

# SONAI BISWAS

## RESUME

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### Skills

Programming	Python, C, MATLAB, Mathematica
Data Structures	Stacks, Queues, Arrays, Binary Tree, Binary Search Tree, Huffman Coding, Hashing, AVL
Quantum Tools	Qiskit, Pennylane, Dwave, Cirq
Quantum	Quantum Machine Learning, Quantum Optimization Algorithms (QAOA, VQE), Quantum Error Correction, Quantum Circuits, Quantum Annealing
ML tools	Pytorch, Keras, Tensorflow, Pandas, OpenCV
Languages	English, German, Hindi, Bengali

### Work Experience

#### Technical University of Dresden

September 2022-June 2025 **Quantum-Classical Hybrid Link Layer Design, Research Associate.**  
Designed and presented the scheduler architecture of hybrid quantum-classical scheduler and tested it for quantum (QKD) use case and working on further integration on OSI layers.

#### Ericsson Global

June-November, 2021 **Design And Evaluation of Quantum Maximum-Likelihood Decoder for Polar Codes, Intern.**  
Implemented QAOA and Quantum Annealer to the classical maximum likelihood Decoder for LDPC and Polar Codes on Ericsson GPU clusters. Constructed the Quantum Formulation for the problem and the Qiskit and Dwave framework for Quantum Decoder. Gave an estimation for the highest possible Decoder size that can be fit with current generation Annealer and circuit centric quantum computers.

#### TCS Bangalore

June-July, 2020 **Variational Quantum Machine Learning on Gearbox Data, Summer Intern.**  
Implemented feature engineering for variational quantum machine learning algorithm on Gearbox dataset produced in house at TCS and achieved an accuracy of 95%. Presented a poster of it at QTML 2021.

#### Indian Institute of Science Education and Research, Kolkata

June – July, 2018 **Simulation N09 Protocol using IBM-Q Experience, Summer Intern.**  
IBM-Q circuit Design for Secured Counterfactual Quantum Key Distribution on IBM-Q 5-qubits 'ibmqx-4' based on Noh (2009).

### Education

2017–2022 **BS-MS, Physics, Indian Institute of Science Education and Research, Kolkata.**  
MS Thesis: Non-maximally Entangled Superdense Coding using Superposition  
CGPA : 8.49/10

## Publications

### In Conference Proceedings

- 2025 **Sonai Biswas**, Qian Zhang, Hilal Sultan Duranoglu Tunc, Juergen Czarske, Riccardo Bassoli, and Frank H. P. Fitzek. Hybrid scheduler on single-mode fiber and multimode fiber for quantum-classical co-transmission. In *2025 IEEE Wireless Communications and Networking Conference (WCNC)*, pages 1–7, 2025.
- 2024 **Sonai Biswas**, Mayukh Singha, Swaraj Shekhar Nande, Shamreen Banu Sheik Sulaiman, Riccardo Bassoli, and Frank H. P. Fitzek. Enhancing iot security with quantum key distribution: A novel approach. In *2024 IEEE Future Networks World Forum (FNWF)*, pages 837–842, 2024.
- 2024 **Sonai Biswas**, Andrea Garbugli, Luca Foschini, Riccardo Bassoli, and Frank H. P. Fitzek. Towards a hybrid 6g internet. In *2024 IEEE Future Networks World Forum (FNWF)*, pages 337–344, 2024.
- 2023 Swaraj Shekhar Nande, Osel Lhamo, **Sonai Biswas**, Riccardo Bassoli, and Frank H. P. Fitzek. Quantum machine learning for controller placement in software defined networks. In *European Wireless 2023; 28th European Wireless Conference*, pages 382–387, 2023.

## Fellowships & Camps

- 2017 –2022 **INSPIRE Fellowship** of Department of Science and Technology (DST), Government of India, for top 1 percentile in Higher Secondary and as a BS-MS student in IISER Kolkata
- 2021 **QGSS 2021**: Completed the two week intensive course provided by IBM Quantum, completing all graded lab work assignments with a final cumulative score of 100%, demonstrating applied understanding and comfort with and about **Quantum Computing and Quantum Machine Learning** using Qiskit.

## Certifications

- 2025 **Intro to Deep Learning**, Kaggle - Learned to implement and train neural networks with TensorFlow/Keras on real-world structured data.
- 2025 **Intro to Machine Learning**, Kaggle - Covered modeling fundamentals: data exploration, validation, decision trees, random forests, and model tuning.
- 2025 **Pandas**, Kaggle - Gained practical skills in data manipulation, indexing, grouping, and real-world dataset processing.

## Achievements & Recognitions

- 2024 **IBM Quantum Challenge 2024 - Advanced Badge**: Demonstrated an understanding of Qiskit 1.0 and the significant updates which come along with it. This badge holder demonstrated the ability to use Qiskit 1.0 to approach utility-scale quantum experiments and follow Qiskit Patterns to appropriately map, optimize, execute, and process quantum circuits.
- 2023 **IBM Quantum Challenge - Spring 2023 - Advanced Badge**: Demonstrated an ability to use dynamic circuits within Qiskit. Also demonstrated an understanding of how to create circuits that perform measurements mid-circuit and dynamically decide what the next steps should be. Also implemented dynamic circuits in the context of iterative phase estimation, quantum teleportation, and error correction.
- 2021 **IBM Quantum Challenge - Fall 2021 - Advanced Badge**: Demonstrated an ability to utilize Qiskit's application module and the specific classes to solve problems in the area of finance, natural sciences, machine learning and optimization and has the skills and an ability to solve a battery revenue optimization problem using Qiskit knapsack class and find the optimized solution with QAOA.