Garrett Merz
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Github Page: https://github.com/GarrettMerz
Website: https://garrettmerz.github.io/

EDUCATION:

University of Michigan, Ann Arbor MI
Ph.D. Physics, expected Spring 2021
GPA: 3.744 (4.0 scale)

The Ohio State University, Columbus, OH
B.S. Physics, Mathematics with Honors Research Distinction, 2016
GPA: 3.811

NOTABLE RESEARCH EXPERIENCE:

ATLAS High Energy Experimental Physics Group at University of Michigan
PhD Candidate; Advisor Dr. Thomas Schwarz

Measuring the CP Properties of a Neutral Higgs with ttH→yy: October 2018-Present

- Topic of graduate thesis work
- Produce and validate data and Monte Carlo samples
- Implement and develop top-quark object reconstruction methods, including a top reconstruction Boosted Decision Tree using engineered features and a kinematic likelihood-based fitting method (KLFitter)
- Construct, optimize and train a series of Boosted Decision Trees (BDTs) to discriminate between rare Standard Model top-associated Higgs production process (ttH), alternative-model "CP-odd" top-associated Higgs production (CP-Odd ttH), and continuum diphoton background events
- Create continuum background templates for measurement of "spurious signal" uncertainty
  - Perform studies to determine optimal method for template construction
- Perform signal shape parameterization
- Present analysis summary at 2019 USATLAS Meeting in Amherst, Massachusetts
- Investigate the applicability of a multiclassifier BDT to discriminate between Standard Model ttH, CP-odd ttH, and continuum diphoton background events
- As Internal Note Editor, produce and maintain internal documentation related to the analysis

Measurements of Higgs boson properties in the diphoton decay channel at $\sqrt{s}$ = 13 TeV with the ATLAS detector: May 2018-Present

- First-ever observation of rare top-associated Higgs production process (ttH)
- Document and maintain n-tuple sample production codebase
- Create continuum background templates for measurement of "spurious signal" systematic
- Perform signal shape parameterization
- As HGAM analysis DAOD contact, promptly produce and monitor DAOD data/ Monte Carlo samples
  - Respond promptly to ATLASSIAN JIRA tickets
  - Maintain the HGAM DAOD production codebase

CMS/CDF Computational Physics Lab at The Ohio State University
Undergraduate Researcher; Advisor Dr. Richard Hughes

Using Convolutional Neural Networks to Identify ttH Events at the LHC: August 2014-June 2016

- Learned to write and implement Convolutional Neural Networks (CNNs) in MatLab and Torch7
- Tested these networks' ability to effectively analyze Monte Carlo simulations of event images gathered

from a multipurpose high-energy physics detector
- Investigated CNNs' ability to discriminate between similar physics processes, namely *ttbar* and *W+jets*
- Applied techniques such as dropout and regularization to improve performance
- Explored implementation of scene-labeling techniques on simulated detector images
- Presented progress at 2015 Fall Undergraduate Poster Forum and 2015 Natural and Mathematical Sciences Forum
- Undergraduate thesis defended in spring of 2016

ADDITIONAL DATA SCIENCE EXPERIENCE:

Proficiency in C/C++, Mathematica, ROOT, MatLab, Python 2 and 3, UNIX/Linux, git, TensorFlow/Keras
RELEVANT EXPERIENCE:

- Took EECS 545: Machine Learning at University of Michigan
  - Covered topics such as Linear/Logistic Regression, Kernels, K-Nearest Neighbors, Support Vector Machines, Boosted/Bagged Decision Trees, Neural Networks
  - Final project: predict political party affiliation from text of political speech
  - Projects and assignments on my github page!
- Attended Yandex Machine Learning in High Energy Physics (MLHEP 2017) summer school in Reading, UK
  - Weeklong course consisting of lectures, hands-on coding sessions, and a Kaggle challenge. Covered topics such as Convolutional/Recurrent Neural Networks, Gaussian Process Regression, etc.

NOTABLE SCHOLARSHIPS AND LEADERSHIP ROLES:

2018 National Science Foundation Graduate Research Fellowship
2018 UM Science Communication Fellowship Program
2017 Norman Barnett Award
2016 Denman Research Forum, First Prize
2016 National Science Foundation Graduate Research Fellowship Program, Honorable Mention
2015 Staninovski Mathematics Scholarship
2015 Phi Beta Kappa Honorary
2012 Valentino Physics Scholarship
2012 Honors Medalist Scholarship
Society of Physics Students, OSU Chapter: *Vice President* 2013-2015

SCIENCE COMMUNICATION:

“Saturday Morning Physics: Update on Physics from the LHC”: 30 March 2019
- Assist in delivery of televised lecture on top-associated Higgs production
- Perform and discuss various demonstrations

UM Science Communication Fellowship Program
• Construct tabletop high-energy physics detector demonstration; present at Museum of Natural History open houses and public events

ComSciCon 2019
- Attend seminars on science journalism, data visualization, podcast development
- Produce and workshop a piece of science communication writing

UMATLAS Virtual and Augmented Reality Outreach Program: June 2016-Present
- Assist in development of the ATLASRift virtual reality experience for the HTC Vive and Oculus Rift headsets (showcasing the ATLAS detector in virtual reality)
- Present the ATLASRift software to the general public at museums and showcases
- Develop novel pedagogical experiences integrating virtual and augmented reality demonstrations into introductory physics laboratory classes