

# Sanae Lotfi

🏠 New York City, USA  
📞 (332) 248 3261  
✉ [sl8160@nyu.edu](mailto:sl8160@nyu.edu)  
📁 [sanaelotfi.github.io](https://sanaelotfi.github.io)

## Research Interests

Foundations of Machine Learning, Probabilistic Modeling, Bayesian Learning, Out-of-Distribution Generalization, Large-Scale Optimization, and Time Series Modeling.

## Education

- 2020–current **Ph.D. in Data Science, New York University, USA**  
GPA: 4.0/4.0  
◦ Supervisor: [Andrew Gordon Wilson](#)  
◦ Affiliations: [CDS](#), [CILVR](#)
- 2018–2020 **M.Sc. in Applied Mathematics, Polytechnique Montreal, Canada**  
GPA: 4.0/4.0  
◦ Supervisors: [Andrea Lodi](#), [Dominique Orban](#)  
◦ Affiliations: [MILA](#), [CERC](#), [GERAD](#)
- 2015–2018 **M.Eng. in Applied Mathematics, Centrale Paris, France**  
GPA: 3.97/4.33

## Publications

- 2022 Bayesian Model Selection, the Marginal Likelihood, and Generalization [\[arxiv\]](#)  
**Sanae Lotfi**, Pavel Izmailov, Gregory Benton, Micah Goldblum, Andrew Gordon Wilson  
International Conference on Machine Learning (ICML), **long oral presentation, top 2% submissions Outstanding Paper Award**
- 2022 Adaptive First- and Second-Order Algorithms for Large-Scale Machine Learning [\[arxiv\]](#)  
**Sanae Lotfi**, Tiphaine Bonniot de Ruisselet, Dominique Orban, Andrea Lodi  
Annual Conference on Machine Learning, Optimization, and Data Science (LOD), **oral presentation**
- 2022 Evaluating Approximate Inference in Bayesian Deep Learning [\[pmlr\]](#)  
Andrew Gordon Wilson, **Sanae Lotfi**, Sharad Vikram, Matthew D. Hoffman, Yarin Gal, Yingzhen Li, Melanie F. Pradier, Andrew Foong, Sebastian Farquhar, Pavel Izmailov  
NeurIPS Competition and Demonstration Track, Proceedings of Machine Learning Research (PMLR)
- 2021 Dangers of Bayesian Model Averaging under Covariate Shift [\[arxiv\]](#)  
Pavel Izmailov, Patrick Nicholson, **Sanae Lotfi**, Andrew Gordon Wilson  
Neural Information Processing Systems (NeurIPS)
- 2021 Stochastic Damped L-BFGS with Controlled Norm of the Hessian Approximation [\[arxiv\]](#)  
**Sanae Lotfi**, Tiphaine Bonniot de Ruisselet, Dominique Orban, Andrea Lodi  
SIAM Conference on Optimization, 2021, **oral presentation**
- 2021 Loss Surface Simplexes for Mode Connecting Volumes and Fast Ensembling [\[arxiv\]](#)  
Gregory W. Benton, Wesley J. Maddox, **Sanae Lotfi**, Andrew Gordon Wilson  
International Conference on Machine Learning (ICML), **spotlight presentation**
- 2020 Stochastic First and Second Order Optimization Methods for Machine Learning [\[polymtl\]](#)  
**Sanae Lotfi**  
Master's thesis, Polytechnique Montreal  
**Best Master's Thesis Award**, Department of Mathematics and Industrial Engineering

## Work Experience

- Summer 2022 **Applied Scientist Intern, Amazon AWS, Santa Clara, USA**  
◦ Supervisors: [Yuyang \(Bernie\) Wang](#) and [Richard Kurle](#).  
◦ Research on time series modeling under distribution shift.

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## Work Experience Cont.

- 2018 **Research Intern, Air Liquide**, Paris, France
  - Designing algorithms to predict gas consumption and optimize the production planning.
- 2017 **Research Intern, BeeBryte**, Singapore
  - Developing and optimizing strategies for trading and hedging in electricity markets.
- Summer 2016 **Research Assistant, USTEM (Electron Microscopy Laboratory)**, Vienna, Austria
  - Conducting mathematical and numerical simulations of atomic diffusion in dissimilar materials.

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## Awards and Honors

- 2022 **Outstanding Paper Award, International Conference on Machine Learning (ICML)**  
Awarded for first-authored paper *Bayesian Model Selection, the Marginal Likelihood, and Generalization*
- 2020 – 2021 **DeepMind Fellowship**,  
One of three DeepMind Fellows to join NYU in 2020–2021
- 2020 **McKinsey First Generation Achievement Award**  
Prize for outstanding individuals who are the first in their family to earn a higher-education degree
- 2020 – 2025 **Data Science Graduate Fellowship**  
5-year graduate fellowship awarded by NYU Center for Data Science
- 2020 **Best Master's Thesis Award at Polytechnique Montreal**  
Awarded by the department of Mathematics and Industrial Engineering at Polytechnique Montréal
- 2015 – 2018 **French Government Scholarship for Excellence**  
3-year scholarship. Awarded for ranking 2nd in CentraleSupélec's entrance exam
- 2013 – 2021 **Académie Hassan II Scholarship for Excellence**  
8-year scholarship. Awarded for ranking 1st in nationwide open competition in mathematics
- 2010 – 2013 **Various first prizes in regional mathematics and physics Olympiads in Morocco**

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## Other Research Projects and Surveys

- 2022 Understanding the Generalization of Deep Neural Networks through PAC-Bayes bounds [\[report\]](#)  
Joint with Andres Potapczynski, Anthony Chen, and Chris Ick
- 2021 Causal Representation Learning [\[report\]](#)  
Joint with Taro Makino and Lily Zhang
- 2019 Analysis of High Dimensional Distributions with Decoupled Norm and Direction [\[report\]](#)  
Joint with Jose Gallego, Ankit Vani, and Max Schwarzer
- 2019 Variance Reduction with Neighbours for Adaptive Optimization [\[report\]](#)  
Joint with Jose Gallego

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## Selected Talks

- Bayesian Model Selection, the Marginal Likelihood, and Generalization**
- 2022 ML Collective, Deep Learning: Classics and Trends (upcoming)
- 2022 Amazon Web Services, Forecast Science Talks
- 2022 International Conference on Machine Learning (ICML), Long Oral
- 2022 INRIA Social Data Group
- 2022 Morocco AI, Webinar Series, [\[video\]](#)
- 2022 Center for Data Science Graduate Student Seminar
- Understanding and Quantifying Generalization in Deep Learning Models**
- 2021 DeepMind Montreal
- 2021 Women in Data Science at NYU

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## Selected Talks Cont.

### **Dangers of Bayesian Model Averaging under Covariate Shift**

- 2021 Neural Information Processing Systems (NeurIPS), [\[video\]](#)
- 2021 Women in Mathematics at NYU, Research Talks

### **Adaptive First and Second Order Algorithms for Large-Scale Machine Learning**

- 2022 Annual Conference on Machine Learning, Optimization, and Data Science (LOD) (upcoming)
- 2021 SIAM Conference on Optimization
- 2020 NeurIPS Optimization for ML Workshop, Spotlight Presentation, [\[video\]](#)
- 2019 Montreal Machine Learning and Optimization Group

### **Planning in Home Health Care Structures using Reinforcement Learning**

- 2019 ICLR AI for Social Good, Spotlight Presentation, [\[video\]](#)

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## Invited Panels

- 2022 Affinity Group Supported Pathways to ML Research Panel and Social, International Conference on Artificial Intelligence and Statistics (AISTATS)
- 2021 Data Science Career Panel, Women in Data Science (WiDS) at NYU

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## Teaching

- 2021 - 2022 New York University
  - o Section Leader and Grader for “DS-GA 3001: Introduction to Data Science for PhD Students”
  - o Grader for “DS-GA 1004: Big Data”
- 2019 - 2020 University of Montreal
  - o Teaching Assistant and Grader for “IFT 6135: Representation Learning”
  - o Section Leader and Grader for “MTH3302: Probability and Statistics for AI”

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## Summer Schools

- 2021 Deep Learning Theory Summer School at Princeton
- 2021 Harnessing Quantum Matter Data Revolution, Virtual Summer School, Teaching Assistant

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## Professional and Community Activities

### **Organizing and Leadership**

- 2022 Co-leader of the “Robustness of Deep Learning Models to Distribution Shift” session at Women in Machine Learning Workshop, ICML
- 2021 Founding organizer of research talks, *Tea-Talks*, at the NYU Association of Women in Mathematics
- 2021 Co-organizer of the NeurIPS competition “Approximate Inference in Bayesian Deep Learning”
- 2017 Leader of a mental health campaign to promote emotional well-being and prevent suicide among hundreds of students at Centrale Paris
- 2016 Co-founder of the competitive programming association at Centrale Paris

### **Outreach and Volunteering**

- 2022 Student volunteer at the International Conference on Machine Learning (ICML)
- 2021-2022 Mentor for the Deep Learning Indaba Mentorship Programme
- 2019 Graduate student representative in the Disciplinary Board at Polytechnique Montreal
- 2016-2018 Mathematics and physics instructor for students from disadvantaged backgrounds at Renovo

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## Professional and Community Activities Cont.

### Research Mentorship

- 2021 Mentored Feliciano Manuel to conduct her undergraduate research on “Cataract Identification using Deep Learning on Retinal Images” at Lúrio University, Mozambique.

### Reviewing

- Conferences NeurIPS 2022, ICML 2022, LOD 2022  
Workshops NeurIPS 2021 Bayesian Deep Learning Workshop, NeurIPS 2019 Women in Machine Learning Workshop

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## Technical Skills

- Proficient Python (Scikit-learn, SciPy stack, PyTorch), Git, Latex  
Experienced TensorFlow, Julia, Matlab, R

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## Selected Media Coverage

- 2022 CDS PhD student wins the Outstanding Paper Award at ICML, NYU Center for Data Science  
2021 [Scholar Q&A: Sanae](#), DeepMind  
2020 [DeepMind Fellow Profile: Sanae Lotfi](#), NYU Center for Data Science  
2016 Barcelonnette vise l'autonomie énergétique, Magazine Barcelonnette  
2013 تلاميذ ينجحون في المباراة العامة للعلوم والتقنيات, Maghress