

John Franklin Crenshaw

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<https://jfcrenshaw.github.io>

Education

University of Washington, Seattle, WA
PhD in Physics

2019 – present

Duke University, Durham, NC, USA
B.S. in Physics, minor in German Language and Literature
GPA: 4.0, summa cum laude

2015 – 2019

Test Scores:

Physics GRE: 930

General GRE: Quant (169) Verbal (170) Writing (4.5)

Research Experience

Duke University Neutrino and Cosmology Group

*August 2016 – May 2019
Durham, NC*

- Working with Dr. Kate Scholberg on the Helium and Lead Observatory (HALO), a supernova neutrino detector based at SNOLAB in Ontario, Canada, and HALO-1kT, the proposed 1-kiloton upgrade to HALO.
- 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 analysis to improve the data unfolding process and to understand how astrophysical parameters influence the analysis of HALO and HALO-1kT data.
- Developed figures of merit to quantify how the sensitivities of HALO and HALO-1kT vary with supernova distance and detector design.
- Calculated expected neutron production rates in HALO and HALO-1kT for various supernova models using the SNOwGLoBES event rate calculator.
- Wrote a technical note for the HALO collaboration, summarizing my results and methods for use in other research efforts. Journal article in preparation.

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 research 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 Pole.
- Studied the muon composition of high energy cosmic ray air showers using CORSIKA air shower simulations.
- Successfully discovered correlations between the number of muons in the shower and the signal density and lateral charge distribution.
- Developed a neural network with Keras to predict the muon number from IceTop Cherenkov tank signals.

Publications

- Sensitivity of the Helium and Lead Observatory to Supernova Neutrino Spectra, *with Kate Scholberg, in preparation for journal submission*
- Simulation, Data Unfolding, and Flux Modeling for Supernova Neutrino Detection with the Helium and Lead Observatory, *senior thesis*
- Data Unfolding and Supernova Distance Studies for HALO, *internal collaboration report*

Presentations

- Data Unfolding for the Helium and Lead Observatory, *5th Joint Meeting of the APS Division of Nuclear Physics and the Physical Society of Japan*, Waikoloa, Hawaii, October 2018
- 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

Teaching Experience

Duke University Physics Department

August 2016 – May 2019

Teaching Assistant for Introductory Mechanics, and Introductory Electricity, Magnetism, and Optics, for life science students and 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.

Self-Employed

January 2016 – May 2019

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.”

Daphne Chang Memorial Award

- award given by Duke Physics Department to undergraduates for excellence in research

Highest Distinction for Undergraduate Thesis

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, LabView

Software: Root, Geant4, SNOwGLOBES, Keras

Hardware: basic circuitry, basic radio telescope operation, use of oscilloscopes, function generators, and spectrum analyzers

Other: Git, GitHub, HTCondor, SSH, LaTeX, Microsoft Office

Operating Systems: Linux, Windows

Language: English (fluent), German (proficient)