Miles Cochran-Branson

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EDUCATION

University of Washington — Seattle, WA | Sep. 2023 - Present
PhD, Physics

Courses Taken and In Progress
Quantum Mechanics, Statistical Mechanics, Electromagnetism and Relativity

Lawrence University — Appleton, WI | June 2023
Bachelor of Arts, Major: Physics, Minor: Mathematics
GPA: 3.99/4.00

Honors

- J. Bruce Brackenridge Prize for excellence in physics
- 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 — Physics-Informed Neural Networks

- Independent research in scientific machine learning and physics-informed neural networks
- Developed physics-informed neural network to numerically solve Einstein's field equations and obtained the Schwarzschild metric [1]
- Results of project presented to the physics and mathematics community at Lawrence U.

RESEARCH EXPERIENCE

RESEARCH AIDE | University of Washington — Geneva, CH / Seattle, WA | June 2023 - Present

- Validated electroweak contribution of background events in the Z + jets background of the $H \to \tau\tau$ analysis in the ATLAS collaboration
- Extensively studied systematic uncertainties of the analysis
- Presented findings at weekly meetings
- Documented results in ATLAS internal note (supporting document) for upcoming publication

PHYSICS REU | 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 τ leptons in the ATLAS detector at the Large Hadron Collider (LHC) [2]
- 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

PHYSICS REU | 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)

[1] https://github.com/milescb/solve_PDEs_with_PINN
[2] https://github.com/milescb/taunet/tree/master

UNDERGRAD RESEARCH ASSISTANT | 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).[3]

TEACHING

GRAD. TEACHING ASSISTANT | University of Washington Seattle, WA | Sep. 2023 - Present

- Lead tutorials and lab sections for introductory physics courses

UNDERGRAD TEACHING ASSISTANT | Lawrence U. Appleton, WI | Sep. 2020 - June 2023

- Communicated challenging physics concepts in a fun and engaging way

PHYSICS AND MATHEMATICS TUTOR | Lawrence U. Appleton, WI | March 2021 - June 2023

ADDITIONAL EXPERIENCE

CHAPTER PRESIDENT | Society of Physics Students Appleton, WI | Sep. 2021 - June 2023

- 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 | Sep. 2020 - June 2023

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

BERYLLIA STRING QUARTET | Lawrence U. Appleton, WI | Sep. 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

AFFILIATIONS

Member, Phi Beta Kappa—National Honors Society
Member, Sigma Pi Sigma—Physics Honors Society
Member, American Physical Society

[3] `https://meetings.aps.org/Meeting/DNP21/Session/GA.5`