

# Andrew Hard

## Curriculum Vitae

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## EDUCATION

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- 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

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- 2017 - Present      **Software Engineer**, *Google*  
  - Developed multi-word prediction algorithms for Gboard with C++, Java
  - Experimented with ML techniques (reinforcement learning, RNNs, LSTMs, CNNs)
- 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×
  - 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

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- 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

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- 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

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- 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

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*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  $13.3\text{ fb}^{-1}$   $pp$  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

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| August 2016   | <b>Search for the production of the Higgs boson in association with invisible particles in the ATLAS detector</b> (Poster)<br><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)<br><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)<br><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)<br><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)<br><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)<br><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)<br><i>2013 APS Division of Particles and Fields Meeting</i> , SCIPP, Santa Cruz, USA  |
| November 2012 | <b><math>h \rightarrow \gamma\gamma</math> vector boson fusion</b> (Invited talk)<br><i>US ATLAS Diboson Jamboree</i> , Brookhaven National Laboratory, USA  |

## REFERENCES

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**Prof. John Parsons**  
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**Dr. Tancredi Carli**  
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