Edward Deleu

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Research Interests

Applied Physics, Quantum Materials, Condensed-Matter Physics, Computational Materials Science, First-Principles Modelling, DFT Simulations, High-Performance Computing, Semiconductor Materials

Education

Stanford University *June 2026 – Present*

Doctor of Philosophy (Ph.D.) in Materials Science and Engineering

- Advisor: Prof. Felipe Jornada
- NSF Graduate Research Fellowship (GRFP) Fellow

Princeton University *September 2022 – May 2026*

Bachelor of Science in Engineering (B.S.E.) in Electrical and Computer Engineering

- Graduated with Highest Honors | GPA: 3.98 / 4.0
- Minors: Materials Science & Engineering, Computer Science

Ramapo High School, Franklin Lakes, New Jersey *September 2018 – June 2022*

High School Diploma | GPA: 4.461 / 4.0

Experience

Stanford University – Department of Materials Science and Engineering

***Ph.D. Student Researcher*, Prof. Felipe Jornada** *June 2026 – Present*

Princeton University – Department of Electrical and Computer Engineering

***Undergraduate Researcher in 2D Materials*, Prof. Saien Xie** *June 2025 – May 2026*

- Investigating strain engineering in 2D transition metal dichalcogenide (TMD) lateral heterostructure devices using Raman/photoluminescence spectroscopy; exploring how uniaxial and biaxial strain tune band offsets and electronic structures for potential nanoscale sensing and optoelectronic applications.
- Optimizing fabrication and polymer-assisted transfer methods to improve strain-transfer efficiency in flexible TMD devices, complemented by VASP DFT simulations quantifying strain-induced band-structure evolution and its effects on excitonic and electronic transport properties.

***Undergraduate Researcher in Applied Physics*, Prof. Ravindra Bhatt** *December 2024 – October 2025*

- Designed and optimized large-scale Python/CuPy/Numba simulation pipelines on Princeton's computing cluster, leveraging 447k CPU-hours and 7k GPU-hours of compute to model disordered integer quantum Hall effect systems in the lowest Landau level to generate a statistically robust dataset.
- Visualized quantum Hall spectra and eigenstate statistics across hundreds of millions of states, applying scaling analysis across system-sizes to extract localization-length exponents and verify simulation results against theoretical predictions and past methodologies.
- Performed advanced statistical and topological analysis of level-spacing statistics and Chern number distributions, contrasting the results of Random Matrix Theory with distribution-fitting methods of the simulation ensembles to reveal new distribution behaviors of quantum states according to their Chern character.

Seagate Technology – Films, Integration, and Inspection Group
Wafer Process Engineering Intern *June 2024 – August 2024*

- Developed efficient and adaptable image processing pipelines and algorithms with OpenCV in Python for highly sensitive sub-100nm anomaly detection in critical-dimension SEM images; the pipeline was implemented and fully scaled in a wafer production environment for improved wafer and process monitoring in real-time.
- Assessed and analyzed capabilities of existing metrology equipment for optical critical-dimension measurements and overlay control by running tools and setting up new recipes to reduce wafer moves, increasing production throughput and efficiency.

Princeton University – Andlinger Center for Energy and the Environment
***Undergraduate Researcher in Machine Learning*, Prof. Minjie Chen** *June 2023 – February 2024*

- Designed and implemented a scalable machine learning framework in PyTorch for magnetic core-loss modeling, incorporating physics-informed normalization and modular material-specific neural networks. The architecture achieved 1.3% average error across various soft-ferrites, enabling expansion to new magnetic materials with minimal experimental data, advancing data-driven materials characterization and design through the largely material-invariant, generalized architecture.
- Leveraged automated hyperparameter tuning with Optuna to evaluate hundreds of candidate models and optimized deployment on Princeton's computing cluster for up to 12× inference speedup.
- Curated datasets and developed reproducible machine learning toolkits for the international 2023 MagNet Challenge for advancing open-source core-loss modeling, including data-augmentation pipelines and robust competition evaluation metrics adopted by 20+ participating universities.

Publications

E. Deleu, R. Samajdar, R. Bhatt, "Topological Properties of the Lowest Landau Level: A Study of Chern Number Statistics," [Manuscript in Preparation]

E. Deleu et al., "Multi-Material Power Magnetics Modeling with a Modular and Scalable Machine Learning Framework," 2024 IEEE Applied Power Electronics Conference and Exposition (APEC), Long Beach, CA, USA, 2024, pp. 370-377, doi: 10.1109/APEC48139.2024.10509142.

J. Li, **E. Deleu**, W. Lee, H. Li, M. Chen and S. Wang, "Investigating the Mutual Impact of Waveform, Temperature, and Dc-Bias on Magnetic Core Loss using Neural Network Models," 2024 IEEE Applied Power Electronics Conference and Exposition (APEC), Long Beach, CA, USA, 2024, pp. 391-395, doi: 10.1109/APEC48139.2024.10509194.

E. Deleu, S. Elez, A. Gadodia, K. Macvaugh and G. Zhao, "Using Deep Learning for Urban Pedestrian Counting," 2021 IEEE MIT Undergraduate Research Technology Conference (URTC), Cambridge, MA, USA, 2021, pp. 1-5, doi: 10.1109/URTC54388.2021.9701649.

Honors & Awards

- **Charles Ira Young Memorial Tablet & Medal,** Princeton University Department of Electrical and Computer Engineering (2026)
- **Lore von Jaskowsky Memorial Prize,** Princeton University School of Engineering and Applied Science (2026)
- **Outstanding Materials Student Award,** Princeton University Department of Materials Science and Engineering (2026)

- **Peter Mark Prize,** Princeton University Department of Electrical and Computer Engineering (2026)
- **Phi Beta Kappa,** Academic Honor Society, Member (2026 – Present)
- **Sigma Xi,** Scientific Research Honor Society, Associate Member (2026 – Present)
- **NSF Graduate Research Fellowship (GRFP) Fellow,** National Science Foundation (2026)
- **Tau Beta Pi,** National Engineering Honor Society, Member (2024 – Present)
- **Shapiro Prize for Academic Excellence,** Princeton University (2024)
- **Undergraduate Presentation Award** for poster titled "A compact machine learning framework for multi-material core loss modeling," sponsored by Siemens at the 2023 Andlinger Center Annual Meeting (2023)
- **Manfred Pyka Memorial Prize in Physics,** Princeton University (2023)

Skills

Programming: Python (NumPy/SciPy/PyTorch/CuPy), MATLAB, Mathematica, LaTeX, Git, SLURM
Technical: High-Performance Computing, Machine Learning, Quantum Espresso, BerkeleyGW, VASP, VESTA, Data Analysis & Visualization, Dataset Management, Cleanroom Fabrication, Adobe Illustrator
Other: Open-Source Development, Flow Charts, Technical Reports & Diagrams, Research Proposals