Luca Buiarelli

+39 (331) 106 9536
buiar001@umn.edu
github.com/lucabuia
linkedin.com/in/luca-buiarelli

Profile

Trained as a condensed matter physicist with experience in analytical models, numerical simulations and group theory. Expertise includes Landau theories, tight-binding models, density functional theory, and Monte Carlo methods, with a recent focus on exploring altermagnetism and other forms of unconventional magnetism.

Education

University of Minnesota — PhD Candidate, Materials Science *Sep. 2023 – Present*

University of Copenhagen — MSc, Condensed Matter Physics *Sep. 2021 – May 2023*

University of Pisa — BSc, Physics *Sep. 2018 – Sep. 2021*

Projects and Research

Magnetic Multipoles in Alternagnets *Dec. 2023 – Present*
University of Minnesota, Advisor: Turan Birol
- Conducted first-principles quantum mechanical numerical simulations and developed simple theoretical models to explain unconventional magnetic materials;
- Developed a post-processing python code for commonly used density functional theory codes to diagnose multipolar magnetism;
- Collaborated as the lead-theorist with various experimental groups who measured optical and magnetic properties of candidate unconventional magnetic materials.

Structural Properties of Kagome-Layered Crystals *Aug. 2022 – May 2023*
University of Copenhagen, Advisors: Brian M. Andersen, Morten H. Christensen
- Studied the structural properties of kagome-layered metals using analytical Landau theories and first-principles electronic simulations.

Finite Size Scaling of the 2D Ising Model *Dec. 2020 – Jul. 2021*
University of Pisa, Advisor: Claudio Bonati
- Implemented a code in C to do Monte Carlo simulations of the 2D Ising model through the Metropolis and Wolff algorithms, and estimate the critical exponents.

Teaching

Teaching Assistant *Spring/Fall 2024*
University of Minnesota, Introduction to Materials Science Laboratory 2001/2002

Workshops and Conferences

- Flatiron Institute, TRIQS School in Paris, FR (attended) *September 2025*
- American Physical Society, Global Summit in Los Angeles, CA (talk) *March 2025*
- School on electron-phonon physics at University of Texas, Austin (attended) *June 2024*
- American Physical Society, March Meeting in Minneapolis, MN (talk) *March 2024*

Skills

Programming: Python, Matlab, C
Communication: Extensive experience presenting scientific results in the form of oral PowerPoint presentation or written Latex documents.
Languages: English (fluent), Italian (native).