

Summary of qualifications. I have a solid experience in probabilistic machine learning (ML) research [4][1][3], a strong background in applied mathematics, and a long-standing practical knowledge in programming. In particular, I can competently write deep learning programs based on `Jax` and `PyTorch`, and I am both interested and knowledgeable about approximate Bayesian inference and large-scale numerical computations. Besides, I have a consistent track of collaborative work on culturally diverse environments—both nationally and internationally (Brazil, Finland, and the UAE). In this context, I believe I am well-positioned to contribute effectively as a postdoctoral researcher at the Technical University of Denmark in Søren Hauberg’s group.

The past and the present

A short biography. I was born in the island of Florianópolis, in Brazil. During my teenage years, I was deeply engaged in academic olympiads, in which I consistently ranked among the best in the country in both mathematical and chemistry competitions. Upon coming of age, I was invited for a fully-funded undergraduate scholarship at the Getulio Vargas Foundation’s School of Applied Mathematics, a recently created institution spearheaded by some of the most prominent Brazilian mathematicians, e.g., César Camacho and Alfredo Iusem. After four years, I finished my bachelor’s degree in Data Science with a near-perfect GPA. A year later, due to my scientific productivity and consistent academic excellence, I also successfully defended both my master’s and doctoral’s theses on Applied Mathematics. Following this, I have spent several months contributing to risk management and engineering projects in the sports betting and retail industries at rapidly growing Brazilian startups. Then, I returned to academia as a postdoctoral associate at MBZUAI in the UAE—a fast-paced and AI-first university with a prestigious faculty body, including Eric Xing and Éric Moulines—, where I am working on the analysis and design of approximate inference algorithms through the lens of amortized sampling.

Research experience. During my PhD, my research focused on algorithmic and theoretical improvements for Generative Flow Networks (GFlowNets), which are a class of models for amortized sampling on discrete and compositional spaces (e.g., graphs and sentences—which can be built by adding atomic components, such as edges and tokens, to a fixed initial state). From a theoretical viewpoint, I designed PAC-Bayesian generalization bounds, delineated the expressivity, and studied divergence-based learning objectives for GFlowNets. Drawing on the derived theory, I developed distributed and streaming algorithms for large-scale approximate Bayesian inference on discrete posteriors. My research has appeared at the top-tier ML venues (e.g., NeurIPS, ICML).

Professional experience. I have also worked for approximately two years—during and after my PhD—as an analytics engineer at tech startups. Throughout this period, I built web APIs, deployed them in cloud-based services, and maintained them for internal and external users. During this period, I learned about software engineering and project management, and I also greatly sharpened my communication skills for a non-technical audience.

Fitness to the position

Alignment in research interests. Bayesian statistics provides a principled and pragmatic framework for learning from data. At its core, Bayes’s rule naturally implements a belief update mechanism based on noisy information. Nonetheless, the research community still struggles to efficiently incorporate Bayesian principles into modern deep learning systems. With this in mind, identifying and mitigating the challenges constraining the efficient implementation of Bayesian methods has been a major driver of my research. As exact Bayesian inference is computationally intractable, I have both studied and worked during the past few years on understanding the Bayesian framework and devising effective tools for carrying out *approximate Bayesian inference* on large-scale and complex distributions [1] [2] [5] [3]. Notably, these methods amount to minimizing a divergence (distance) function from a family of tractable distributions to a target measure, having an inherently geometrical interpretation [3]. As such, I also have a growing interest in differential geometry—Riemannian manifolds, logarithmic and exponential maps, curved exponential families—which is a mathematically coherent approach for cleanly characterizing these problems.

What lies ahead? My goal as a postdoc at Søren Hauberg’s group will be to understand and mitigate the limitations of approximate Bayesian methods applied to deep learning—through the lens of differential geometry. I am also eager to work with students, aid with teaching, assist with grant-writing, and engage in further academic activities (e.g., reading groups, presentations).

- [1] [T. da Silva](#), A. Souza, L. Carvalho, S. Kaski, D. Mesquita, “[Embarrassingly Parallel GFlowNets](#)”, ICML, 2024.
- [2] [T. da Silva](#), D. de Souza, D. Mesquita, “Streaming Bayes GFlowNets”. NeurIPS, 2024.
- [3] [T. da Silva](#), E. Silva, D. Mesquita, “On Divergence Measures for Training GFlowNets”, NeurIPS, 2024.
- [4] [T. da Silva](#), E. Silva, R. Alves, A. Souza, V. Garg, S. Kaski, D. Mesquita “[When do GFlowNets learn the right distribution?](#)”, ICLR, 2025. Also, SPIGM@ICML 2024 workshop.
- [5] [T. da Silva](#), O. Rivasplata, A. Souza, S. Kaski, V. Garg, D. Mesquita, “Generalization and Distributed Learning of GFlowNets”, ICLR, 2025.
- [6] [T. da Silva](#), E. Silva, D. Heider, S. Kaski, D. Mesquita, A. Ribeiro, “[Human-aided discovery of ancestral graphs](#)”, under review, 2024. LatinX@NeurIPS workshop. Also available on [arxiv](#).

Tiago da Silva

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Education

PhD in Applied Mathematics

2024/03 – 2024/12

School of Applied Mathematics, Brazil. Advisor: [Prof. Diego Mesquita](#).

- Thesis title: Streaming, Distributed, and Asynchronous Amortized Inference.
- Fast-tracked graduation due to recognized academic excellence and scientific productivity.

MSc in Applied Mathematics

2024/03 – 2024/12

School of Applied Mathematics, Brazil. Advisor: [Prof. Diego Mesquita](#).

- Dissertation title: Expert-Aided Discovery of Ancestral Graphs.

BSc in Data Science

2020/03 – 2023/12

School of Applied Mathematics, Brazil

- GPA: 9.9/10.0. 1st in class and 1st in the entrance exam. Received a fully-funded scholarship.

Selected Publications

- When do GFlowNets learn the right distribution?** ICLR 2025 (spotlight)
 - [da Silva, T.](#), Silva, E., Alves, R., Souza, A., Garg, V., Kaski, S., Mesquita, D.
 - TL;DR: We show that a GFlowNet's learning objective may have an unattainable global minimum, which is undetectable by standard diagnostics. To address this, we propose the first tractable metric for assessing GFlowNets.
- Generalization and Distributed Learning of GFlowNets?** ICLR 2025
 - [da Silva, T.](#), Souza, A., Rivasplata, O., Garg, V., Kaski, S., Mesquita D.
 - TL;DR: We devise the first PAC-Bayesian generalization bounds for GFlowNets. Inspired by them, we also introduce the first general-purpose distributed learning algorithm for GFlowNets, drastically accelerating training convergence.
- Streaming Bayes GFlowNets** NeurIPS 2024
 - [da Silva, T.](#), Souza, D., and Mesquita, D.
 - TL;DR: We design a method to update GFlowNets trained on a streaming Bayesian posterior. Experiments show a drastic reduction in training time when compared against learning from scratch a model based on the entire dataset.
- On Divergence Measures for Training GFlowNets** NeurIPS 2024
 - [da Silva, T.](#), Silva, E., and Mesquita, D.
 - TL;DR: We empirically show that the inefficacy of divergence-based objectives for GFlowNets is due to their large gradient variance. We then develop variance reduction techniques that significantly accelerate training convergence.
- Embarrassingly Parallel GFlowNets** ICML 2024
 - [da Silva, T.](#), Souza, A., Carvalho, L., Kaski, S., and Mesquita, D.
 - TL;DR: We propose a divide-and-conquer approach to train a log-pool of GFlowNets in an embarrassingly parallel fashion. Results show a significant speed up in learning when the unnormalized target is expensive to evaluate.
- Exploring scientific literature by textual and image content using DRIFT** Computer & Graphics 2022
 - Pocco, X., [da Silva, T.](#), Poco, J., Nonato, L. G., Gomez-Nieto, E.
 - TL;DR: We developed a text- and image-driven visualization-based search engine for scientific literature.

Preprints & Workshops

- Human-aided Causal Discovery of Ancestral Graphs** LatinX @ NeurIPS 2024
 - [da Silva, T.](#), Silva, E., Góis, A., Heider, D., Kaski, S., Mesquita, D., Ribeiro, A.
 - TL;DR: We devise a Bayesian human-in-the-loop algorithm for causal discovery under latent confounding.

Employment

Mohamed bin Zayed University of Artificial Intelligence

Abu Dhabi, UAE

- Postdoctoral Associate.
 - Working on probabilistic machine learning and Bayesian inference.

2025/10 – ongoing

Rei do Pitaco

Santa Catarina, Brazil

- Data Scientist.

2025/01 – 2025/11

- ▶ Spearheaded the development of the company's bet builder, allowing customers to create customized bets. I designed, implemented, and maintained both the algorithm and the web API responsible for the real-time odds calculations.
- ▶ Handling up to 1.2 million requests per day, the service accounted for 50% of the company's sportbook revenue.

Proffer (Price Monitoring & Optimization startup)*Rio de Janeiro, Brazil*

- Software Engineer.*2024/04 – 2025/09*
 - ▶ Extended the company's API to support larger workloads via asynchronous processing and caching.
 - ▶ Led the adoption of Infrastructure as Code (IaC) using Terraform as a standard for the company's web scraping services.
 - ▶ Assisted in the migration of the company's infrastructure between cloud providers (AWS and Azure).

Rei do Pitaco (largest fantasy sports company in Brazil)*Rio de Janeiro, Brazil*

- Data Science intern.*2023/01 – 2023/07*
 - ▶ Designed predictive models to define the opening lines of bets on the outcomes of sport events (bookmaking).
 - ▶ Deployed and upheld the created models within applications serving thousands of concurrent users.

Honors & Awards

Award for Academic Excellence, Brazilian Society of Applied and Computational Mathematics.*2023*

First place, School of Applied Mathematics entrance exam.*2020*

I was awarded 19 prizes in scientific competitions during high school, including:

William Glenn Whitley Prize for achieving the highest score on the State Mathematical Olympiad.*2019*

Top score in the country, Brazilian Mathematical Olympiad of Public Schools.*2019*

Top score in the country, Brazilian Mathematical Olympiad of Public Schools.*2018*

Gold medal, Brazilian Chemistry Olympiad.*2018*

Gold medal, Brazilian Mathematical Olympiad of Public Schools.*2017*

Gold medals, State Chemistry Olympiad. Highest score in 2019.*2016-2019*

Research Experience

Green AI Lab, Brazil*2022/08 – 2025/10*

Worked on streaming, distributed, and asynchronous algorithms for probabilistic machine learning.

Aalto University, Finland*2024/07 – 2024/10*

Visiting scholar at the PML group. Worked on the generalization and expressivity of amortized inference algorithms.

Visual Data Science Lab, Brazil*2020/08 – 2023/01*

Worked on the development of an open-source library for reverse engineering visualizations (REV).

Teaching

I worked as a teaching assistant for four years at the School of Applied Mathematics in courses on statistics and machine learning. I assisted the professors in designing and grading homeworks. I also held office hours to support students.

Languages

Portuguese (Native), English

Skills

Computer languages: Proficient with Python and SQL. Competent with R and Stan and Rust. Familiar with C++.

Scientific computing frameworks: PyTorch, PyTorch Geometric, GPyTorch, NumPy, SciPy, Jax.

Technologies: Git, Linux, Docker, FastAPI, Datadog, Kubernetes, Argo, Tailscale, Kafka.

References

Diego Mesquita*diego.mesquita@fgv.br*

Amauri Souza*amauri.souza@aalto.fi*

DECLARATION

I hereby DECLARE, on the request of the interested party and for all due purposes, that **TIAGO DA SILVA HENRIQUE**, identity no. 35.898.091-0, completed the **Master's in Applied Mathematics and Data Science** at School of Applied Mathematics, Fundação Getulio Vargas. The Final Project, entitled "HUMAN-AIDED DISCOVERY OF ANCESTRAL GRAPHS", was graded as pass on December 11, 2024 and the student earned the Master's in Applied Mathematics and Data Science.

Rio de Janeiro, December 29, 2025.

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Rio de Janeiro, December 29, 2025.

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