John Franklin Crenshaw

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Education

Duke University, Durham, NC, USA *2015 – Present*
B.S. in Physics *expected May 2019*
B.A. in German Language and Literature
GPA: 4.0

Humboldt University, Berlin, Germany *Fall 2017*

Research Experience

Duke University Neutrino and Cosmology Group *August 2016 – Present*
Durham, NC

- Working with Dr. Kate Scholberg on the Helium and Lead Observatory (HALO), a supernova neutrino detector based at SNOLAB in Ontario, Canada.
- Simulated the HALO detector in Geant4 to determine the efficiency of neutron capture for neutrino-induced neutrons as a function of energy.
- Performed Monte Carlo studies and used Bayesian algorithms to improve the data unfolding process and to understand how astrophysical parameters influence the analysis of HALO data.
- Developed a figure of merit to quantify how HALO's sensitivity varies with supernova distance.
- Used the SNOwGLoBES supernova-neutrino flux modeling software to calculate the expected neutron production rates in HALO for various supernova models.
- Wrote a technical note for the collaboration, summarizing my results and methods for use in other research efforts.

Institute for Nuclear Physics, Karlsruhe Institute of Technology *May - August 2018*
Karlsruhe, Germany

- Worked with Dr. Andreas Haungs and Agnieszka Leszczyńska in Karlsruhe, Germany as a part of the DAAD RISE program, a science exchange program hosted by the German government.
- Worked at the Institute for Nuclear Physics on the IceTop Air Shower Array, a cosmic ray detector located at the South Polse
- Used CORSIKA air shower simulations to study the muon composition of extensive air showers initiated by high energy cosmic rays in the atmosphere.
- Successfully discovered correlations between the signal density and lateral distance distribution to the number of muons in the shower.
- Developed metrics to calculate the muon number from IceTop Cherenkov tank signals.

Presentations

- Data Unfolding for the Helium and Lead Observatory, *28th International Conference on Neutrino Physics and Astrophysics*, Heidelberg, Germany, June 2018. DOI 10.5281/zenodo.1301081
- Data Unfolding and Supernova-Neutrino Flux Modeling for HALO, *Duke University Physics Department Undergraduate Poster Session*, April 2018
- Efficiency Studies for the Helium and Lead Observatory, *Duke University Physics Department Undergraduate Poster Session*, April 2017

Teaching Experience

Duke University Physics Department *August 2016 – Present*

Teaching Assistant for Physics 142L – General Physics II: Electricity and Magnetism
Teaching Assistant for Physics 151L – Introductory Mechanics for Engineers
Teaching Assistant for Physics 152L – Introductory Electricity, Magnetism, Optics for Engineers

- As the sole instructor in the room, I directed lab sections and taught relevant physics concepts to large classes of introductory physics students.
- Tutored students who requested additional help outside of the classroom.

Self-Employed *January 2016 – Present*

Private Tutor

- Tutored undergraduates in Introductory Physics, Modern Physics, Intermediate Mechanics, Multivariable Calculus, and Linear Algebra

Awards

Duke Faculty Scholar of the Class of 2019

- The highest award given to undergraduates by the Duke University Faculty, in recognition of independent work that suggests "great potential for innovative scholarship and a scholarly career."

Phi Beta Kappa, *national academic honors society*
Sigma Pi Sigma, *national physics honors society*
Delta Phi Alpha, *national German honors society*
Dean's List with Distinction, *Duke University*

- Indicates a GPA within the top 10% of all undergraduates for the given semester.
- Awarded every semester while at Duke.

Skills

Programming: Python, C++, Mathematica, Root, Geant4, SNOwGLoBES, Keras
Other: Git, GitHub, HTCondor, LaTeX, Microsoft Office
Operating Systems: Linux, Windows
Language: English (fluent), German (proficient)