

John Graham Reynolds

johngrahamreynolds@gmail.com | (502) 475-3717 | Houston, TX

github.com/johngrahamreynolds

huggingface.co/MarioBarbeque

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** Austin, TX
Master of Science in Artificial Intelligence 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** Baltimore, MD
Bachelor of Science in Physics, Mathematics 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

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|--|----------------------------------|--------------|
| Tensor Networks for Quantum Systems | <i>Research Project</i> | 2025–Present |
| <ul style="list-style-type: none">Developing tensor network algorithms for simulating quantum many-body systems and emergent holographic geometry, bridging quantum information theory, machine learning optimization techniques, and quantum gravityImplementing MPS, PEPS, MERA and other hybrid neural tensor networks using Python/PyTorch/TensorNetwork/Cirq for quantum simulation and entanglement analysisExploring connections between tensor network state representations and the AdS/CFT correspondence as theoretical and phenomenological evidence of holographyInvestigating overlap between tensor network and quantum circuit representations of canonical quantum algorithms like Deutsch–Jozsa, Grover's algorithm, etc.Open-source implementation: github.com/johngrahamreynolds/holographic_tensor_networks | | |
| CyberSolve-LinAlg - Fine-tuned FLAN-T5 Model | <i>Published on Hugging Face</i> | 2024-2025 |
| <ul style="list-style-type: none">Parallelized multiple Nvidia A100 GPUs to fine-tune FLAN-T5 on Google DeepMind Mathematics dataset, achieving 90.7% accuracy on linear equation solving benchmarksOptimized training pipeline using Nvidia Apex fused kernels for normalization layers and AdamW optimizer, reducing training time and GPU memory overheadImplemented distributed training workflow on Azure Databricks processing 2M+ mathematical problems using PyTorch and Hugging Face AccelerateCreated 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 <i>Vanderbilt University Medical Center - Data Platform Services</i>	Jan 2022 – Present Nashville, TN
<ul style="list-style-type: none">Architected and manage \$600K annual Azure cloud infrastructure supporting 100+ Databricks workspaces across Vanderbilt research and corporate departments, serving 400+ researchers, engineers, and data scientistsSpearheaded 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 appEngineered 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 systemsDeveloped and maintained custom Python pipeline orchestration package with optimized wheel builds, enabling efficient deployment and management of production data workflows across multiple engineering teamsBuilt production DataOps and MLOps infrastructure with Docker containers, GitLab CI/CD pipelines, and TerraformLed cloud migration from Bicep to Terraform while mentoring 2 engineers I recommended for hire	
Theoretical Physicist & Graduate Researcher <i>Johns Hopkins University</i>	Jan 2019 – May 2020 Baltimore, MD
<ul style="list-style-type: none">Conducted quantum black hole research under Professor David Kaplan investigating black hole information loss paradox using advanced mathematical techniques from quantum field theory and general relativityDeveloped computational methods using Python and Mathematica to solve coupled systems of nonlinear partial differential equations arising from quantum gravity modelsApplied tensor calculus and differential geometry to analyze information flow across black hole event horizonsCollaborated with theoretical physics group on quantum entanglement and holographic principle applications	
CLASS Telescope Engineer <i>Johns Hopkins University</i>	Sept 2017 – Jan 2019 Baltimore, MD
<ul style="list-style-type: none">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 <i>\$4000 research grant, nominated by Professor Charles L. Bennett</i>	2018
Harvard Prize Book <i>Excellence in academic achievement and character</i>	2015

RESEARCH INTERESTS

Quantum Computing, Quantum Information Theory, & Quantum Gravity <i>Tensor Networks, Quantum Algorithms, Quantum Many-Body Systems, ML for Quantum Systems</i>	
Theoretical Physics Notes & Solutions <i>Notes on String Theory and Quantum Gravity: github.com/johngrahamreynolds/string_solutions</i>	

EXTRACURRICULAR INTERESTS

Marathon Running <i>Top 15% Derby Festival miniMarathon, Top 32% San Diego Marathon</i>	680+ miles in 2025
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