

Giorgio Giannone

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I am a Principal Research Scientist with the AI Innovation Team at **Red Hat** and Research Affiliate with the DeCoDE Lab at **MIT**.

My research lies at the intersection of Generative Modeling and Probabilistic Inference, developing efficient methods tailored for data-constrained domains.

I have published over 20 papers in leading venues - including NeurIPS, ICML, CVPR, Nature npj - and hold two US patents.

My current focus areas include Inference-Time Scaling, Test-Time Adaptation, Vision-Language Alignment, and Few-Shot Generation.

Experience

Principal Research Scientist, Red Hat

Boston, Massachusetts, USA
June 2025 - Present

- AI Innovation Team
 - Probabilistic Inference for Vision and Language Models
 - Inference-Time Scaling and Reasoning for LLMs
 - `its-hub` Development and vLLM Gateway Integration
 - Context Optimization for AgentOps

Research Affiliate, Massachusetts Institute of Technology

Cambridge, Massachusetts, USA
Jan 2026 - Present

- DeCoDE Lab. Department of Mechanical Engineering
 - Inference-Time Scaling for Constrained Generative Design
 - Iterative Self-Training for CAD Program Synthesis

Applied Scientist, Amazon

Seattle, Washington, USA
April 2024 - June 2025

- Home Innovation and GenAI Team
 - Grounded Vision-Language Models
 - Evaluation for Text-to-Image Models (CVPR)
 - Detection and Ranking Algorithms for Amazon Visual Shopping
 - Subject-Driven Generative Models for AI Creative Studio

Visiting Researcher, UCL Centre for Artificial Intelligence

London, UK
Jan 2024 - March 2024

- Host: David Barber
 - Multi-Resolution Convolutional Models for Long Sequences (NeurIPS)
 - Bayesian Inference for Language Models

PhD Internships and Collaborations

Researcher (PhD Intern), Microsoft Research

Cambridge, MA, USA, *Jun 2023 - Sept 2023*

- ML and Statistics Group. Hosts: David Alvarez Melis, Nicolo Fusi
- Dynamic Vocabulary Augmentation for LLMs

Research Collaborator, MIT-IBM AI Lab

Cambridge, MA, USA, *Jan 2023 - June 2023*

- Model Alignment Team. Host: Akash Srivastava
- Generative Models for Systems with Constraints (NeurIPS)
- Aligning Language Models with Negative Data
- Specialized Language Models for Enterprise Domains

Research Scientist (PhD Intern), IBM Research

Zurich, Switzerland, *Jun 2022 - Nov 2022*

- Accelerated Discovery Team. Hosts: Matteo Manica, Teodoro Laino
 - Multitask Language Models for Text and Chemistry (ICML)
 - Open-source library GT4SD for conditional generative models
- Applied Scientist** (PhD Intern), Amazon Science Cambridge & London, UK, *Jul 2021 - Oct 2021*
- Alexa Team. Hosts: Yunlong Jiao, Emine Yilmaz
 - Domain Agnostic Subpopulation Generalisation

Research Engineer, NNAISENSE

- Deep Learning Team. Managers: Christian Osendorfer, Jonathan Masci
 - Structured Latent Variable Models
 - NeuralODE Algorithms for High-Range Event Camera Streams

Co-Founder, SecretAIry (formerly GAiA)

- Chatbots to enhance Workplace Communication
 - Selected among 100+ startups to join the EnLabs Incubator

Lugano, Switzerland
Jan 2019 - Jan 2020

Rome, Italy

July 2017 - Jan 2019

Education

PhD, Generative Machine Learning

Technical University of Denmark, Lyngby, Denmark
June 2020 - Dec 2023

- Few-Shot Generative Models (ICML)
- Multitask Language Models for Conditional Molecule Generation (ICML)
- Diffusion Models for Generative Engineering Design and Topology Optimization (NeurIPS)
- Thesis: Learning Generative Models with Limited Data
 - Supervisor: Ole Winther; Co-supervisor: Søren Hauberg

Visiting PhD Student, MIT School of Engineering

Cambridge, Massachusetts, USA
Jan 2023 - Sept 2023

- Constrained Diffusion Models for Engineering Design (NeurIPS & Patent)
- Improving Generative Constraint Satisfaction using Invalid Designs (TMLR)
- Evaluating Vision-Language Models for Engineering Tasks (Journal)
- Research on LLM Agents for CAD design. Co-developer of `text2cad`.
 - Host: Faez Ahmed, DeCoDE Lab

Master's Degree, Data Science

Sapienza University, Rome, Italy
Sept 2016 - Nov 2018

- Excellence Path & Summa Cum Laude
- Thesis: Multimodal Learning for Scene Understanding
 - Supervisor: Aris Anagnostopoulos; External Supervisor: Boris Chidlovskii

Visiting Graduate Student, NYU Tandon School of Engineering

NYC, New York, USA
Sept 2017 - Jan 2018

- Visualization and Data Analytics Research Center. Host: Enrico Bertini
 - Built an interactive entity retrieval tool to investigate 10M documents

Master's Degree, Mechanical Engineering

Sapienza University, Rome, Italy
Sept 2014 - Jan 2017

- Summa Cum Laude
- Thesis: Bubble Dynamics in Turbulent Shear Flows
 - Supervisor: Carlo Massimo Casciola; Co-supervisor: Paolo Gualtieri

Bachelor's Degree, Mechanical Engineering

Sapienza University, Rome, Italy
Sept 2009 - May 2014

- Thesis: Rapid Prototyping of Metallic Manufacturing

Selected Publications & Patents

Bootstrapping Image-to-CAD Program Synthesis via Geometric Feedback	under-review
<u>GIANNONE</u> , DORIS, NOBARI, XU, SRIVASTAVA, AHMED	2026
Mitigating Premature Exploitation in Particle-based Monte Carlo for ITS	under-review
<u>GIANNONE</u> , XU, NAYAK, AWHAD, SUDALAIRAJ, XU, SRIVASTAVA	2025
Generative optimization models for machine learning	US Patent (MIT & IBM)
<u>GIANNONE</u> , SRIVASTAVA, AHMED	2025
Feedback-Driven Vision-Language Alignment	under-review
<u>GIANNONE</u> , LI, FENG, PEREVODCHIKOV, CHEN, MARTINEZ	2025
Be More Specific: Evaluating Object-centric Realism in Synthetic Images	CVPR
LIANG, CORNEANU, FENG, <u>GIANNONE</u> , MARTINEZ	2025
Evaluating Vision-Language Models for Engineering Design Springer Artificial Intelligence Review	
PICARD, EDWARDS, DORIS, MANN, <u>GIANNONE</u> , ALAM, AHMED	2025
NITO: Neural Implicit Fields for Resolution-free Topology Optimization	TMLR
NOBARI, REGENWETTER, <u>GIANNONE</u> , AHMED	2025
Reparameterized Multi-Resolution Convolutions for Long Sequence Modelling	NeurIPS
CUNNINGHAM, <u>GIANNONE</u> , ZHANG, DEISENROTH	2024
Constraining Generative Models for Engineering Design with Negative Data	TMLR
REGENWETTER, <u>GIANNONE</u> , SRIVASTAVA, GUTFREUND, AHMED	2024
Aligning Optimization Trajectories with Diffusion Models	NeurIPS
<u>GIANNONE</u> , SRIVASTAVA, WINTHER, AHMED	2023
Diffusing the Optimal Topology: A Generative Optimization Perspective	IDETC23
<u>GIANNONE</u> , AHMED	2023
Unifying Molecular and Textual Representations via Multi-task LM	ICML
CHRISTOFIDELLIS*, <u>GIANNONE</u> *, BORN, WINTHER, LAINO, MANICA	2023
Accelerating Material Design with GT4SD	Nature npj Computational Materials
<i>GT4SD Team (Core Contributor)</i>	2023
Few-Shot Diffusion Models	SBM@NeurIPS
<u>GIANNONE</u> , NIELSEN, WINTHER	2022
SCHA-VAE: Hierarchical Context Aggregation for Few-Shot Generation	ICML
<u>GIANNONE</u> , WINTHER	2022
Method and apparatus for semantic segmentation and depth completion	US Patent (NAVER)
CHIDLOVSKII, <u>GIANNONE</u>	2022
JM1: Worst-group Generalization by Group Interpolation	NeurIPS-W
<u>GIANNONE</u> , HAVRYLOV, MASSIAH, YILMAZ, JIAO	2021
Hierarchical Few-Shot Generative Models	NeurIPS-W
<u>GIANNONE</u> , WINTHER	2021
Transformation-aware Variational Autoencoders	Technical Report
<u>GIANNONE</u> , SAREMI, MASCI, OSENDORFER	2020
Input-filtering NeuralODEs for spiking data	NeurIPS-W
<u>GIANNONE</u> , ANOOSHEH, QUAGLINO, D'ORO, MASCI, GALLIERI	2020
\mathcal{T}-VAE: No Representation without Transformation	NeurIPS-W
<u>GIANNONE</u> , MASCI, OSENDORFER	2019
Learning Common Representation from RGB and Depth Images	CVPR-W
<u>GIANNONE</u> , CHIDLOVSKII	2019

Projects & Open Source

its-hub: A Python library for inference-time scaling

2025

- Contributor.
- Inference-Time Scaling for Language Models.
- Focus on Mathematical Reasoning.
- Contributed Entropic Particle Filtering algorithms and new benchmark.

Text2CAD: Democratizing Engineering Design. Prompt by Prompt.

2023

- Co-Lead.
- DesignX. Team of engineers and researchers based at MIT and Caltech.
- Generative tool that allows users to create CAD models using natural language prompts.
- The tool is designed to be user-friendly and accessible to non-experts, enabling a wide range of users to quickly create complex CAD models without the need for specialized training.

GT4SD: Generative Toolkit for Scientific Discovery

2022

- Core Contributor.
- Library leveraging conditional generative models for accelerated discovery.
- Work on Diffusion Models for images and 3D molecule conformation. The GFlowNet framework. Property Prediction module. Public Hub for model upload. Training Pipelines. Documentation. Tutorials. Testing. CI/CD. Server and Client API. Docker Images for CPU and GPU.

Grants & Awards

GPU Grant, LUMI-G, EuroHPC

Copenhagen, Denmark

Nov 2023

PI, Efficient Pre-training of Large Generative Models for Constrained Design

Grant, Otto Møensted's Foundation

Copenhagen, Denmark

Dec 2022

Research Grant

Grant, Independent Research Fund Denmark

Lyngby, Denmark

Jun 2020

DFF PhD Grant

Grant, Perception as Generative Reasoning

NeurIPS 2019

Oct 2019

Awarded Complimentary Conference Registration by DeepMind

Grant, Pi School

Rome, Italy

Oct 2018

Full Tuition for the School of AI (3% acceptance rate)

Certificate of Award, Tsinghua University

Beijing, China

Aug 2018

Prize for Outstanding Accomplishments, Deep Learning Summer School

1st Pick, Excellence Path, Master's Degree, Data Science

Rome, Italy

Mar 2018

Admission based on the First year's Academic Performance

Participation in the School for Advanced Studies

Academic Service

Reviewer

Conference: ICML19, ICCV19, AAAI20, ICML21 (top 10%), AISTATS21, ICML22, NeurIPS22, CVPR23, NeurIPS23, ICML24, ICLR25, CVPR25, NeurIPS25, ICLR26, ICML26

Journal: TPAMI, TMLR

Workshop: NeurIPS-IBW20, NeurIPS-MetaLearn21, ICML-DeployableGenAI23, ACL-LanguageMolecules24

Teaching

Teaching: Deep Learning (DTU 02456), Bayesian Machine Learning (DTU 02477), Advanced Machine Learning (DTU 02460)

Supervision: two special courses (9 months), two master's thesis (6+6 months), 18 final projects

Talks

Algorithmic Methods for Data Mining (Sapienza University), Bayesian Reading Group (DTU), MLLS Center (KU), UCL-NLP (UCL), Amazon Alexa (Cambridge), DeCoDE Lab (MIT)

Volunteering

PAISS18, NeurIPS18, ELLIS Unit Copenhagen, MLLS

Skills

Languages

- Python (proficient); R, Matlab (good knowledge); C, Java, JavaScript (basic knowledge)

Research

- Accelerate, HF Transformers, LaTeX, NLTK, OpenCV, PyTorch, SpaCy, TensorFlow, verl

Software

- AWS, CVX, Docker/podman, FastAPI, Git, GitHub Actions, Gradio, Linux, MinIO, MongoDB, MySQL, Travis, vLLM, LangGraph, LangFlow, Langfuse, Cline, Cursor, OpenRouter