

# Mary I. Letey



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maryiletey.com

## EDUCATION

### Harvard University

Applied Mathematics PhD with [Professor Cengiz Pehlevan](#).

Sep 2023 • Present

### Perimeter Institute for Theoretical Physics

Perimeter Scholars International MSc.

Sep 2022 • June 2023

### University of Cambridge, England

St John's College, Undergraduate Mathematical Tripos.

Oct 2018 • June 2022

### University of Colorado, Boulder

135 Credit Hours in Undergraduate Computer Science and Mathematics.

June 2014 • May 2018

## PUBLICATIONS

M. Letey, Y. Lu, A. Maite, C. Pehlevan (2024)

Double-Descent of In-Context Learning in Transformers.

*In Preparation.*

M. Letey, Z. Shumaylov, F. Agocs, W. Handley, M. Hobson, A. Lasenby (2022)

Quantum Initial Conditions for Curved Inflating Universes.

*Under review; [arxiv](#).*

## RESEARCH EXPERIENCE

### Montreal Institute for Learning Algorithms (Mila)

Supervisor – [Professor Siamak Ravanbakhsh](#)

June 2023 • Sep 2023

Generalising continuous kernel CNNs to implement neural operators continuously dependent on an input function.

### Perimeter Institute for Theoretical Physics

Supervisor – [Professor Latham Boyle](#)

Dec 2022 • June 2023

**Master's Thesis.** Extending the use of reflection groups in classifying discrete structures in Lorentzian spaces, we demonstrate substantial differences between reflection groups in Euclidean and Lorentzian spaces.

### Kavli Institute for Cosmology, University of Cambridge

Supervisor – [Dr Will Handley](#)

June 2022 • Sep 2022

A novel comoving curvature perturbation variable for inflaton fluctuations in curved universes is proposed and analysed. Novel initial conditions are proposed by setting the vacuum using the renormalised stress energy tensor.

## PROJECTS

• For more detailed descriptions, cool maths, and less recent projects, please see my [website](#). •

### Geometric Methods in Machine Learning, Harvard University

Supervisor – [Professor Melanie Weber](#)

Jan 2024 • Present

Various ongoing research-based course projects in differential geometry, geometric deep learning, and ML on manifolds.

### Algorithms and Data Science Expository Project, Harvard University

Supervisor – [Professor Sitan Chen](#)

Oct 2023 • Dec 2023

On diffusion-based generative models; connecting variational inference in graphical models to score approximation.

### Perimeter Institute Quantum Intelligence Lab

Supervisor – [Professor Roger Melko](#)

Oct 2022 • Feb 2023

Generalising data-enhanced Variational Monte Carlo simulations to account for measurement error in Rydberg arrays.

### Mathematical Computational Projects, University of Cambridge

Oct 2021 • Apr 2022

Isotropic Quantum Scattering

Geodesic Motion and Symmetries of the Kerr Black Hole

Modelling Accretion Discs

Modified  $V/V_{\max}$  Tests for Quasar Redshift Distribution

## PROGRAMMING EXPERIENCE

MATLAB, Maple, Mathematica

Python, JAX

C++, C

## FELLOWSHIPS AND AWARDS

### Graduate Prize Fellowship.

Harvard University.

Sep 2023

### Perimeter Scholar's International Scholarship

Perimeter Institute, 45000 CAD • 25 awards per ~500 applicants.

Sep 2022

### Royal Society Bursary

For summer research in Cosmology, 3000 GBP.

June 2022