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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. 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	○ C++ ○ Python ○ ROOT+RooStats+TMVA ○ numpy+scipy+matplotlib	○ SQL variants ○ Mathematica and Matlab ○ shell scripting ○ C & ASM for μ-controllers	○ Javascript ○ Lisp dialects ○ PHP ○ Perl

COMMAND LINE	git/svn, tmux/screen, emacs, ssh/rsync, etc.	*the usual Linux stuff*
STATISTICS	fitting, statistical tests, likelihoods, Bayesian vs. frequentists	*quantifying with limited knowledge*
MACHINE LEARNING	supervised learning, boosted decision trees	*co-authored paper: training BDTs with weighted events*
PUBLISHING	LaTeX+beamer, HTML/CSS, Photoshop/Illustrator/Gimp/Inkscape	*things should look nice*
EXTRA TOPICS	(social) network structure, coding theory, and compression	*graduate course projects*

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 $H \to ZZ \to 4\ell$) and to measurements involving multiple leptons, including the rare decay $Z \to 4\ell$.

- 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 $Z(\to \ell\ell)\gamma$+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