courses</i>

## Experience

- 2011–PRESENT **Post Doctoral Research Fellow**, *ATLAS Experiment*, 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 code* to run in batch (Condor) and on the Grid to analyze *large amounts of data*
  - 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 LaTeX documents
  - Constructed event visualizations in various forms
  - Tested new detectors as part of a hardware installation team
  - *Controlled experiment-wide data acquisition*, 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 allowing me to contribute to nearly the *complete analysis*, including
    - exploring the theory and experimental sensitivity with simulation,
    - rejecting backgrounds with BDTs and estimating 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 public documents* on diboson physics sensitivity before data was available.
  - Implemented tools for calculating confidence regions via *marginalized likelihoods*.
  - Collaborating with an engineer and supervising a student, *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* with systematic comparisons, uncovering faults
  - Commissioning of 40 large muon detectors, which involved
    - *leading a team of five students* 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 *software testing platforms* for DAQ hardware used on balloon and satellite experiments
  - *Simulated coded aperture imaging* used at X-ray wavelengths (where lenses are not possible)

## 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

- NOTE "ATLAS measurements of the 7 and 8 TeV cross sections for  $Z \rightarrow 4\ell$  in pp collisions", May 2013. ATLAS-CONF-2013-055
- 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
- PROJECTS See, for instance, <http://cern.ch/wilsona/OtherTopics/NetworksSI708>

## Other interests

- HOBBIES electronics, photography – small analog and microcontroller projects, digital and chemical darkrooms
- CULTURE cooking, travel, hiking, and wandering – seeing, smelling, touching, and tasting the world