Syed Ali Asghar

Date of birth: 16 Jul 2001 | **Place of birth:** Karachi, Pakistan | **Nationality:** Pakistani | **Gender:** Male |

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ABOUT ME

Passionate student of physics trained in the field of quantum optics, quantum computing and quantum information theory. Dedicated and enthusiastic about working in quantum technology, looking for an opportunity to extend my skills to learn and deliver.
Research Interests:
• Quantum Algorithms
• Quantum Simulation
• Quantum Error Correction

EDUCATION AND TRAINING

1 JAN 2021 – 31 DEC 2023 Karachi , Pakistan
BACHELORS OF SCIENCE (HONORS) IN PHYSICS University of Karachi

A 3-year Bachelor of Science degree in physics with coursework including Quantum Mechanics, Classical Mechanics, Atomic and Molecular Physics.

Website https://www.uok.edu.pk/ | **Field of study** Physics , Mathematics | **Final grade** CGPA: 3.18 | **Level in EQF** EQF level 6

1 JAN 2024 – 31 DEC 2024 Karachi, Pakistan
MASTER'S OF SCIENCE IN PHYSICS (1 YEAR) University of Karachi

This MSc is a one-year degree program which combined with my BSc (Hons) is equivalent to a normal 4-year BS degree. (3 years BSc Hons + 1 year MSc = 4 Years BS)

Website https://www.uok.edu.pk/ | **Field of study** Physics | **Final grade** CGPA: 3.19 | **Level in EQF** EQF level 7 |

Thesis Relativistic Generalization of Planck's Radiation Law and ML Detection of Subtle Spectral Distortions in CMB

PROJECTS

Relativistic Generalization of Planck's Radiation Law and ML Detection of Subtle Spectral Distortions in CMB (MSc Thesis)

Under supervision of Dr Muhammad Zeeshan Iqbal (Associate Prof. of Physics, UoK),
this research extends Planck's law to relativistic regimes using statistical mechanics and Van Kampen-Israel's inverse four-temperature theory. It establishes a framework for relativistic thermal radiation and CMB anisotropy analysis, integrating computational modeling and machine learning for detecting spectral distortions in astrophysical systems.

Variational Quantum Eigensolver for H2 Molecule Ground State Calculation (Personal Project)

Implemented the Variational Quantum Eigen solver (VQE) using Pennylane to compute the ground state energy of the hydrogen molecule (H2). Constructed the molecular Hamiltonian, optimized parameterized quantum circuits, and minimized the energy expectation value using gradient-based optimization techniques. Demonstrated quantum-classical hybrid computation for molecular energy estimation, showcasing proficiency in quantum computing frameworks and variational algorithms.

Simulation of Quantum Error Correction Using Surface Code in Qiskit (Personal Project)

Implemented a distance-3 surface code in Qiskit to explore quantum error correction. Simulated random Pauli errors (X, Y, Z) and performed stabilizer measurements to detect and correct them using a basic decoding algorithm. Analyzed the improvement in fidelity, demonstrating the effectiveness of error correction in fault-tolerant quantum computing. This project deepened my understanding of quantum error correction and enhanced my skills in quantum circuit simulation and analysis.

WORK EXPERIENCE

SMCS, IBA MAIN CAMPUS – KARACHI, PAKISTAN

RESEARCH INTERN – APR 2025 – CURRENT

As a research intern under Dr. Jibran Rashid at IBA SMCS, I am engaged in a project focused on benchmarking the Variational Quantum Eigensolver (VQE). This research aims to systematically evaluate the performance of various components within the VQE pipeline, including ansätze, qubit mappings, basis sets, classical optimizers, and quantum backends. By applying VQE to a range of molecular systems, starting with H_2 and extending to larger molecules, the project seeks to identify optimal configurations and trade-offs for each component. The goal is to provide a comprehensive comparative analysis that informs the design of more efficient and accurate quantum algorithms for computational chemistry.

IQRA UNIVERSITY – KARACHI, PAKISTAN

APPLIED PHYSICS LAB INSTRUCTOR – 1 AUG 2025 – CURRENT

Conduct electronics-focused physics labs for computer science students, covering diodes, rectifiers, capacitors, and resistors; taught component identification and coding, circuit assembly, and measurement techniques.

SCIENTIA MAGAZINE

WRITING INTERN – 15 MAY 2025 – 5 JUL 2025

As a writing intern at *Scientia Magazine*, I honed my skills in science communication and public education. My role involved researching complex scientific topics and translating them into engaging, accessible articles for a general audience. Through this experience, I developed a strong foundation in writing with clarity, accuracy, and impact, bridging the gap between scientific communities and the broader public.

EDTECH – KARACHI, PAKISTAN

HIGH SCHOOL MATHEMATICS TEACHER – 21 JUL 2022 – 11 NOV 2022

- Create PPT for mathematics curriculum.
- Explaining the concept through voice over on PPTs.
- Editing mathematics lecture videos.

SKILLS

Python | Javascript | Julia

Quantum Libraries

Qiskit | Pennylane | Classiq

Python Libraries

Sympy | numpy

CONFERENCES AND SEMINARS

1 SEP 2024 – 2 SEP 2024 CERN
Julia HEP 2024 Workshop

Presented an online lightening talk on topic "Empowering Underrepresented Communities Through Julia".

Link https://indico.cern.ch/event/1410341/contributions/6135573/

11 FEB 2024 – 13 FEB 2024 Quaid e Azam University, Islamabad
18th National Symposium in Frontiers in Physics

ACHIEVEMENTS

25 MAR 2024
Second place in QSite Quantum Hackathon

Developed a quantum algorithm using Xin et al. (Phys. Rev. A, 2020) to simulate a harmonic oscillator on Classiq's platform. Utilized quantum-controlled operations to model its evolution, demonstrating quantum computing's efficiency in solving linear differential equations. Link to report is provided.

3 SEP 2021
Winner of the 2021 Particle Physics Competition at the University of Karachi.

1 JAN 2024 – 20 JAN 2024
First prize in 'Video making competition about particle physics and ATLAS experiment'

Link https://indico.cern.ch/event/1361509/overview

CERTIFICATIONS AND COURSES

3 FEB 2025
Practical Quantum Computing with IBM Qiskit for beginners

An online non-credit course authorized by Packt and offered through Coursera

Link https://coursera.org/share/717a65c3cb4a2a7aecc26572b86122ec

11 JAN 2024
Quantum Machine Learning Fundamentals

An online non-credit course authorized and offered through ingenii

27 JUN 2024
Introduction to Python Programming

An online non-credit course authorized by University of Pennsylvania and offered through Coursera.

Link https://coursera.org/share/2a209025dba6a7d50fcada87b8e01136

4 AUG 2024
Exploratory Data Analysis for Machine Learning

An online non-credit course authorized by IBM and offered through Coursera, completed with honors.
Course Project

Link https://coursera.org/share/d0823ac7ff77699246e30f6f762c2758

11 DEC 2020
Introduction to Philosophy

An online non-credit course authorized by University of Pennsylvania and offered through Coursera

Link https://coursera.org/share/b29da91363c35ab5fc8aa8cf54364359

30 DEC 2022
Philosophy of Science

An online non-credit course authorized by The University of Edinburgh and offered through Coursera

Link https://coursera.org/share/7967f69f60c72db70bb5154ad1a41dbc

29 SEP 2020
ER22.1x: Justice

An online non-credit course authorized by Harvard University and offered through Edx

Link https://courses.edx.org/certificates/7f0e13a12b024df2b6d6883f3f6bcf16

21 JUL 2025
Supervised Machine Learning: Regression

An online non-credit course authorized by IBM and offered through Coursera.

Link https://coursera.org/share/faf4413a7f8ccad86ca55fca87ccd876

WORKSHOPS AND CHALLENGES

19 JUN 2024
IBM Quantum Challenge

An online workshop organized by IBM Qiskit, focusing on "The Path to Utility," with expert-led lectures and hands-on Qiskit SDK training for utility-scale quantum hardware.

Link https://www.credly.com/badges/bd3502ed-7f9b-456b-8789-62784dfe8274/public_url

15 JUL 2024 – 1 AUG 2024
IBM Qiskit Global Summer School 2024: The Path to Utility

Mentored participants in an official Qiskit Fall Fest event, conducting hands-on workshops and facilitating learning in quantum computing.

Link https://www.credly.com/badges/ace494c8-0010-4761-b555-d6f489e102f1/public_url

1 DEC 2024

2024 Qiskit Fall Fest Mentor

Participated in the CMS Open Data Workshop & Hackathon 2024, engaging in data analysis and collaboration on real particle physics datasets from the CMS experiment at CERN

Link https://www.credly.com/badges/e76d2732-94b7-43c5-b8fe-0fdd777373de/public_url

CMS Open Data Workshop

A five day virtual participation in "Celestial Holography Summer School" organized by Perimeter Institute.

26 JUL 2024

Celestial Holography Summer School

OUTREACH ACTIVITIES

Zeta Science Forum - Co founder

Co founded a STEM outreach events organizing platform focused to educate the audience from the school level to the graduate level about science, physics, mathematics, and everything in between.
Events organized by Zeta Science Forum:

- IBM Qiskit Hans-On Workshop
- Hands-On Julia HEP Workshop
- New horizons in Physics
- Travellers of Science

Link https://zetascienceforum.wixsite.com/zeta

LANGUAGE SKILLS

Mother tongue(s): **URDU**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	B2	B2	B1	B1	B1

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user