

John Graham Reynolds

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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

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 <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 quantum 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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