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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. 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	○ 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/dev. stuff*
STATISTICS fitting, using likelihoods, Bayesian vs. frequentist, etc. *...for quantifying level of knowledge*
MACHINE LEARNING supervised learning, boosted decision trees (BDTs) *...including a paper on BDTs and weights*
PUBLISHING LaTeX, PowerPoint, HTML/CSS, Photoshop, Illustrator, etc. *...with the goal to communicate effectively*
EXTRA PROJECTS network structures, coding theory, compression *...in a variety of graduate courses*
INDEP. STUDY Andrew Ng's machine learning course, Bill Howe's data science course, etc. *...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 $H \to ZZ \to 4\ell$) and to measurements involving multiple leptons, including the rare decay $Z \to 4\ell$.

- *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 $Z(\to \ell\ell)\gamma$+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 $Z \to 4\ell$ 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