

Andrew Hard

Curriculum Vitae

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EXPERIENCE

- 2019 - Present **Senior Software Engineer**, *Google*
2017 - 2019 **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×
 - 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*
- 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

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

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 Beau-fays, 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

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

REFERENCES

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