

# 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, using likelihoods, Bayesian vs. frequentist, etc.		...the usual Linux/dev. stuff
MACHINE LEARNING	supervised learning, boosted decision trees (BDTs)		...for quantifying level of knowledge
PUBLISHING	L <sup>A</sup> T <sub>E</sub> X, PowerPoint, HTML/CSS, Photoshop, Illustrator, etc.		...including a paper on BDTs and weights
EXTRA PROJECTS	network structures, coding theory, compression		...with the goal to communicate effectively
INDEP. STUDY	Andrew Ng's machine learning course, Bill Howe's data science course, etc.		...in a variety of graduate courses
			...on Coursera

## 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 L<sup>A</sup>T<sub>E</sub>X 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