AMEYA SHIRISH BHAVE

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❖ SUMMARY:

PhD researcher and Qiskit Advocate specializing in **quantum error correction (QEC)** with a focus on **Realtime decoding problem**, **erasure-aware fault tolerance** and **scalable decoder + benchmarking pipelines** for QLDPC (BB, HGP) codes. Hands-on experience building **Stim/sinter** simulation workflows, stabilizer-circuit transformations, and **message-passing ML/Classical decoders** with an emphasis on reproducibility and low-latency trade-offs. Contributor to IBM's **Qiskit Advocate Mentorship Program (QAMP)** (C-API circuit library, docs, tutorials). Seeking a **QEC/architecture internship** to build hardware-inspired fault-tolerant tools.

❖ EDUCATION:

The University of Texas at Dallas — **PhD** in Computer Engineering, 2024 - May 2027. GPA : 3.53/4
University of Maryland, Baltimore County – **MS** in Computer Science, 2022-24. GPA : 3.63/4

❖ SKILLS:

Quantum & QEC: Qiskit; Stim/sinter; QLDPC codes; decoders (BP, BP+OSD, Relay-BP, ML-based); ZX-Calculus.
Programming Languages & Systems: Python, Rust, PyTorch, SciPy, NumPy, Git, Github.
Soft Skills: Communication, Collaboration, Problem Solving, and Technical Writing.
Relevant Course Work: Quantum Information and coding theory, Quantum Communications, Intro to Quantum Computing.

❖ PUBLICATIONS:

[1] **"BiBiEQ : Bivariate Bicycle Codes on Erasure Qubits",** *IEEE QCNC 2026*, *arXiv:2602.07578*, 2026.
[2] **"HyperNQ: A Hypergraph Neural Network Decoder for Quantum LDPC Codes",** *IEEE ICC 2026*, *arXiv:2511.01741*, 2025.
[3] **"QUARTET: Quantum Utilization and Adaptation via Resource-Tuned Execution Techniques**", *2025 IEEE QCE*
[4] **"ZXNet: ZX Calculus-Driven GNN Framework for Quantum Circuit Equivalence Checking,"** *Proc. 62nd ACM/IEEE DAC*, 2025.

❖ RESEARCH EXPERIENCE:

Research Assistant, UT Dallas, Dallas **, Aug 2024– Present.**

1. **BiBiEQ : Bivaraite Bicycle Codes on Erasure Qubits –** *Accepted IEEE QCNC 2026* **, May – Oct. 2025.**
- Built **2 conversion engines** (Exact, Approx) to transform **erasure-aware memory circuits (Stim)** into **stabilizer circuits** for decoding.
- Benchmarked **BB codes 72/108/144**; **LER decreased 26–34×** for **distance (d):6→10** vs **2–2.7×** for **d:10→12** (largest gains by **d≈10**).
- Produced **per-round LER–erasure** curves and **pseudo-thresholds** in a reproducible pipeline.

2. **HyperNQ: Hypergraph NN Decoder for QLDPC Codes –** *Accepted in IEEE ICC 2026* **, Apr – Aug 2025.**
- Designed a **two-stage message-passing HGNN** (hyperedge modeling; linear-in-sparsity) for QEC decoding.
- Achieved **84% LER decrease vs BP** and **50% vs GNN** in the pseudo-threshold regime with a **shallower network**.
- Built a reproducible **training/evaluation** stack; profiled **accuracy/throughput trade-offs** for low-latency decoding.

❖ RELEVANT PROJECTS:

1. **Qiskit Advocate Mentorship Program (QAMP) — Circuit Library (C-API) · , Oct 2025–Present.**
- Built C-API circuit-library scaffold with core and variational circuits, aligned with Qiskit transpiler concepts.

2. **Simulating Quantum Channels via Sz.-Nagy Dilation (Amplitude Damping) , Sep - Dec 2024.**
- Implemented **Sz.-Nagy unitary dilation** for Kraus-based amplitude-damping channels in **Qiskit AER/FakeManilaV2**.

3. **Solving System of Linear Equations using Quantum Algorithm and finding potential speed-ups , Oct - Dec 2023.**
- Implemented HHL in **Qiskit** and built a **custom emulator** showing **constant-time per-shot** vs the simulator's exponential scaling.
- Benchmarked emulator vs simulator; achieved **~1e-3 absolute error** against ground truth on test systems.

4. **Quantum Accelerated Simulated Annealing , Jan - Jul 2023.**
- Proposed **discretized quantum annealing (DiQA)** and hybrid **QASA** for **combinatorial optimization** in **Qiskit**.
- Benchmarked QASA vs classical SA, achieving **comparable solution quality in fewer steps** on Qiskit simulators/hardware.

❖ Technical Certification : IBM Certified Associate Developer - Quantum Computation using Qiskit v0.2X , Nov 2021.