AMEYA SHIRISH BHAVE

Postal Address: 7575 Frankford Rd, Dallas, TX 75252
Email:bhaveameya28@gmail.com **Professional**:https://ameya28bhave.github.io/ **Phone:** +14435704723
: linkedin.com/in/ameya-bhave-130a45148 : https://github.com/Ameya28Bhave

❖ SUMMARY:

Quantum researcher and Qiskit Advocate specializing in quantum error correction (QEC). Work spans neural decoders and erasure-aware decoding for QLDPC (BB, HGP) codes with interests in **fault-tolerant algorithms, information theory**. Seeking to advance decoding, transpiler/compilers, and circuit libraries toward utility-scale quantum computing. Contributed to the C-API circuit-library, docs, and tutorials in the **Qiskit Advocate Mentorship Program (QAMP)** from IBM.

❖ 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, 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

❖ RESEARCH EXPERIENCE:

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

1. **Erasure-Aware Decoding Framework –** *Submitted to IEEE QCNC 2026 (under review)* **, 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.

❖ PUBLICATIONS:

[1] **"HyperNQ: A Hypergraph Neural Network Decoder for Quantum LDPC Codes,"** *arXiv:2511.01741*, *IEEE ICC 2026*, .
[2] **"ZXNet: ZX Calculus-Driven GNN Framework for Quantum Circuit Equivalence Checking,"** *Proc. 62nd ACM/IEEE DAC*, 2025.
[3] **"Biclustering a Dataset Using Photonic Quantum Computing,"** *Frontiers in CS*, 2024, Article 1441879.
[4] **"On quantum annealing without a physical quantum annealer,"** QET 2023, London, UK, 2023, doi: 10.1049/icp.2023.3265.

❖ TECHNICAL CERTIFICATIONS:

- IBM Certified Associate Developer - Quantum Computation using Qiskit v0.2X**, Nov 2021**