

JANNICKE PEARKES

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EDUCATION

Stanford University **Dec 2022 (expected)**
Ph.D. Candidate in Experimental Particle Physics, supervised by Caterina Vernieri and Su Dong

University of British Columbia **2017**
B.A.Sc. Engineering Physics – Electrical Engineering Specialization

RESEARCH EXPERIENCE

SLAC National Accelerator Laboratory **Sept 2017 – Present**
ATLAS Experiment – PhD Candidate (with C. Vernieri and D. Su) Menlo Park, USA

Searches for Di-Higgs to $bb\gamma\gamma$ - Key analyzer and internal note editor [3]:

- Developed and implemented a new b-jet energy calibration method using a deep neural network regression
- Optimized analysis selection for sensitivity to Higgs self-coupling (κ_λ) via parameterized neural networks
- Prepared and validated MC requests for HH signal models, designed our data/MC comparison plots
- Contributed to analysis framework developments in python and C++ used by ~ 20 active analyzers
- Actively participates in group meetings and facilitates collaboration between institutes and individuals

Di-Higgs Combination - Key analyzer and internal note editor [2]:

- Performed non-resonant κ_λ scan and produced the final limit and efficiency plots
- Lead $bb\gamma\gamma$ efforts to ensure statistical orthogonality in the multi-channel combination
- Co-editor of the ATLAS Physics Briefing for the general public [8]

Di-Higgs HL-LHC Prospects Combination - Editor of the conference note [1]:

- Collaborated with the $bb\tau\tau$ and $bb\gamma\gamma$ projections teams to produce combined projections for Snowmass

Inner Tracker Upgrade (ITk) - Qualification Task:

- Assembled test stands for electrical quality control testing of RD53A ASICs with RCE and YARR
- Performed electrical quality control tests of FE-I4 pixel modules used in the CERN Outer Tracker prototype
- Developed the ITk production database and produced tutorials used by ~ 100 people

Stanford University **June 2017 – Aug 2017**
ATLAS Experiment – CERN Summer Student (with L. Tompkins) Meyrin, Switzerland

- Commissioned the ATCA Data Formatter (DF) subsystem of the ATLAS Fast Tracker (FTK)
- Assembled, programmed, installed, tested and debugged FPGAs and microcontrollers in the DF system
- Tested bit error and data transmission rates with the DF subsystem and established acceptable performance

University of British Columbia **Sept 2015 – May 2017**
ATLAS Experiment – NSERC USRA (with W. Fedorko, A. Lister and C. Gay) Vancouver, BC, Canada

Boosted Top Quark Tagging:

- Designed and tested the first constituent-based deep neural network for boosted top tagging in ATLAS.
- Four papers originated from this project. My first author paper has been cited 80 times to date [4],[5],[6],[7].

Z' to Di-lepton Search [8]:

- Performed signal injection tests with the BumpHunter algorithm
- Optimized input parameters to the BumpHunter for increased sensitivity to *Z'* signal models

University of Victoria

May 2015 – Aug 2015

ATLAS Experiment – NSERC USRA (with R. Kowalewski)

Victoria, BC, Canada

- Designed deep convolutional neural networks for classification of ATLAS calorimeter images for the ATLAS Missing Transverse Energy trigger

TRIUMF

Jan 2015 – April 2015

DAQ Group – Senior Design Project (with T. Lindner and F. Retiere)

Vancouver, BC, Canada

- Created a simulation of shaping and read-out electronics with LTSpice for the Hyper Kamiokande Experiment

TRIUMF

Sept 2014 – Dec 2014

EMMA Co-op Student (with B. Davids)

Vancouver, BC, Canada

- Prepared surfaces of ultra-high voltage electrodes and simulated surface defects with ANSYS FEA software

Deutsches Elektronen Synchrotron (DESY)

July 2014 – Sept 2014

CMS Summer Student - μ TCA Group (with U. Behrens and I. Melzer-Pellmann)

Hamburg, Germany

- Programmed FPGAs in VHDL and tested performance of high speed electronics for the CMS HCAL

TRIUMF

Jan 2013 – Apr 2013

TITAN Co-op Student (with B. Schultz and J. Dilling)

Vancouver, BC, Canada

- Simulated ion beams, created an ultra-high vacuum monitoring system with LabView, experimental data analysis [9], [10]

SELECTED PUBLICATIONS

As a member of the ATLAS Collaboration I am an author on over 100+ publications since 2020. For a full list of publications please see my [Inspire record](#). Listed below are publications that I contributed to significantly.

1. *ATLAS Collaboration*, Measurement Prospects of Higgs boson pair production combining the $b\bar{b}\gamma\gamma$ and $b\bar{b}\tau^+\tau^-$ final states with the ATLAS detector at the HL-LHC, [ATL-PHYS-PUB-2022-005](#) (2022)
2. *ATLAS Collaboration*, Combination of searches for non-resonant and resonant Higgs boson pair production in the $b\bar{b}\gamma\gamma$, $b\bar{b}\tau^+\tau^-$ and $b\bar{b}b\bar{b}$ decay channels using pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector, [ATLAS-CONF-2021-052](#) (2021)
3. *ATLAS Collaboration*, Search for Higgs boson pair production in the two bottom quarks plus two photons final state in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector, [CERN-EP-2021-180](#) (2021)
4. *Butter, A. et al.*, The Machine Learning Landscape of Top Taggers, [SciPost Phys. 7.1.014](#) (2019)
5. *ATLAS Collaboration*, Performance of top-quark and W -boson tagging with ATLAS in Run 2 of the LHC, [Eur. Phys. J. C 79 375](#) (2019).
6. *S. Egan, W. Fedorko, A. Lister, J. Pearkes, C. Gay*, Long Short-Term Memory (LSTM) networks with jet constituents for boosted top tagging at the LHC, [\[arxiv:1711.09059\]](#) (2017)
7. *J. Pearkes, W. Fedorko, A. Lister, and C. Gay*, Jet Constituents for Deep Neural Network Based Top Quark Tagging, [\[arxiv:1704.02124\]](#) (2017)

8. *ATLAS Collaboration*, Search for high-mass new phenomena in the dilepton final state using proton-proton collisions at $\sqrt{s}=13$ TeV with the ATLAS detector, [Phys. Lett. B 761](#) (2016)
9. *TITAN Experiment*, Mass measurements of neutron-rich Rb and Sr isotopes, [Phys. Rev. C 93, 045807](#) (2016)
10. *TITAN Experiment*, First direct mass measurement of the neutron-deficient nucleus ^{24}Al , [Phys. Rev. C 92, 045803](#) (2015)

CONFERENCES AND SCHOOLS

International Conference on High Energy Physics – Virtual	Apr 2022
Poster: <i>ATLAS Di-Higgs Combination Results</i>	
APS April Meeting – New York, NY	Apr 2022
Talk: <i>ATLAS Di-Higgs Combination Results</i>	
New Methods and Ideas in Particle Physics – Aspen, Colorado	Mar 2022
Talk: <i>HH Searches with ATLAS</i>	
Higgs 2021 – Virtual, Stony Brook	Aug 2021
Plenary YSF Talk: <i>Search for non-resonant di-Higgs production in the $bb\gamma\gamma$ final state at 13 TeV with ATLAS</i>	
SLAC Summer Institute – Virtual, SLAC	Aug 2021
Poster: <i>Searches for Di-Higgs Decaying to $bb\gamma\gamma$ with the ATLAS Detector</i>	
Hadron Collider Physics Summer School – Virtual, Fermilab	Jul 2020
Machine Learning for Jets – New York, NY	Jan 2020
SLAC Summer Institute – Menlo Park, CA	Aug 2019
Poster: <i>B-jet Energy Regression for HH Searches</i>	
Hadronic Calibration Workshop – Heidelberg, Germany	Sep 2018
CTEQ Summer School – Mayaguez, Puerto Rico	Jun 2018
Machine Learning for Jets – Berkeley, CA	Nov 2017
Inter-Experimental Machine Learning Workshop – CERN, Switzerland	Mar 2017
Talk: <i>Top Tagging with Deep Neural Networks</i>	
APS Northwest Meeting – Penticton, BC, Canada	May 2016
Talk: <i>Using Neural Networks to Separate Signal from Background with Real Missing Transverse Energy</i>	

AWARDS

APS Grad Slam Winner	2022
Martin and Beate Block Award - most promising young physicist, Aspen Center for Physics	2022
NSERC Undergraduate Student Research Award	2016
2nd Place Canadian Undergraduate Physics Conference	2015
NSERC Undergraduate Student Research Award	2015
1st Place TRIUMF Undergraduate Student Symposium	2014
3rd Place Canadian Undergraduate Physics Conference	2014
2nd Place TRIUMF Undergraduate Student Symposium	2013

RESEARCH MENTORING

Everett Lee (SLAC summer student) - $HH \rightarrow bb\gamma\gamma$ kinematic fit	2022
Mirella Vassilev (SLAC graduate student)- b-jet working point studies for VBF $HH \rightarrow bb\gamma\gamma$	2022
Brandon Zhang (Stanford undergraduate student) - $HH \rightarrow bb\gamma\gamma$ kinematic fit	2021
Jake Hofgard (Stanford undergraduate student) - HL-LHC Prospects for $HH \rightarrow bb\gamma\gamma$ analysis	2021
David Wendt (Stanford undergraduate student) - VBF sensitivity studies for $HH \rightarrow bb\gamma\gamma$ analysis	2020
Ishira Fernando, Sean Hackett, Alex Boulton-McKeehan (Stanford undergraduate students)	2020

Dark photon prospects with Mu3e	
Genevieve Hayes (UBC summer student) - Tracks as inputs for boosted top tagging	2019
Shannon Egan (UBC summer student) - LSTMs for boosted top tagging	2018
Anita Mahinpei (UBC summer student) - Adversarial training for boosted top tagging	2018

TEACHING EXPERIENCE

Stanford University	Stanford, CA
<i>Advanced Physics Laboratory - Teaching Assistant</i>	April 2020 – June 2020
<ul style="list-style-type: none"> Advanced undergraduate physics course in which students researched and proposed an experiment of their choice. Mentored a group of students interested in the Atomki anomaly and resonance searches with Mu3e. 	
<i>Learning and Teaching of Science - Student</i>	April 2020 – June 2020
<ul style="list-style-type: none"> Elective course covering best practices in teaching science taught by C. Wieman and G. Trujillo 	
<i>Mechanics Laboratory - Teaching Assistant</i>	October 2019 – December 2019
<ul style="list-style-type: none"> Enriched introductory physics labs covering experimental design and data analysis. Taught students to design research questions, collect and analyse data from pendulums and water bottle rockets, and quantitatively assess where their models fit the data. 	
<i>Introduction to Laboratory Physics - Teaching Assistant</i>	March 2018 – June 2018
<ul style="list-style-type: none"> Enriched introductory physics labs covering optics, heat transfer, radiation, and electronic circuits. Designed and ran introductory python data analysis tutorials 	
Byte Camp Education Society	Vancouver, BC, Canada
<i>Lead Instructor</i>	June 2012 – August 2012
<ul style="list-style-type: none"> Taught programming, animation and video game design in Flash to summer camp students ages 11-14 	

OUTREACH

Discotracker - an ATLAS Inner Tracker inspired art installation	2022
“Design thinking and the Discotracker” Symmetry Magazine article written by Emily Driehaus	
ATLAS Physics Briefing - HH Combination, lead author	2021
Link on ATLAS Website	
ATLAS Physics Results Explained Video for $b\bar{b}\gamma\gamma$ analysis - participant	2020
Link to our video	
“What is a particle?” - York House Girls School outreach presentation	2019

LEADERSHIP ACTIVITIES

SLAC Users Organization – High Energy Physics Advocacy Representative	March 2018 & 2020
<ul style="list-style-type: none"> Lead meetings with 25 congressional offices in Washington DC to advocate for High Energy Physics 	
UBC Snowbots – Autonomous Robotics Team	Sept 2012 – Dec 2015
Member → Software Team Lead → Team Captain	
<ul style="list-style-type: none"> As software lead, developed computer vision system (filtering, lane following) with OpenCV in C++, developed LIDAR obstacle avoidance, GPS navigation algorithms, and high level AI for integrating the multiple subsystems. As team captain, co-ordinated growth of the team from 15 to 56 active students Raised over \$30,000 in funding for the team and organized team travel to 3 international competitions 	

SKILLS

Languages: English and German (bilingual), French (intermediate)

Programming Languages: Python, C++, Bash, C, VHDL, Verilog, MATLAB, LabView

Libraries: Tensorflow, Keras, Numpy, Pandas, Scikit-learn, Matplotlib, Open-CV, ROS

High Performance Computing: Slurm, condor, torque, moab

Laboratory: Ultra high voltage and ultra high vacuum cleanroom experience

Rapid Protoyping: Water-jet, laser-cutter, 3D printer, lathe, 40 hour machine shop course

Communication: Award winning public speaking skills and writing of papers/documentation

Group Culture: Regular organizer of research group dinners and social activities

OTHER ACTIVITIES

Enjoys backpacking, hiking, skiing, climbing and listening to podcasts. AIARE 1 (avalanche safety) and wilderness first aid certified.