

Akhil Francis

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SUMMARY

- Final year PhD candidate in Physics with core expertise in applications of quantum computation
- Strong programming skills in Python and C/C++, and experience in Monte Carlo simulations and bootstrapping
- Five years of experience in using quantum algorithms and analysing data from quantum machines
- Executed many computational projects including machine learning and data analysis projects
- Interested in Quantitative Analyst and Data Scientist positions
- Expected to graduate before May 2023

EDUCATION

North Carolina State University

Ph.D. Candidate in Physics, (CGPA 4.00/4.00)

Raleigh, NC

Aug. 2017 – Present

Indian Institute of Science Education and Research

Integrated BS-MS in Physics, (CGPA 8.0/10.0)

Mohali, India

Aug. 2011 – May 2016

TECHNICAL SKILLS

Programming Languages: Python, C/C++

Math: Mathematica

Quantum Computing Softwares and Libraries: QISKIT | search-compiler, QISKIT-Nature

Machine Learning and Data Analysis: Scikit-learn, Keras | Pandas, NumPy, Scipy, Matplotlib

Writing: LaTeX, MS Office

Softwares and Tools: Inkscape, Gnuplot | Git, Tmux

EXPERIENCE

Graduate Research Assistant

North Carolina State University

May 2018 – Present

Raleigh, NC

- Carrying out machine learning project using supervised and unsupervised machine learning techniques to study benchmarking of quantum machines at Oak Ridge National Laboratory
- Developed and deployed quantum algorithms to study condensed matter physics problems, executed these algorithms in quantum machines via cloud, and extracted information from the noisy data
- Worked on independent and collaborative projects with other theory and experimental groups
- Completed individual computational projects utilizing advanced computational methods in many-body physics and quantum simulations for computational physics courses
- Performed Monte Carlo simulations and bootstrapping for error estimation and employed statistical tests of data from quantum machines
- Published research articles in high impact journals, presented and participated in conferences and workshops
- Mentored undergraduate students in research and leading to one publication

Graduate Teaching Assistant

North Carolina State University

Aug. 2017 – Dec. 2018

Raleigh, NC

- Conducted and evaluated problem solving sessions for undergraduate students for three semesters
- Developed excellent leadership and communication skills by managing a large number of students in a classroom
- Aided in designing and upgrading laboratory experiments for undergraduate students in WebAssign and performed captioning of video lectures

Graduate Research Assistant (MS)

Indian Institute of Science Education and Research

Aug. 2014 – May 2016

Mohali, India

- Studied CP violation and estimated Jarlskog invariant and the corresponding CP violating phase, in leptonic sector from computations using unitarity triangles, taking analogy from quark sector for the Master's thesis project
- Completed a group computational project simulating relativistic orbits as a part of the computational physics course using the Runge-Kutta methods for solving partial differential equations

PUBLICATIONS

- [A. Francis](#), Anjali A. Agrawal, Jack H. Howard, Efehan Kökcü, Alexander F. Kemper | **“Subspace Diagonalization on Quantum Computers using Eigenvector Continuation”** | arXiv:2209.10571 (2022)
- Kathleen E. Hamilton, Nouamane Laanait, [A. Francis](#), Sophia E. Economou, George S. Barron, Kübra Yeter-Aydeniz, Titus Morris, Harrison Cooley, Muhun Kang, Alexander F. Kemper, and Raphael Pooser | **“An entanglement-based volumetric benchmark for near-term quantum hardware”** | arXiv:2209.00678 (2022))
- [A. Francis](#), E. Zelleke, Z. Zhang, A. Kemper, and J. Freericks | **“Determining ground-state phase diagrams on quantum computers via a generalized application of adiabatic state preparation”** | Symmetry 14(4): 809 (2022)
- [A. Francis](#), D. Zhu, C. Huerta Alderete, Sonika Johri, Xiao Xiao, J.K. Freericks, C. Monroe, N. M. Linke, A.F. Kemper | **“Many Body Thermodynamics on Quantum Computers via Partition Function Zeros”** | Science Advances 7, 2447 (2021)
[A. Francis](#), J. Freericks, and A. Kemper | **“Quantum computation of magnon spectra”** | PhysRevB.101.014411 (2020)

PRESENTATIONS

- Graduate Student Research Symposium | April 2022 | North Carolina State University | poster presentation | **Many-Body Thermodynamics on Quantum Computers via Partition Function Zeros**
- March Meeting, APS | March 2022 | Chicago | oral presentation | **Determining ground-state phase diagrams on quantum computers via a generalized application of adiabatic state preparation**
- March Meeting, APS | March 2021 | Virtual | oral presentation | **Many-Body Thermodynamics on Quantum Computers via Partition Function Zeros**
- South Eastern Section American Physical Society | November 2020 | Virtual | oral presentation | **Many-Body Thermodynamics on Quantum Computers via Partition Function Zeros**
- Kwek Group meeting | September 2020 | National University of Singapore | Virtual | oral presentation | **Quantum Computation of Spin Systems**
- South Eastern Section American Physical Society | November 2019 | Wrightsville Beach, NC | oral presentation | **Magnon Spectra using Quantum Computers**
- NISQ | June 2019 | University of Maryland | poster presentation | **Evaluating Many-Body Correlation Functions using Quantum Computation**

ACHIEVEMENTS

- Selected for INSPIRE SHE fellowship, of Department of Science and Technology, Govt. of India, to study five year integrated bachelors and masters.