

# Alexandre Adam

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Github  • ORCID  • Google Scholar 

## Education

<b>Ph.D., Physics</b> , Université de Montréal	<i>2022–Present</i>
• Advisor: <b>Laurence Perreault-Levasseur</b>	
• Research focus: <b>High-dimensional Bayesian Inference in Astronomy</b>	
<b>M.Sc., Physics</b> , Université de Montréal	<i>2020–2022</i>
• Advisor: <b>Laurence Perreault-Levasseur</b>	
• Research focus: <b>Recurrent Inference Machines and Gravitational Lensing</b>	
• GPA: 4.3/4.3	
<b>B.Sc., Physics</b> , Université de Montréal	<i>2017–2020</i>
• Overall GPA: 4.0/4.3	

## Teaching and Mentoring

### Teaching Assistant

PHY1234 · Introduction to Numerical Physics <i>Grading homeworks, assistance in lab work</i>	<i>2021</i>
PHY3711 · Cosmology and Extragalactic Physics <i>Grading homeworks</i>	<i>2024–2025</i>

### Research Mentoring

Noé Dia — Undergraduate intern <i>Guided summer research leading to 2 publications</i>	<i>2022–2024</i>
Antoine Bourdin — Undergraduate intern <i>Guided summer research leading to 1 publication</i>	<i>2023–2024</i>
Salma Sahli — M.Sc. Student <i>Primary mentor and technical support leading to 1 publication</i>	<i>2024–2025</i>
Gabriel Missael Barco — M.Sc. Student <i>Primary mentor and technical support leading to 1 publication</i>	<i>2024</i>

### Summer School Courses

Introduction to Recurrent Neural Networks <i>Instructor for the Astromatic hackaton</i>	<i>2022</i>
Introduction to Diffusion Models and Bayesian Inference <i>Instructor for the Astromatic hackaton</i>	<i>2023</i>

## Awards and Fellowships

NSERC graduate research doctoral program · 115 000\$	<i>2023</i>
Hydro-Québec scholarship (Declined) · 20 000\$	<i>2023</i>
IVADO MSc excellence scholarship · 40 000\$	<i>2020</i>
Dean's list	<i>Fall 2017-2019; Winter 2018-2020</i>

## Service and Outreach

Reviewer for Astronomy and Astrophysics	<i>2025</i>
Reviewer for Monthly Notices of the Royal Astronomical Society	<i>2023</i>
Reviewer for Machine Learning and the Physical Sciences at NeurIPS	<i>2023-2024</i>
Reviewer for Machine Learning for Astrophysics at ICML	<i>2023-2024</i>
Organizer for the Astromatic hackaton and summer school	<i>2022-2023</i>
Wrote a blog for the Ciela Institute website	<i>2024</i>

## Conference Contributions

IAIFI Summer Workshop, Cambridge, MA, USA <i>High-dimensional Bayesian Inference with Diffusion Models and Generative Flow Networks</i>	August 12, 2025 INVITED TALK
International BASP Frontiers Conference, Villars-sur-Ollon, Switzerland <i>Echoes in the Noise: Posterior Samples of Faint Galaxy Surface Brightness Profiles with Score-Based Likelihoods and Priors</i>	January 29, 2025 POSTER
Physics in the AI Era, Pisa, Italy <i>Solving inverse problems with diffusion models</i>	September 25, 2024 INVITED TALK
Annual CRAQ Meeting, Saint-Alexis-des-Monts, Qc, Canada <i>Echoes in the Noise: Posterior Samples of Faint Galaxy Surface Brightness Profiles with Score-Based Likelihoods and Priors</i>	May 8, 2024 CONTRIBUTED TALK
CD3×Simons Foundation Workshop, Kashiwa, Japan <i>Echoes in the Noise: Posterior Samples of Faint Galaxy Surface Brightness Profiles with Score-Based Likelihoods and Priors</i>	January 25, 2024 CONTRIBUTED TALK
243rd American Astronomical Society Meeting, New Orleans, LA, USA <i>Echoes in the Noise: Posterior Samples of Faint Galaxy Surface Brightness Profiles with Score-Based Likelihoods and Priors</i>	January 9, 2024 POSTER
ML4PS at NeurIPS, New Orleans, LA, USA <i>Echoes in the Noise: Posterior Samples of Faint Galaxy Surface Brightness Profiles with Score-Based Likelihoods and Priors</i>	December 15, 2023 POSTER
Cosmic Connections: A ML×Astrophysics Symposium, New York, NY, USA <i>Posterior Samples of Source Galaxies in Strong Gravitational Lenses with Score-Based Priors</i>	May 24, 2023 CONTRIBUTED TALK
Annual CRAQ Meeting, Saint-Alexis-des-Monts, Qc, Can <i>Posterior Samples of Source Galaxies in Strong Gravitational Lenses with Score-Based Priors</i>	May 9, 2023 CONTRIBUTED TALK
ML4PS at NeurIPS, New Orleans, LA, USA <i>Posterior Samples of Source Galaxies in Strong Gravitational Lenses with Score-Based Priors</i>	December 15, 2022 <b>Spotlight Talk</b> (4/188 ACCEPTED)
Boom! A Workshop on Explosive Transients with LSST (Virtual) <i>Pixelated Reconstruction of Gravitational Lenses using Recurrent Inference Machine</i>	July 29, 2022 CONTRIBUTED TALK
ML4Astro at ICML, Baltimore, MD, USA <i>Pixelated Reconstruction of Gravitational Lenses using Recurrent Inference Machines</i>	July 22, 2022 POSTER
Annual CRAQ Meeting, Magog, Qc, Canada <i>Free-Form Reconstruction of Gravitational Lenses using Recurrent Inference Machine</i>	May 9, 2022 CONTRIBUTED TALK
Likelihood-free in Paris, France <i>Free-Form Strong Gravitational Lensing Reconstruction using Recurrent Inference Machine</i>	April 21, 2022 CONTRIBUTED TALK
IVADO Digital October (Virtual)	October 21, 2022

*Posterior Samples of Source Galaxies in Strong Gravitational Lenses with Score-Based Priors*

POSTER

IAIFI Summer Workshop, Cambridge, MA, USA

August 8, 2022

*Pixelated Reconstruction of Gravitational Lenses using Recurrent Inference Machines*

POSTER

Annual CASCA Meeting (Virtual)

May 18, 2022

*Free-Form Reconstruction of Gravitational Lenses using Recurrent Inference Machine*

POSTER

IVADO Digital October (Virtual)

October 29, 2021

*Automatic Reconstruction of Gravitational Lenses*

CONTRIBUTED TALK

Centenaire du département de physique, Montréal, Canada

October 20, 2021

*Apprentissage automatique de la reconstruction de lentilles gravitationnelles*

POSTER

## Peer-reviewed publications

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### First author

5. **A. Adam**, C. Stone, C. Bottrel, R. Legin, Y. Hezaveh, L. Perreault-Levasseur.  
*Echoes in the Noise: Posterior Samples of Faint Galaxy Surface Brightness Profiles with Score-Based Likelihoods and Priors.*  
NeurIPS Workshop on Machine Learning and the Physical Sciences, (2023)  
The Astrophysical Journal, vol. 169 (5), pp. 254 (2025).  
arXiv:2311.18002
4. R. Legin\*, **A. Adam\***, Y. Hezaveh, L. Perreault-Levasseur. (\*: Equal contribution)  
*Beyond Gaussian Noise: A Generalized Approach to Likelihood Analysis with non-Gaussian Noise.*  
The Astrophysical Journal Letters, vol. 949 (2), L41 (2023).  
arXiv:2302.03046
3. **A. Adam**, Y. Hezaveh, L. Perreault-Levasseur, M. Welling.  
*Pixelated Reconstruction of Foreground Density and Background Surface Brightness in Gravitational Lensing Systems using Recurrent Inference Machines.*  
The Astrophysical Journal, vol. 951 (1), pp. 6 (2023).  
arXiv:2301.04168
2. **A. Adam**, A. Coogan, N. Malkin, R. Legin, L. Perreault-Levasseur, Y. Hezaveh, Y. Bengio.  
*Posterior samples of source galaxies in strong gravitational lenses with score-based priors.*  
NeurIPS Workshop on Machine Learning and the Physical Sciences (2022).  
arXiv:2211.03812
1. **A. Adam**, L. Perreault-Levasseur, Y. Hezaveh.  
*Pixelated Reconstruction of Gravitational Lenses using Recurrent Inference Machines.*  
ICML Workshop on Machine Learning for Astrophysics (2022).  
arXiv:2207.01073

### As primary mentor for junior researcher

5. N. Dia, M. J. Yantovski-Barth, **A. Adam**, M. Bowles, P. Lemos, A. M. M. Scaife, Y. Hezaveh, L. Perreault-Levasseur.  
*IRIS: A Bayesian Approach for Image Reconstruction in Radio Interferometry with expressive Score-Based priors.*

Submitted to The Astrophysical Journal (2025)

arXiv:2501.02473

4. S. Salhi, **A. Adam**, L. Albert, R. Doyon, L. Perreault-Levasseur  
*Score-based models for 1/f correlated noise correction in James Webb Space Telescope spectral data.*  
NeurIPS workshop on Machine Learning and the Physical Sciences (2024).  
ML4PS2024:258
3. A. Bourdin, R. Legin, M. Ho, **A. Adam**, Y. Hezaveh, L. Perreault-Levasseur. *Inpainting Galaxy Counts onto N-Body Simulations over Multiple Cosmologies and Astrophysics.*  
ICML workshop on AI for Science (2024).  
arXiv:2408.00839
2. G. M. Barco, **A. Adam**, C. Stone, Y. Hezaveh, L. Perreault-Levasseur.  
*Tackling the Problem of Distributional Shifts: Correcting Misspecified, High-Dimensional Data-Driven Priors for Inverse Problems.*  
The Astrophysical Journal, vol. 980 (1), pp. 108 (2024).  
arXiv:2407.17668
1. N. Dia, M. J. Yantovski-Barth, **A. Adam**, M. Bowles, P. Lemos, A. M. M. Scaife, Y. Hezaveh, L. Perreault-Levasseur.  
*Bayesian Imaging for Radio Interferometry with Score-Based Priors.*  
NeurIPS Workshop on Machine Learning and the Physical Sciences (2023).  
arXiv:2311.18012

### As author with significant contribution

9. L. Leuzzi, M. Meneghetti, **A. Adam**, L. Moscardini, C. Giocoli.  
*Observation-driven simulations of strong lensing galaxy clusters.*  
Submitted to Astronomy and Astrophysics (2025).
8. E. Angeloudi, M. Huertas-Company, J. Falcón-Barroso, L. Perreault-Levasseur, **A. Adam**, A. Boecker.  
*The spatially-resolved effect of mergers on the stellar mass assembly of MaNGA galaxies.*  
Accepted for publication in Astronomy & Astrophysics (2025)  
arXiv:2509.25340
7. C. Stone, **A. Adam**, A. Coogan, L. Perreault-Levasseur, Y. Hezaveh.  
*cascade: building Pythonic scientific simulators.*  
Journal of Open Source Software, vol. 10 (113), pp. 8786 (2025).  
joss.08786
6. C. L. Rhea, J. Hlavacek-Larrondo, **A. Adam**, R. Kraft, Á. Bogdán, L. Perreault-Levasseur, M. Prunier.  
*Deconvolving X-Ray Galaxy Cluster Spectra Using a Recurrent Inference Machine.*  
The Astronomical Journal, vol. 169 (5), pp. 268 (2025).  
arXiv:2409.10711
5. C. Stone, **A. Adam**, A. Coogan, M. J. Yantovski-Barth, A. Filipp, L. Setiawan, C. Core, R. Legin, C. Wilson, G. M. Barco, Y. Hezaveh, L. Perreault-Levasseur.  
*Caustics: A Python Package for Accelerated Strong Gravitational Lensing Simulations.*  
Journal of Open Source Software, vol. 9 (103), pp. 7081 (2024).  
arXiv:2406.15542
4. S. Venkatraman, M. Jain, L. Scimeca, M. Kim, M. Sendera, M. Hasan, L. Rowe, S. Mittal, P. Lemos, E. Bengio, **A. Adam**, J. Rector-Brooks, Y. Bengio, G. Berseth, N. Malkin.  
*Amortizing intractable inference in diffusion models for vision, language, and control.*  
Proceedings of the Conference on Neural Information Processing Systems, vol. 37, pp. 76080–76114 (2024).

arXiv:2501.20971

3. M. Sendera, M. Kim, S. Mittal, P. Lemos, L. Scimeca, J. Rector-Brooks, **A. Adam**, Y. Bengio, N. Malkin.  
*Improved off-policy training of diffusion samplers.*  
Proceedings of the Conference on Neural Information Processing Systems, vol. 37, pp. 81016–81045 (2024).  
arXiv:2501.05098
2. C. L. Rhea, J. Hlavacek-Larrondo, , R. Kraft, Á. Bogdán, **A. Adam**, L. Perreault-Levasseur..  
*Unraveling the mysteries of galaxy clusters: recurrent inference deconvolution of X-ray spectra*  
NeurIPS workshop on Machine Learning and the Physical Sciences (2023).  
arXiv:2311.18014
1. M. Pasquato, S. Haddad, P. Di Cintio, **A. Adam**, P. Lemos, N. Dia, M. Petrache, U. Niccolò Di Carlo, A. Alberto Trani, L. Perreault-Levasseur, Y. Hezaveh.  
*The search for the lost attractor.*  
NeurIPS Workshop on Machine Learning and the Physical Sciences (2023).  
arXiv:2311.16306