

TECHNICAL EXPERTISE

- Quantum & Physics:** Tensor Networks, Quantum Computing, Quantum Information Theory, Quantum Field Theory, General Relativity, String Theory, Statistical Physics
- Pure Mathematics :** Tensor Calculus, Differential Geometry, Abstract Algebra, Information Theory, Complex Analysis, Optimization Theory
- ML/AI Expertise :** Transformers, CNNs, Natural Language Processing, Computer Vision, Language Modeling, Reinforcement Learning, Generative AI
- Coding & Tools :** Python, Mathematica, C/C++, SQL, Bash/Zsh, LaTeX, Git, Docker, Linux/macOS/Windows
- ML/AI Frameworks :** PyTorch, Hugging Face, LangChain, Cirq, PennyLane, Gymnasium, SB3, Numpy, Scikit-learn
- Cloud & Platform :** Azure, Databricks, Terraform, Delta Lake, Apache Spark, GitHub/GitLab, HPC Systems

EDUCATION

- University of Texas at Austin**
Master of Science in Artificial Intelligence

Austin, TX
Aug 2025 – Dec 2026, expected
- Relevant Coursework:** Deep Learning, Natural Language Processing; Spring '26: Advanced Deep Learning, Machine Learning
 - Research Focus:** Tensor Networks, Quantum Information Theory, Machine Learning for Quantum Systems
- Johns Hopkins University**
Bachelor of Science in Physics, Mathematics

Baltimore, MD
Aug 2016 – May 2020
- Advanced Physics Research:** Quantum Mechanics, Quantum Field Theory, General Relativity, String Theory
 - Advanced Mathematics Research:** Differential Geometry, Abstract Algebra, Complex Analysis, Tensor Calculus

RESEARCH & PROJECTS

- Tensor Networks for Quantum Systems**

Research Project

2025–Present
- Developing **tensor network algorithms** for simulating quantum many-body systems and emergent holographic geometry, bridging quantum information theory, machine learning optimization techniques, and quantum gravity
 - Implementing **MPS, PEPS, MERA** and other hybrid neural tensor networks using Python/PyTorch/TensorNetwork/Cirq for quantum simulation and entanglement analysis
 - Exploring connections between tensor network state representations and the **AdS/CFT correspondence** as theoretical and phenomenological evidence of holography
 - Investigating overlap between tensor network and quantum circuit representations of canonical quantum algorithms like Deutsch–Jozsa, Shor’s algorithm, etc.
 - Open-source implementation:** github.com/johngrahamreynolds/holographic_tensor_networks
- CyberSolve-LinAlg - Fine-tuned FLAN-T5 Model**

Published on Hugging Face

2024-2025
- Parallelized multiple Nvidia A100 GPUs to fine-tune FLAN-T5 on Google DeepMind Mathematics dataset, achieving **90.7% accuracy** on linear equation solving benchmarks
 - Optimized training pipeline using Nvidia Apex fused kernels for normalization layers and AdamW optimizer, reducing training time and GPU memory overhead
 - Implemented distributed training workflow on Azure Databricks processing **2M+** mathematical problems using PyTorch and Hugging Face Accelerate
 - Created novel evaluation dataset** to measure partial correctness in mathematical reasoning, enabling fine-grained analysis of model performance beyond binary accuracy metrics

PROFESSIONAL EXPERIENCE

Data/Machine Learning/Infrastructure Engineer

Vanderbilt University Medical Center - Data Platform Services

Jan 2022 – Present

Nashville, TN

- Architected and manage **\$600K annual** Azure cloud infrastructure supporting 100+ Databricks workspaces across Vanderbilt research and corporate departments, serving **400+ researchers, engineers, and data scientists**
- **Spearheaded development of Vanderbilt's first AI Assistant** prototype, architecting enterprise-grade NLP system using DBRX LLM with LangChain RAG on vector-indexed institutional data and production-ready beta inference app
- Engineered petabyte-scale data lake using Apache Spark, Azure Data Factory, and Delta Lake with large-scale ETL pipelines processing **150+ data sources** from SQL Server, RESTful APIs, and other systems
- Developed and maintained custom Python pipeline orchestration package with optimized wheel builds, enabling efficient deployment and management of production data workflows across multiple engineering teams
- Built production DataOps and MLOps infrastructure with Docker containers, GitLab CI/CD pipelines, and Terraform
- Led cloud migration from Bicep to Terraform while mentoring **2 engineers I recommended for hire**

Theoretical Physicist & Graduate Researcher

Johns Hopkins University

Jan 2019 – May 2020

Baltimore, MD

- Conducted **quantum black hole research** under Professor David Kaplan investigating quantum information loss paradox using advanced mathematical techniques from quantum field theory and general relativity
- Developed computational methods using Python and Mathematica to solve coupled systems of nonlinear partial differential equations arising from quantum gravity models
- Applied tensor calculus and differential geometry to analyze information flow across black hole event horizons
- Collaborated with theoretical physics group on quantum entanglement and holographic principle applications

CLASS Telescope Engineer

Johns Hopkins University

Sept 2017 – Jan 2019

Baltimore, MD

- Designed cryogenic systems for cosmology telescope using Python and SolidWorks, achieving target **temperature of 100mK (-273°C)**
- Deployed telescope infrastructure at 17,000ft research site in Chilean Andes

AWARDS & RECOGNITION

Johns Hopkins Bloomberg Distinguished Professor STAR Award

\$4000 research grant, nominated by Professor Charles L. Bennett

2018

Harvard Prize Book

Excellence in academic achievement and character

2015

RESEARCH INTERESTS

Quantum Computing, Quantum Information Theory, & Quantum Gravity

Tensor Networks, Quantum Algorithms, Quantum Many-Body Systems, ML for Quantum Systems

Theoretical Physics Notes & Solutions

Notes on String Theory and Quantum Gravity: github.com/johngrahamreynolds/string_solutions

EXTRACURRICULAR INTERESTS

Marathon Running

Top 15% Derby Festival miniMarathon, Top 32% San Diego Marathon

680+ miles in 2025