

# Miles Cochran-Branson

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## EDUCATION

### University of Washington

PHD, PHYSICS

Seattle, WA | Jun. 2023 - Present

### Lawrence University

BACHELOR OF ARTS, MAJOR: PHYSICS, MINOR: MATHEMATICS

GPA: 3.99/4.00

Appleton, WI | June 2023

## HONORS

- Phi Beta Kappa, member since June 2023
- J. Bruce Brackenridge Prize for excellence in physics
- $\Sigma\Pi\Sigma$ —Physics Honors Society—member since 2022
- Sir Isaac Newton Award for creativity in computational physics problem-solving
- Ralph White Prize in Mathematics for excellence in mathematics
- Maurice Cunningham Phi Beta Kappa Prize for the highest GPA in the junior class at Lawrence U.
- Phi Beta Kappa Downer Freshman Prize for academic excellence during first year classes at Lawrence U.

## CAPSTONE PROJECT

- Independent research in scientific machine learning and physics-informed neural networks
- Developing physics-informed neural network to solve Einstein's field equations numerically and obtain the Schwarzschild metric
- Results of project will be presented to the physics and mathematics community at Lawrence U.

## RESEARCH EXPERIENCE

### RESEARCH AIDE | CERN

Geneva, Switzerland | June 2023 - September 2023

- Validated electroweak contribution of background events in the  $Z + \text{jets}$  background of the  $H \rightarrow \tau\tau$  analysis in the ATLAS collaboration
- Extensively studied systematic uncertainties of the analysis
- Presented findings at weekly meetings
- Documented results in ATLAS internal note

### REU INTERN | UNIVERSITY OF WASHINGTON

Seattle, WA | June 2022 - August 2022

- Implemented deep neural networks (DNN) and mixture density networks (MDN) to better describe the  $p_T$  spectrum of  $\tau$  leptons in the ATLAS detector at the Large Hadron Collider (LHC)
- Learned fundamentals of machine learning techniques
- Presented findings for the Tau working group at ATLAS
- Results are currently being prepared to merge into ATLAS software

### REU INTERN | UNIVERSITY OF CALIFORNIA, DAVIS

Davis, CA | June 2021 - August 2021

- Developed estimate for double production of quarkonium in PbPb collisions to be used in current analysis
- Implemented Monte-Carlo principles and simulation techniques
- Collaborated with group of 15 fellow researchers
- Presented findings at the national Division of Nuclear Physics (DNP) conference as part of the American Physical Society (APS)

**RESEARCH INTERN | LAWRENCE U.**

Appleton, WI | June 2020 - December 2020

- Developed a model using principals from physics education research (PER) and psychology to improve introductory physics courses at Lawrence U.
- Conducted research on the use of free body diagrams and introductory student approaches to physics
- Led interviews with students and made coding scheme to quantify interview results
- Presented findings and conclusions leading to modifications in course structure for intro-physics courses

## PRESENTATIONS AND PUBLICATIONS

Cochran-Branson, M and Buat, Q. *TES determination using a Mixture Density Network (MDN)*. Presentation given to: Tau Working Group at ATLAS, Virtual meeting (Geneva, Switzerland), 2022.

Cochran-Branson, M and Calderon de la Barca Sanchez, M. *An estimate for the production of double quarkonium in PbPb collisions at  $\sqrt{s_{NN}} = 5.02$  TeV*. Poster session presented at: National Division of Nuclear Physics conference, 2021, October 12-14; Virtual Meeting (Boston).

## ADDITIONAL EXPERIENCE

**TEACHING ASSISTANT | LAWRENCE U.**

Appleton, WI | September 2020 - Present

- Solidify foundations in fundamentals of physics

**TUTOR | LAWRENCE U.**

Appleton, WI | March 2021 - Present

- Tutor for five physics and five math classes

**CHAPTER PRESIDENT | SOCIETY OF PHYSICS STUDENTS**

Appleton, WI | September 2021 - Present

- Applied and received funding for joint project launching a weather balloon with local high school
- Organized weekly meetings to foster community between introductory students and professors

**PRESIDENT | LAWRENCE SWING DANCING**

Appleton, WI | September 2020 - Present

- Design, organize, and teach lessons in fundamentals of swing dance

**BERYLLIA STRING QUARTET | LAWRENCE U.**

Appleton, WI | September 2019 - December 2021

- First violinist for the Beryllia String Quartet

**DATA ANALYST | RB CONSULTING**

Carmichael, CA | November 2019 - December 2019

- Developed skills in data collection, analysis, and presentation

## TECHNICAL SKILLS

**Computer Languages:** Python, Julia, C++, R

**Packages:** ROOT, NumPy, Matplotlib, Tensorflow, HomotopyContinuation.jl, DifferentialEquations.jl, NeuralPDE.jl, Flux.jl

**Technology:**  $\LaTeX$ , Mathematica, Git

**Spoken Languages:** Professional working proficiency in German