

# Andrew Hard

## Curriculum Vitae

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## EDUCATION

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- Expected 2016     **Doctor of Philosophy** in Physics  
*University of Wisconsin, Madison WI*  
Advised by Prof. Sau Lan Wu
- 2010     **Bachelor of Arts** in Physics, Honors  
*University of Chicago, Chicago IL*  
Advised by Prof. Edward Blucher

## EXPERIENCE

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- 2011 - 2016     **Graduate Research Assistant**, *Department of Physics, University of Wisconsin*
  - Discovered Higgs boson, performed first measurements of couplings, spin, and mass.
  - Organizer for first  $h \rightarrow \gamma\gamma$  coupling result, statistical expert for multiple analyses.
  - Invented algorithm to spatially and temporally match CMOS chip hits at LBNL.
  - Developed analysis software with C++, ROOT, & shell scripts used by collaborators.
  - Optimized physics searches in large phase spaces using massive  $O(10^9)$  datasets.
  - Contributed significantly to 19 papers & notes, author on 250+ ATLAS publications.
  - Wrote and coordinated 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.
  - Invented 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 SQL.
  - Published documentation, 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++, ROOT, and Geant4.
  - Constructed  $\mu$  particle modules, worked in machine shop, tested electronics.

## SELECTED PUBLICATIONS

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*Search for resonances in diphoton events at  $\sqrt{s} = 13$  TeV with the ATLAS detector*, ATLAS Collaboration, 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>.

*Search for new phenomena in events with missing transverse momentum and a Higgs boson decaying to two photons in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector*, ATLAS Collaboration, ATLAS-CONF-2016-011.

*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 19 papers & notes since 2011, author on 250+ ATLAS publications since 2013.

## CONFERENCE PRESENTATIONS

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August 2016	<b>Search for the production of Higgs boson in association with invisible particles in the ATLAS detector</b> (Poster) <i>38<sup>th</sup> International Conference on High Energy Physics</i> , Chicago, USA
July 2016	<b>Search for a high mass diphoton resonance using the ATLAS detector</b> (Invited talk) <i>22<sup>nd</sup> International Symposium on Particles, Strings and Cosmology</i> , ICISE, Vietnam
November 2014	<b>Search for non-pointing and delayed photons in the diphoton and missing transverse momentum final state in 8 TeV <math>pp</math> collisions</b> (Talk) <i>2014 US LHC User's Association Annual Meeting</i> , Argonne National Laboratory, USA
April 2014	<b>Higgs to diphoton workshop perspective</b> (Invited talk) <i>ATLAS Higgs Workshop</i> , Rome, Italy
December 2013	<b>Individual and combined measurements of the spin and parity properties of the Higgs boson using the ATLAS detector</b> (Invited talk) <i>High Energy Physics in the LHC Era</i> , Valparaíso, Chile
November 2013	<b>Spin determination of a narrow resonance near 125 GeV with the two-photon decay channel at ATLAS</b> (Invited talk) <i>2013 US LHC User's Association Annual Meeting</i> , Madison, USA
August 2013	<b>Spin measurement of the Higgs-like resonance observed in the two photon decay channel in ATLAS</b> (Talk) <i>2013 APS Division of Particles and Fields Meeting</i> , SCIPP, Santa Cruz, USA
November 2012	$h \rightarrow \gamma\gamma$ <b>vector boson fusion</b> (Talk) <i>US ATLAS Diboson Jamboree</i> , Brookhaven National Laboratory, USA

## SKILLS

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<b>Scientific</b>	Physics, Mathematics, Statistics, Simulation, High Throughput Computing, Numerical Methods, Data Structures, Machine Learning, Collaborative Research, Public Presentation
<b>Programming</b>	C++, Python, Java, $\text{\LaTeX}$ , Unix/Linux shell scripting, ROOT, Matlab, SQL, TensorFlow
<b>Languages</b>	English (native), French (basic oral and written communication)

## VOLUNTEERING & OUTREACH

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■ Newtonian physics demonstration for Chicago Public Library	2016
■ US voter outreach & registration at CERN	2016
■ Discussed research and funding with U.S. lawmakers in 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

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2015	<b>Teaching Assistant Rookie of the Year</b> , <i>Department of Physics, University of Wisconsin</i>
2013 & 2014	<b>Lighting Round Winner</b> , <i>US LHC User's Association Annual Meeting</i>

## REFERENCES

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**Prof. Sau Lan Wu**  
*University of Wisconsin*  
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