Nima Afkhami-Jeddi

Ph.D. in Theoretical Physics — Researcher

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Summary

Theoretical physicist with expertise in computational methods, optimization, and numerical simulations seeking to transition to AI research. Extensive experience with algorithm development for complex theoretical problems. Strong background in mathematical modeling, data analysis, and programming across multiple languages including Python, Julia, and C++.

Education

2014–2019 **Ph.D. in Physics**, *Cornell University*, Ithaca, NY
Thesis: *Causality Constraints in Quantum Field Theory and Quantum Gravity*
Advisor: Prof. Thomas Hartman

2013–2014 **M.Sc. in Physics**, *Perimeter Institute for Theoretical Physics*, Waterloo, ON
Thesis: *Soft theorems of Graviton scattering in arbitrary dimensions*
Advisor: Prof. Freddy Cachazo

2009–2013 **B.Sc. in Physics**, *York University*, Toronto, ON, *Summa Cum Laude*

Professional Experience

2022–Present **Postdoctoral Research Fellow**, *McGill University*, Montreal, QC
- Developed numerical optimization algorithms for computing metrics and spectrum of manifolds in high dimensions using **Mathematica**, **Julia**, and **C++**
- Created machine learning models for classification problems in conformal field theories
- Implemented numerical methods for modular bootstrap of 2D conformal field theories
- Built automated scheduling system to streamline department operations

2019–2022 **Postdoctoral Research Fellow**, *University of Chicago, Kadanoff Center*, Chicago, IL
- Developed optimization algorithms for the sphere packing problem with applications to error-correcting codes
- Created novel numerical approaches to high-dimensional optimization problems
- Leveraged cloud computing resources for parallelized numerical simulations

Technical Skills

Languages	Python, Julia, C++, PHP, SQL, Mathematica
ML/AI Tools	PyTorch, TensorFlow, JAX, NumPy, SciPy, Pandas, LangChain/LangGraph, Pinecone, Huggingface
Cloud & Compute	Docker, Apptainer/Singularity, Git, Linux, SLURM, AWS, Google Cloud
Numerical Methods	Optimization algorithms, Monte Carlo simulations,Semi-Definite programming
Other Software	Visual Studio, Unix Shell, CAD, KiCad, LabVIEW

Selected Projects

- arXiv Agent : Created an agentic workflow to produce instructions for LLM to reproduce Hep-Th physics results from basic assumption with a success scoring measure as a part of larger personal project.
- Developed numerical methods for computing the metric and spectrum of the Lapacian on Calabi-Yao Manifolds implemented in Mathematica and C++
- Developed numerical methods for modular bootstrap of 2d Conformal Field Theories implemented in Mathematica and Julia
- Designed and implemented optimization algorithms for high-dimensional parameter spaces with applications to error-correcting codes and neural network architecture search.
- Created custom scheduling system for the physics department at McGill to automate the organization of seminar speakers and mailing lists

Selected Publications

2025 N. Afkhami-Jeddi, N. Afkhami-Jeddi, S. Caron-Huot, J. Chakravarty and A. Maloney, "Imprint of the black hole singularity on thermal two-point functions," [arXiv:2510.21673 [hep-th]].

2022 N. Afkhami-Jeddi, "Conformal bootstrap deformations," JHEP 09, 225

2022 N. Afkhami-Jeddi, A. Ashmore and C. Cordova, "Calabi-Yau CFTs and random matrices," JHEP 02, 021

2021 N. Afkhami-Jeddi, H. Cohn, T. Hartman and A. Tajdini, "Free partition functions and an averaged holographic duality," JHEP 01, 130

2020 N. Afkhami-Jeddi, H. Cohn, T. Hartman, D. de Laat and A. Tajdini, "High-dimensional sphere packing and the modular bootstrap," JHEP 12, 066

Awards & Honors

2022 Non-Perturbative Bootstrap Fellowship, McGill University

2019 Kadanoff Fellowship, University of Chicago

2015 The Lucent Travel Award from Lucent Technologies, Cornell University

2014 NSERC Postgraduate Scholarships-Doctoral Program

2013 NSERC Postgraduate Scholarships-Masters Program

2013 Perimeter Scholars International Award

Teaching Experience

2022 **Mentorship Leading to Publication**, *University of Chicago*
Supervised graduate student Anuj Apte in research leading to published work in theoretical physics with machine learning applications.

2020 **Conformal Bootstrap Lecture Series**, *University of Chicago*
Taught advanced numerical methods and computational techniques for theoretical physics problems.

2018 **Graduate General Relativity I**, *Cornell University*
Instructed graduate students in mathematical formalism and computational approaches to general relativity.

Additional Skills

Research	Experience designing and conducting research projects from conception to publication
Technical Writing	Published multiple papers in peer-reviewed journals with complex mathematical content with more than 800 citations
Data Analysis	Extensive experience in statistical analysis and interpretation of numerical data
Hardware	PCB design, circuit design, and engineering physics experience