

Hussain Kadhem

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🎓 Education

University of California, Berkeley Ph.D. Applied Mathematics Since Aug 2022

- geometric and Monte-Carlo methods for computational quantum field theory
- high-performance scientific computing

University of Cambridge Master of Advanced Study Jun 2022

- Pure Mathematics Part III

University of Toronto Hon. B.Sc (computer science, mathematics and statistics) Jun 2021

- Specialist Program in Mathematics - Comprehensive Stream

🎓 Scholarships and Funding Awards

- Data Science Fellow UC Berkeley D-Lab Fall 2023 – Winter 2024
- Departmental Fellowship UC Berkeley Fall 2023
- Student Travel Award SIAM Aug 2023
- STEM FYI Professional Development Award UC Berkeley Jun 2023
- Structured Quartet Research Ensembles AIM Oct 2022
- EWJ Gateway Fellowship International House at UC Berkeley Aug 2022 – May 2024
- Snowdon Master’s Scholarship Cambridge Trust October 2021 – June 2022
- Part III International Scholarship Cambridge Faculty of Mathematics October 2021 – June 2022
- Master’s Scholarship Canadian National Institute for the Blind Oct 2021 – June 2022

📄 Preprints

1. L. Beneish, J. Berg, E. Goedhart, H. M. Kadhem, A. S. López, and S. Treneer. “Replicable functions arising from code-lattice VOAs fixed by automorphisms”. In: (2023). arXiv: [2306.15402](https://arxiv.org/abs/2306.15402) [[math.NT](#)]

Work Experience

Graduate Domain Consultant UC Berkeley Research Computing Since Jul 2023

Graduate Researcher Lawrence Berkeley National Laboratory Aug 2022 – Jun 2023

- Appointed to the Computer Languages and Systems Software Group (CLaSS), Applied Mathematics and Computational Research (AMCR) division.
- Funded by the Exascale Computing Project (ECP) of the Department of Energy.
- Implementing and supporting parallel programming features of Fortran 2018 for the Flang compiler frontend of LLVM.

Compiler Software Developer IBM Toronto, Jun 2019 – Sep 2021

- **Engineering** compiler optimizations and infrastructure for *C++* and *Fortran* using the *LLVM* framework.
- **Applying** mathematical problem solving methods from *graph theory*, *combinatorics*, *algebra*, *statistical modeling*.
- **Accelerating** scientific computing, machine learning, deep learning workloads running on *PowerPC* supercomputer architectures.
- **Collaborating** in a modern *agile* team dedicated to engagement with open-source communities.
- **Delivering** high-quality software using modern *Linux* tools and *CI/CD/CT* pipelines including *Buildbot*, *Docker*, *Google Test*, *GitHub*, *Ninja*, *Phabricator*.

Software Engineering Intern Nvidia Santa Clara, CA, May 2018 – Aug 2018

- Working in the Linux graphics driver team, I completed a project to write a *GCC* compiler extension to modernize the build system and protect against security exploits.

High Performance Computing Consultant Xanadu.ai Toronto, Dec 2017 – Apr 2018

- As a contractor for this *quantum computing* startup, I did research and development in the areas of *numerical linear algebra* and *high-performance computing*, such as designing eigenvalue solvers and implementing algorithms for algebraic graph problems.
- Developed mathematical libraries and optimized workloads using *C++*, *CUDA*, *Matlab*, *Python*, *numpy*, *tensorflow*; and administered an *Ubuntu* GPU compute server.

Past Projects

GPU Replica Exchange MCMC Sampling for Molecular Modeling Winter 2023

- Final project for graduate course on *Applications of Parallel Computing*.

Undergraduate Summer School at the Park City Mathematics Institute Jul 2021

- Hosted by the Institute for Advanced Study, on *quadratic forms*, *Milnor K-theory*, and *arithmetic*.

Adjoint School on Applied Category Theory Feb 2021 – Jul 2021

- research group on *enriched profunctor nuclei*, supervised by Professor Simon Willerton

Computing Asymptotic Distributions of Ordered Cubic Number Fields Jun 2021 – Dec 2021

- Undergraduate project supervised by Professor Ila Varma at the University of Toronto.

Markov Processes on matrices and groups May 2020 – Dec 2020

- Undergraduate thesis project supervised by Professor Giulio Tiozzo at the University of Toronto.

Google Summer of Code CERN SixTrack Feb 2017 – Jul 2017

- Wrote and accelerated parallel routines for a symplectic solver of particle accelerator beams using *Python*, *C++*, *CUDA*, and *OpenCL*, for execution on the distributed **CERN** computing cluster.

Conferences and Seminars

ICIAM 2023 Tokyo Aug 2023

- Poster: *Using the Neural ODE Toolkit For a Geometric Resolution of the Numerical Sign Problem*

US Quantum Information Science Summer School Aug 2023

- Hosted by SQMS Center at Fermilab

MSRI Graduate Summer School Jun 2023

- Algebraic Methods for Biochemical Reaction Networks

Visiting Graduate Student Jun 2023

- University of Bergen, Bergen Language Design Lab

J3 Fortran standards committee Feb 2023

- Attended as non-voting alternate.

Student Learning Seminar on Derived Algebraic Geometry Fall 2022

- Organized weekly seminar and gave 3 talks on ∞ -category theory, dg-categories, and derived schemes.

ACM/IEEE Supercomputing Conference (SC22) Nov 2022

- Poster: **Agile Acceleration of LLVM Flang Support for Fortran 2018 Parallel Programming features.**

14th workshop on Challenges for Parallel Computing, CASCON x EVOKE Nov 2019

- Organizer and chair.

Service

UC Berkeley Graduate Assembly since Sep 2022

- Delegate for the mathematics department

Chancellor's Advisory Council on Disability Access and Planning since Oct 2022

- Regular member, representative of the Graduate Assembly

Berkeley Math Directed Reading Program Fall 2022

- Mentored an undergraduate student for a reading project on representation theory.