Shah Ishmam Mohtashim

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Education

University of Dhaka *Dhaka, Bangladesh*

B.S. in Chemistry *2017 - 2022*

- Minor in Physics and Mathematics

Publications

2021 **On The Variational Formulations For The Graph Isomorphism Problem,** arxiv:2111.09821

2021 **Qurzon: A Prototype for a Divide and Conquer Based Quantum Compiler,** arXiv:2109.07072

2021 **Disordered Phase in Ising and Metastability in Cellular Potts Models Hint at Glassy Dynamics,** arXiv:2106.11298

2021 **Subspace Search Variational Quantum Eigensolver,** Pennylane Community Tutorial

Projects

The Variational Quantum Thermalizer For The Sherrington-Kirkpatrick Model

Microsoft Challenge at the Quantum Coalition Hackathon 2022 *April 2022*

- Variational Quantum Thermalizer(VQT) and noise-induced VQT for 3 qubit Sherrington Kirkpatrick (SK) model of spin glass. We try to reach the thermal state of the SK model for temperature=1
- Blog post link

Hack the Q-Map: Guess the terrain of the quantum map!

MIT iQuHACK 2022 x Microsoft x IonQ Challenge *January 2022*

- Hack the QMap is a game powered by quantum computing where the players of the game have to build quantum circuits, gate by gate in each move of the game, to generate terrain which is as close to the original terrain generated by our quantum game engine! (circuits)

Diagonal Unitary Circuit Decomposer

Quantum Coalition Hack *April 2021*

- Made a decomposer/transpiler that takes diagonal unitary matrix and returns corresponding quantum gates.

Nurse Scheduling Problem using Discrete Quadratic Model

MIT Quantum Hackathon *January 2021*

- Implemented DQM of the NSP problem using DWave's Hybrid Solvers.
- Met the obligatory hard nurse and hard shift constraint but could not satisy the soft nurse constraint.

QAOA Implementation for the weighted MaxCut problem

Personal Project *2021*

- Calculated MAXCUT using QAOA.

Variational Quantum Eigensolver from Scratch

Personal Project *2020*

My first quantum computing project!

Network Analysis of Proteins

Functional Protein Research Group *Ongoing*

- Residue Interaction Network to measure centrality to identify functional sites of the protein
- Gaussian Network Model and Anisotropic Network Model to calculate protein dynamics(molecular motion, fluctuation of residue, B factors)

Solving 1D advection equation using classical and quantum algorithm

Quantum Winter Hackathon *2020*

- Discretizing the wave equation using finite difference method with the implicit time integration scheme.
- L1 Norm of the numerical and analytical solution.
- Tested the HHL and VQLS algorithm to solve the PDE of advection equation

Work Experience

Functional Protein Research Group
Dhaka, Bangladesh

Research Assistant
2020 - Ongoing

- Network Analysis of Proteins.

Synopsis Education
Dhaka, Bangladesh

Scholastic Aptitude Test(SAT) Tutor
January 2018-July 2021

- Taught SAT and SAT subject tests to over 40 students.

Honors & Awards

2021 **Top 20,** Qiskit Hackathon Europe: Research Study Group
2021 **Advanced Badge,** IBM Quantum Challenge - Fall 2021
2021 **Advanced Badge,** IBM Quantum Challenge Africa 2021
2021 **Advanced Badge,** IBM Quantum Challenge 2021
2020 **Advanced Badge,** IBM Quantum Challenge -FALL 2020
2020 **Special Mention- Top 10 ,** Quantum Winter Hackathon
2018 **National Finalist (top 12),** Famelab *Bangladesh*
2016 **Runners Up, National Round, Invited to attend National Camp,** Bangladesh, Biology Olympiad 2016 *Bangladesh*
2015 2^{nd} **Runners Up, National Round, Invited to attend National Camp,** Bangladesh, Biology Olympiad 2015 *Bangladesh*
2015 **Top 10, National Round,** Bangladesh Astronomy Olympiad 2015 *Bangladesh*

Talks

Warsaw IT Days 2022
Approximated Approaches to the Vehicle Routing Problem on NISQ Devices by Classical Preprocessing
April 2022

IEEE EDS Dhaka University Chapter: Workshop on Quantum Computing
Introduction to quantum computing and quantum information theory
January 2022

Qoffee O'clock, Qindia, YouTube
Detection of glassy dynamics using Quantum Computer
July 2021

Community Service

Banglai Quantum Computing
Member
2020-Ongoing

- Quantum Computing Community Building amongst Bengali Speaking People
- Organizing bi-weekly meetings on Saturdays

References

Omar Shehab
Quantum Computing Applications Researcher, IBM Quantum
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Amit Saha
Consultant & Scientific expert(Quantum Computing), Atos
amit.saha@atos.net amit-saha-05a3387b