Andrew Hard

Curriculum Vitae

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Education

2016 — **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

2017 - Present — **Software Engineer**, *Google*
- Researched generative text models with federated learning and differential privacy
- Published work on federated training for recurrent neural language models
- Developed multi-word prediction networks for Gboard with TensorFlow, C++, Python

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
- Statistical expert, created new Monte Carlo method to reduce CPU usage by $1000\times$
- Contributed significantly to 21 papers & notes, author on 250+ ATLAS publications

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

2009 - 2010 — **Undergraduate Research Assistant**, *Enrico Fermi Institute, University of Chicago*
- Developed particle detector simulation in C++ with ROOT and Geant4 libraries

Skills

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

Programming — C++, Python, Java, Go, 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

Federated learning for mobile keyboard prediction, Andrew Hard, Kanishka Rao, Rajiv Mathews, Françoise Beaufays, Sean Augenstein, Hubert Eichner, Chloé Kiddon, Daniel Ramage, arxiv:1811.03604.

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
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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