

# John Franklin Crenshaw

(615) 636 – 4935 | john.crenshaw@duke.edu  
601 Westview Ave Nashville, TN 37205  
<https://jfcrenshaw.github.io>

## Education

---

**Duke University**, Durham, NC, USA

*2015 – Present*

B.S. in Physics

*expected May 2019*

Minor in German Language and Literature

**GPA: 4.0**

**Humboldt University**, Berlin, Germany

*Fall 2017*

### Test Scores:

Physics GRE: 930

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

## 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, 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 publication 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 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 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.

## Presentations

---

- Data Unfolding for the Helium and Lead Observatory, *5<sup>th</sup> 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, *28<sup>th</sup> 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, 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)