Musa A. Hussien

Postdoctoral Researcher / Computational Physicist / Materials Scientist

Materials Science Division & Molecular Foundry, Lawrence Berkeley National Laboratory

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Summary

Theoretical and Computational physicist with 7+ years of experience solving complex materials problems using first-principles simulations and HPC. Currently at Lawrence Berkeley National Laboratory working on quantum materials and superconductors for qubit applications, with growing experience applying ML to accelerate materials discovery. Seeking a research scientist or applied science role in quantum computing or AI at an industry lab in the US

Skills

Simulation & Modeling: First-principles calculations and molecular dynamics using Quantum ESPRESSO, VASP, EPW, and LAMMPS — spanning electronic structure, atomistic, and condensed matter systems.
Programming & Data: Python for scientific computing, numerical analysis, data processing and visualization, with workflow automation across Linux, macOS, and Windows environments.
Machine Learning & HPC: Machine learning model training, with end-to-end HPC workflows including job execution, troubleshooting, and post-processing pipelines.

Experience

Lawrence Berkeley National Laboratory *Berkeley, CA*
Postdoctoral Researcher **Apr. 2024–Present**

- Run and optimize large-scale simulations on HPC systems and automate post-processing to accelerate interpretation and reporting.
- Collaborate with cross-functional research teams to define computational strategies, validate results, and communicate technical findings.
- Lead first-principles calculations on superconducting materials for qubits fabrication in collaboration with experimentalist at Berkeley lab.
- Developing machine learning interatomic potential for amorphous materials, with emphasis on topology diagnosis and materials-property analysis.

African Institute for Mathematical Sciences (AIMS) *Cape Town, South Africa*
Head Tutor, Teaching Assistant, and Project Assistant **Mar. 2023–Apr. 2024**

- Coordinated teaching support across advanced courses in physics, mathematics, and AI.
- Mentored students in Python-based scientific computing, debugging, and quantitative problem-solving.
- Supported academic operations and project delivery in a fast-paced multidisciplinary environment.

University of KwaZulu-Natal *South Africa*
Part-Time Lecturer and Lab Demonstrator **2019–2022**

- Delivered instruction and laboratory support in electromagnetism, optics, and general physics.
- Helped students interpret results, write reports, and connect theory with practical problem-solving.

Omdurman Islamic University & Sudan University of Science and Technology *Sudan*
Lecturer and Physics Instructor **2017–2019**

- Taught electricity and magnetism, modern physics, and Python for scientific applications.
- Developed course materials, supervised labs, and trained students in theoretical and computational methods.

Leadership Experience

Recognized for leading tutoring and teaching support at AIMS, coordinating academic delivery, mentoring students, and contributing to program execution across advanced quantitative courses.

Education

University of KwaZulu-Natal *South Africa*
Ph.D. in Theoretical and Computational Condensed Matter Physics **2023**

Sudan University of Science and Technology *Sudan*
M.Sc. in Physics **2016**

Omdurman Islamic University *Sudan*
B.Sc. in Physics, First Class Honors **2014**

Selected Projects

HPC Automation — Built a workflows for job execution in supercomputer, data extraction, and analysis across simulation environments.

ML for Materials Design — Applied machine learning methods to run large-scale simulations and materials-property prediction, and applying the existing ML-models for particular applications

Amorphous Topological Materials — Investigated non-trivial topology in amorphous Bi_2Se_3 using first-principles calculations.

Superconductor Materials — Studying the superconductors properties of Metal nitrides, based materials for qubits fabrication.

Selected Presentations

Revisiting the Instability and Superconductivity of δ-NbN from First-Principles, APS Global Physics Summit. **2026**

Diagnosing Topological Properties of Amorphous Bi_2Se_3 from First-Principles, APS Global Physics Summit. **2025**

Theoretical Design of Phonon Filters for Quantum Sensing and Qubits, 2025 Molecular Foundry User Meeting, Berkeley Lab. **2025**

Magnetoelectric and Proximity Effects in Ferromagnetic Metal-Insulator-Metal Hybrid Materials, Psi-k Conference, SwissTech Convention, EPFL. **2022**

Publications

Quantum Phase Transitions of the Topological Edge State in Bismuth Selenide, Preprint. **2024**

Quantum Phase Transition in the Spin Transport Properties of Ferromagnetic Metal-Insulator-Metal Hybrid Materials, *Nanomaterials*. **2022**

Electrodynamics of Topologically Ordered Quantum Phases in Dirac Materials, *Nanomaterials*. **2021**

Awards & Honors

Early Career, American Physical Society (APS), USA **2024–Present**

Certified Physicit (CPhys), South African Institute of Physics (SAIP), South Africa. **2023–Present**

Exceptional Leadership Award, African Institute for Mathematical Sciences, Sudan **2024**

ASESMANET Fellowship for Psi-k Conference participation, ICTP, Switzerland **2022**