Benjamin W. Walker

Ben.Walker2@utdallas.edu · +1 (985) 264-1836 · linkedin.com/in/benjaminwwalker

Education

Polytechnique Fédérale de Lausanne (EPFL) / Grenoble-INP / PoliTo May 2025
M.S. in Micro and Nanotechnologies for Integrated Systems

The University of Texas at Dallas May 2023
B.S. in Physics and B.S. Electrical Engineering, Minor in Nanotechnology *GPA: 3.93*

Northwestern State University May 2019
Associate's of General Studies *GPA: 3.85*

Louisiana School for Math, Science, and the Arts (LSMSA) May 2019
High School Diploma *GPA: 3.93*

Fellowships

National Science Foundation Graduate Research Fellowship Program March 2023
- Three years of full PhD funding with a $37,000 annual stipend

McDermott Fellowship Program March 2023
- 4-Year annual $10,000 discretionary research stipend and $36,000 for 4th year of PhD funding

Barry Goldwater Scholarship March 2022
- Most prestigious award for an undergraduate researcher from my work in skyrmion logic devices

National Merit Scholarship March 2019
- Received full-ride scholarship at UT Dallas plus housing and $28,000 in stipends

Patents

1. **B. W. Walker**, A. E. Edwards, X. Hu, and J. S. Friedman, Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *U.S. Patent Application No. 63/480,374* (Filed: 01-18-2023)

Professional Experience

Research Assistant May 2023 – Present
University of Texas at Dallas - NeuroSpinCompute Laboratory *Richardson, TX*
- Leading a team of undergraduate researchers to design and optimize skyrmion circuits, acheiving thus far a 10× reduction in energy consumption
- Developing novel approaches to micromagnetic-based reservoir computing, which use machine learning to optimize device structure

Research Intern May 2024 – August 2024
Université Paris-Saclay - Integnano Laboratory *Palaiseau, France*
- Devloped an STT-MRAM inference array which utilizes a novel write-in-series approach to reduce transistor overhead and minimize energy for compute-in-memory applications
- Analyzed the performance of the array to ensure an error rate of fewer than 1 per 10,000

Undergraduate Research Assistant Oct 2019 – May 2023
University of Texas at Dallas - NeuroSpinCompute Laboratory *Richardson, TX*
- Invented a novel skyrmion logic device that uses voltage-controlled magnetic anisotropy (VCMA) to control skyrmion propagation and synchronization, which reduces power consumption by over 100×
- Designed large-scale reversible skyrmion logic circuits, which demonstrate efficient pipelining and maintain efficiency at scale

Hardware Engineering Intern May 2022 – July 2022
Microsoft - Physical Design Team *Raleigh, NC*
- Helped develop a custom floorplanning step by pre-placing standard cells and buffers and pre-routing trunks on high-speed critical buses to achieve flop to flop reach in several millimeters
- Created an interpreter between Innovus and Fusion Compiler (FC) for our TCL Physical Design scripts, aiding my team's translation effort and improved its efficiency by 50%

Visiting Researcher Jan 2022 – April 2022

Universidad de Salamanca - Simulación de Nanoestructuras Magnéticas (SINAMAG) *Salamanca, Spain*

- Designed voltage-driven reversible skyrmion logic circuits to reduce energy consumption with Mumax3
- Parametrically modelled and optimized micromagnetic devices in COMSOL to increase electrical efficiency by 70%

MRSEC Research Experience for Undergraduates May 2021 – Aug 2021

University of Texas at Austin - Integrated Nano Computing Lab *Austin, TX*

- Fabricated and validated WSe2-based devices via electron beam lithography (EBL), atomic force microscopy (AFM), and magneto-optic Kerr effect (MOKE) imaging

Electrical Engineering Intern Jan 2021 – Aug 2021

University of Texas at Dallas - Texas Analog Center for Excellence *Richardson, TX*

- Helped design a spin transfer torque (STT) memristor-based neuromorphic chip, collaborating with graduate students
- Verified aspects of device's logical operation via Verilog to prepare tapeout for foundry

Journal Publications

1. X. Hu, C. Cui, S. Liu, F. Garcia-Sanchez, W. H. Brigner, **B. W. Walker**, A. J. Edwards, T. P. Xiao, C. H. Bennett, N. Hassan, M. P. Frank, J. A. C. Incorvia, and J. S. Friedma, Magnetic Skyrmions and Domain Walls for Logical and Neuromorphic Computing, *Neuromorphic Computing and Engineering*, Mar 2023, *doi*: 10.1088/2634-4386/acc6e8

2. **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, X. Hu, M. P. Frank, F. Garcia-Sanchez, J. S. Friedman, Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *ArXiv Condensed Matter*, Jan 2023, *doi*: 10.48550/arXiv.2301.10700

3. X. Hu, **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, P. Zhou, J. A. C. Incorvia, A. Paler, M. P. Frank, J. S. Friedman, Logical and Physical Reversibility of Conservative Skyrmion Logic, *IEEE Magnetics Letters*, May 2022, *doi*: 10.1109/LMAG.2022.3174514

4. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman, "Skyrmion Logic Clocked via Voltage- Controlled Magnetic Anisotropy" *Applied Physics Letters*, May 2021, *doi*: 10.1063/5.0049024

Conference Publications and Presentations

1. **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, X. Hu, M. P. Frank, F. Garcia-Sanchez, J. S. Friedman Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *Government Microcircuit Applications & Critical Technology Conference*, Mar. 2023.*

2. X. Hu, **B. W. Walker**, F. Garcia-Sanchez, P. Zhou, J. A. C. Incorvia, A. Paler, M. P. Frank, J. S. Friedman, Logical and Physical Reversibility of Conservative Skyrmion Logic, *Government Microcircuit Applications & Critical Technology Conference*, Mar. 2022.

3. **B. W. Walker**, B. W. Walker, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, J. S. Friedman, Conservative Skyrmion Logic with Voltage-Controlled Magnetic Anisotropy Synchronization, *Joint IEEE International Magnetics Conference & Conference on Magnetism and Magnetic Materials*, Jan. 2022.*

4. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman, Skyrmion Logic with Voltage-Controlled Magnetic Anisotropy Clocking *Texas Analog Center for Excellence Symposium*, Oct. 2021*

5. X. Hu, M. Chauwin, F. Garcia-Sanchez, **B. W. Walker**, N. Betrabet, J. A. C. Incorvia, A. Paler, C. Moutafis, J. S. Friedman, Skyrmion Logic System for Large-Scale Reversible Computing, *IEEE International Conference on Nanotechnology*, Jul. 2021 (invited).

6. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman, "Voltage Controlled-Clocked Skyrmion Logic Synchronizers," *International Conference on Nanomagnetism and Spintronics (Solitons and Skyrmion Magnetism)*, Jun. 2021*

*Presented In-Person

Poster Presentations

1. **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, X. Hu, M. P. Frank, F. Garcia-Sanchez, J. S. Friedman, Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *Undergraduate Research Day at the Texas Capitol*, Apr. 2023

2. **B. W. Walker**, A. J. Edwards, F. Garcia-Sanchez, M. P. Frank, and J. S. Friedman "Low-Dissipation Conservative Skyrmion Logic with Voltage-Based Propagation," *University of Texas at Dallas Undergraduate Research Scholar Awards*, Apr. 2022

3. **B. W. Walker**, X. Li, and J. A. C. Incorvia, "Fabrication and Analysis of WSe2-based Electronic Devices," *MRSEC REU Poster Presentation*, Jul. 2021

4. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman "Skyrmion Logic Clocked via Voltage-Controlled Magnetic Anisotropy," *University of Texas at Dallas Undergraduate Research Scholar Awards*, Apr. 2021

Miscellaneous Awards

Pacific Crest Trail Thru-Hiker: Hiked 2000+ miles from Mexico to Canada	August 2023
Undergraduate Research Scholar Award: Accepted for presentation at UT Dallas	April 2021/2022/2023
Patti Henry Pinch Scholarship: UTD Funding for 2023 GOMAC Tech Presentation	March 2023
TxACE Best Poster Award: Presented research and won against 30 graduate students	October 2021
Colorado Trail Thru-Hiker: Hiked 500 miles from Denver to Durango, Colorado	August 2021
First Place CometHack: Our thermostat project won first prize	April 2021
National Youth Science Foundation Delegate: Louisiana's State Representative	May 2019
Hall of Fame: Highest honor for my high school (analogous to valedictorian)	May 2019
Eagle Scout: Boy Scouts of America's highest honor	July 2016