Andrew Hard

Curriculum Vitae

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Education

2016 (Expected) — **Doctor of Philosophy** in Physics
University of Wisconsin, Madison WI, USA
Thesis: *Search and discovery with the resonant $\gamma\gamma$ final state at ATLAS*
Advised by Prof. Sau Lan Wu

2010 — **Bachelor of Arts** in Physics, Honors
University of Chicago, Chicago IL, USA
Advised by Prof. Edward Blucher

Experience

2011 - 2016 — **Graduate Research Assistant**, *Department of Physics, University of Wisconsin*
- Discovered Higgs boson, performed first measurements of mass, couplings, and spin
- Optimized physics searches with TB-scale datasets using machine learning techniques
- Developed widely used analysis software with C++, Python, ROOT, & shell scripts
- Statistical expert, created new Monte Carlo method to reduce CPU usage by $1000\times$
- Invented algorithm to spatially and temporally match CMOS chip hits at LBNL
- Contributed significantly to 21 papers & notes, author on 250+ ATLAS publications
- Wrote and coordinated sucessful DoE funding reports for Wisconsin ATLAS Group

2014 — **Graduate Teaching Assistant**, *Department of Physics, University of Wisconsin*
- Led discussions and labs on classical mechanics, electrodynamics, thermodynamics
- Designed supplemental exercises and summary notes that boosted exam performances

2010 - 2011 — **CERN Technologist**, *Enrico Fermi Institute, University of Chicago*
- Electronic calibration expert for the ATLAS Experiment hadronic calorimeter
- Developed & maintained calibration software package using Python and MySQL
- Documented, monitored and reported on detector status to collaboration

2009 - 2010 — **Undergraduate Research Assistant**, *Enrico Fermi Institute, University of Chicago*
- Developed particle detector simulation in C++ with ROOT and Geant4 libraries
- Constructed μ particle modules, worked in machine shop, tested electronics

Skills

Scientific — Physics, Statistics, Simulation, Numerical Methods, Data Structures, High Throughput Computing, Databases, Machine Learning, Public Presentation

Programming — C++, Python, Java, LaTeX, Unix/Linux shell scripting, ROOT, Matlab, SQL, TensorFlow

Languages — English (native), French (basic oral and written communication)

Volunteering & Outreach

- Newtonian physics demonstration for Chicago Public Library — 2016
- US voter outreach & registration at CERN — 2016
- Discussed research & funding with U.S. lawmakers in Washington D.C. — 2014, 2015
- Created GIF visualizations of Higgs boson discovery data — 2013
- Visited classrooms at the Chattanooga School for the Arts & Sciences — 2012

Awards

2015 — **Teaching Assistant Rookie of the Year**, *Department of Physics, University of Wisconsin*
2013, 2014 — **Lightning Round Winner**, *US LHC User's Association Annual Meeting*

Selected Publications

Search for resonances in diphoton events at $\sqrt{s} = 13$ TeV with the ATLAS detector, ATLAS Collaboration, J. High Energ. Phys. (2016) 2016: 1. doi:10.1007/JHEP09(2016)001, arXiv:1606.03833 [hep-ex].

Search for Higgs boson pair production in the $b\bar{b}\gamma\gamma$ final state using pp collision data at $\sqrt{s} = 13$ TeV with the ATLAS detector, ATLAS Collaboration, ATLAS-CONF-2016-004, https://cds.cern.ch/record/2138949.

A search for new phenomena in events with missing p_T and a Higgs boson decaying to two photons in a 13.3 fb^{-1} pp collision dataset at $\sqrt{s} = 13$ TeV with the ATLAS detector, ATLAS Collaboration, ATLAS-CONF-2016-087.

Performance of Silicon Pixel Detectors at Small Track Incidence Angles for the ATLAS Inner Tracker Upgrade, ATLAS Collaboration, ATL-INDET-PROC-2015-011, https://cds.cern.ch/record/2065104.

Search for non-pointing and delayed photons in the diphoton and missing transverse momentum final state in 8 TeV pp collisions at the LHC using the ATLAS detector, ATLAS Collaboration, Phys. Rev. D90, 112005 (2014), arXiv:1409.5542 [hep-ex].

Evidence for the spin-0 nature of the Higgs boson using ATLAS data, ATLAS Collaboration, Phys. Lett. B726 (2013) 120, arXiv:1307.1432 [hep-ex].

Measurement of Higgs boson production in the diphoton decay channel in pp collisions at center-of-mass energies of 7 and 8 TeV with the ATLAS detector, ATLAS Collaboration, Phys. Rev. D90, 112015 (2014), arXiv:1408.7084 [hep-ex].

Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Lett. B716 (2012) 1-29, arXiv:1207.7214 [hep-ex].

Significant contributions to 20 papers & notes since 2011, author on 250+ ATLAS publications since 2013.

Conference Presentations

August 2016 — **Search for the production of the Higgs boson in association with invisible particles in the ATLAS detector** (Poster)
38th International Conference on High Energy Physics, Chicago, USA

July 2016 — **Search for a high mass diphoton resonance using the ATLAS detector** (Invited talk)
22nd International Symposium on Particles, Strings and Cosmology, ICISE, Vietnam

November 2014 — **Search for non-pointing and delayed photons in the diphoton and missing transverse momentum final state in 8 TeV pp collisions** (Talk)
2014 US LHC User's Association Annual Meeting, Argonne National Laboratory, USA

April 2014 — **Higgs to diphoton workshop perspective** (Invited talk)
ATLAS Higgs Workshop, Rome, Italy

December 2013 — **Individual and combined measurements of the spin and parity properties of the Higgs boson using the ATLAS detector** (Invited talk)
High Energy Physics in the LHC Era, Valparaíso, Chile

November 2013 — **Spin determination of a narrow resonance near 125 GeV with the two-photon decay channel at ATLAS** (Invited talk)
2013 US LHC User's Association Annual Meeting, Madison, USA

August 2013 — **Spin measurement of the Higgs-like resonance observed in the two photon decay channel in ATLAS** (Talk)
2013 APS Division of Particles and Fields Meeting, SCIPP, Santa Cruz, USA

November 2012 — **$h \to \gamma\gamma$ vector boson fusion** (Invited talk)
US ATLAS Diboson Jamboree, Brookhaven National Laboratory, USA

References

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