Daniel Butter • Applied AI/ML Researcher

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Google Scholar

SUMMARY

Hands-on researcher with 12+ years experience designing and leading 25+ research projects in mathematical physics, including managing personal 183k€ EU grant. 2+ years studying AI/ML theory, with direct experience developing RAG-driven coding assistant. Expert problem-solving skills, strong abilities mentoring and motivating others, and excellent communication skills from teaching classes and delivering seminars.

EDUCATION

University of California, Berkeley — **Berkeley, CA, USA**
Ph.D. Theoretical Physics

Harvard University — **Cambridge, MA, USA**
A.B. Chemistry & Physics, summa cum laude

CORE TECHNICAL SKILLS

Languages & Frameworks: Python, TypeScript/JavaScript, `C++/C`, Bash; PyTorch, TensorFlow, scikit-learn

AI/ML Expertise: Retrieval-Augmented Generation (RAG) pipelines, multi-agent orchestration for automated code repair, large-codebase embeddings, classical ML with NumPy/Pandas

Cloud & DevOps: Google Cloud (Cloud Functions, Firestore, Cloud Run), Docker, Linux, Bash scripting, Git & GitHub, GitHub Actions CI/CD

Systems & Web: REST/JSON APIs, serverless Apps Script back-ends, Postgres data stores

Mathematics & Analysis: Group theory, differential geometry, numerical optimization, statistics

WORK EXPERIENCE

AI Researcher
CodeGPT (remote, contract) — *Jan 2025 – May 2025*

- Contracted to implement major improvements to a **RAG database** that indexes multi-language codebases (`C/C++`, `C#`, JS/TS, Python, Java, Go, PHP) for LLM coding assistant; delivered >**10×** speed improvement.
- Implemented a **multi-agent repair loop** for internal testing on SWE-Bench.

DevOps Engineer
Comprehensive Therapy Center, Grand Rapids, MI (volunteer) — *Sep 2023 – Apr 2024*

- Built a **serverless scheduler** on **Google Cloud**; cut booking time 3× and enabled zero-downtime releases.
- Designed REST API and front-end Apps-Script UI; wrote unit tests and automated deployments.
- Gathered requirements from non-technical staff to identify inefficiencies and streamline processes.

Staff Research Scientist / Theoretical Physicist
Texas A&M • Dutch National Institute for Subatomic Physics (NIKHEF) • University of Western Australia — *2010 – 2023*

- Authored 51 peer-reviewed papers (13 sole-author, 1300+ cites) on string theory & supergravity; managed €183 k Marie-Curie grant and led international teams of up to 10 researchers.
- Developed high-performance `C++`/**Python** algebra frameworks to simplify 10k-term Lagrangians.
- Mentored 8 PhD students; 4 continued to co-author publications in subsequent positions.

PROJECT HIGHLIGHTS – AI / ML / HPC

- **Agentic Code-Repair Loop.** Orchestrated multi-agent system on SWE-Bench benchmark (internal project at CodeGPT).
- **Large-Codebase RAG Indexer.** Improved Typescript RAG service that encodes multi-language repos (`C/C++`, JS/TS, Python, Go, Rust, Dart). Decreased ingest time by more than **10×**.
- **Cadabra Tensor Engine.** Extended *Cadabra* (`C++`/**Python**) to simplify 10 k-term Lagrangians. Skills directly transferable to high-performance numerics.

RESEARCH HIGHLIGHTS – PHYSICS

Most of my research has involved a framework for manifestly supersymmetric quantum field theory, known as superspace. Here are the top four advances (all of them single-author) I am most proud of:

- **Conformal superspace.** Graduate work introduced novel superspace framework for handing conformal supergravity, significantly simplifying computational effort. Extended to all relevant dimensions and amounts of supersymmetry by self and other authors.
- **Harmonic/projective superspace unification.** Developed method for unifying harmonic and projective superspaces by complexifying harmonic auxiliary space S^2 to $T\mathbb{CP}^1$.
- **Covariant harmonic/projective superspace.** Invented covariant framework for coupling conformal supergravity to harmonic and projective superspaces.
- **Superspace for double field theory.** Invented manifestly supersymmetric and doubled spacetime for covariant description of low energy string theory.

RELEVANT UNDERGRAD COURSEWORK / CONTINUING LEARNING

- Harvard CS50: Intro to Computer Science (Junior Year, Grade: A)
- Harvard CS51: Intro to Computer Science II (Senior Year, Grade: A)
- Harvard CS121: Formal Systems and Computation (Senior Year, Grade: A)
- Coursera: Intro to Statistics
- Harvard CS50x (online)
- Harvard CS50 Intro to AI w/ Python (online)
- Coursera: Machine Learning w/ Andrew Ng
- DeepLearning.AI specialization
- Contributor to *Cadabra* computer algebra system (Python/`C++`).

INDIVIDUAL GRANTS AND HONORS

- Marie Curie Fellowship from European Union independent research funding (€183k)
- UWA Research Development Award research travel fund (A$11k)
- Friedman Prize in Applied Mathematics, Berkeley
- Outstanding Graduate Student Instructor, Berkeley
- Phi Beta Kappa, Harvard University
- Detur Book Prize (for high GPA), Harvard University