**Nate Gillman**
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## EDUCATION

**Brown University**, Providence, RI
- **PhD** (Artificial Intelligence, Machine Learning, Generative Modeling) *2020 – present*
- **ScM** (Mathematics) *2022*

**Wesleyan University**, Middletown, CT
- **BA** (Mathematics, Computer Science; Class rank 1/748, Barry Goldwater Scholar) *2020*

## PUBLICATIONS/PATENTS (coauthors, project pages listed on personal site)

**Artificial Intelligence**
- Self-Correcting Self-Consuming Loops for Generative Model Training. *ICML 2024.*
- IsoScore: Measuring the Uniformity of Embedding Space Utilization. *ACL 2022*.
- Methods and Systems for Dynamically Generating a Plurality of Machine Learning Systems During Processing of a User Data Set. Pub. No. US 2024/0028312 A1, January 25, 2024. *US Patent Application Publication.*

**Mathematics**
- Large Sets with Small Injective Projections. *Annales Fennici Mathematici, 2021.*
- Patterns of Primes in the Sato-Tate Conjecture. *Research in Number Theory, 2020.*
- Explicit Subconvexity Savings for Sup-norms of Cusp Forms in PGL(n, R). *Journal of Number Theory, 2020.*
- From Partitions to Hodge Numbers of Hilbert Schemes of Surfaces. *Philosophical Transactions of the Royal Society A, 2019.*
- Exact Formulas for Invariants of Hilbert Schemes. *Research in Number Theory, 2018.*

## RELEVANT WORK/PROJECT/RESEARCH EXPERIENCE

**Artificial Intelligence PhD Research**, Brown University *2020-present*
- *Generative modeling:* invented theoretical technique for stabilizing self-consuming generative model training; applied to fix model collapse for case of human motion generation using diffusion models (ICML 2024)
- *Natural language processing, machine learning:* invented rigorous mathematical method for measuring uniformity of spatial utilization of word embedding spaces; designed and executed numerical experiments using Numpy to evaluate properties of competing metrics (ACL 2022)

**Machine Learning Internships during PhD leave of absence**, New York City *June 2022 – June 2023*

1) **NLP Data Scientist**, American Express AI Labs *June 2022 – August 2022*
   - Created chatbot using open-source software; improved customer UX when disputing fraudulent charges
2) **Machine Learning Engineer**, Akkio *(startup, enterprise SaaS)* *August 2022 – January 2023*
   - Revamped PyTorch time series models, improved forecasting performance by 30%; product patented
3) **Machine Learning Engineer**, Captions *(startup, consumer iOS app)* *March 2023 – June 2023*
   - Trained PyTorch audio models (speaker separation, speaker diarisation, voice cloning) from scratch

**Pure Mathematics Research**, Brown, Emory, Wesleyan, Budapest Semesters in Math *2016-2022*
- Conjectured and proved theorems about distribution of primes, and distribution of geometric invariants

## RELEVANT TECHNICAL SKILLS

- *Programming languages:* Python, C, Cython, Standard ML, R, LaTeX, SageMath, HTML, JavaScript
- *Data science/tooling:* PyTorch, Tensorflow, Jax, Numpy, Pandas, Matplotlib, AWS, GCP, Cuda, Docker
- *Expertise/interests:* deep learning, generative modeling, computer vision, natural language processing

## LEADERSHIP/TEACHING EXPERIENCE

- *Seminar organization:* Brown math PhD student seminar (2021), arithmetic dynamics seminar (2020)
- *Teaching:* PhD student teacher training (2021), mentored a directed reading program in cryptography (2021), course assistant for algebra, analysis, calculus, discrete math, number theory (2017-2022)
- *Outreach:* organized activities “Numbers in Nature with Nate” and “Math Yoga” at youth summer camps