# Mary I. Letey

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## Education

**Harvard University** — Sep 2023 • Present
Applied Mathematics with Professor Cengiz Pehlevan — PhD Candidate

**Perimeter Institute for Theoretical Physics** — Sep 2022 • June 2023
Perimeter Scholars International (PSI) MSc Program — Full Funding ($45000)

**University of Cambridge, England** — Oct 2018 • June 2022
St John's College, Undergraduate Mathematical Tripos — Class II, Division 1

**University of Colorado, Boulder** — June 2014 • May 2018
135 Credit Hours in Undergraduate Computer Science and Mathematics — 3.93 / 4.00 GPA

## Publications

**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)** — June 2023 • Sep 2023
Supervisor – Professor Siamak Ravanbakhsh

Generalising the use of continuous kernel CNNs to implement neural operators using functional kernels, equivariant to symmetries of input function space.

**Perimeter Institute for Theoretical Physics** — Dec 2022 • June 2023
Supervisor – Professor Latham Boyle

**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** — June 2022 • Sep 2022
Supervisor – Dr Will Handley

**Royal Society bursary support**. To generalise results in cosmological inflation to include non-flat universes and non-eternal inflation, a novel comoving curvature perturbation variable is proposed and analysed. Novel initial conditions are proposed by setting the vacuum using the renormalised stress energy tensor.

## Projects

**Perimeter Institute Winter School Research** — Oct 2022 • Feb 2023
Supervisor – Professor Freddy Cachazo

Investigating tree-level scatting amplitudes for gluons in Yang-Mills. By utilising colour decomposition, we study the singularity structure partial amplitude formulas in the case of 3 negative-helicity gluons with projective geometry.

**Perimeter Institute Quantum Intelligence Lab** — Oct 2022 • Feb 2023
Supervisor – Professor Roger Melko

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

**Graduate Machine Learning Project, University of Colorado** — Jan 2018 • May 2018
Supervisor – Dr Christopher Ketelsen

Developed an RNN model to predict fluctuations in stock prices, using topic modelling to derive features from text.

## Programming Experience

MATLAB, Maple, Mathematica — Python, JaX — C++, C — Linux

# Jobs and Community Involvement

**Reviewer – ICLR 2023 Physics4ML Workshop** Feb 2023

**Tutor – Blue Education** June 2021 • Present

Tutored over 20 pupils one-on-one in Mathematics and Physics for Oxbridge applications, interviews, and STEP.

**Senior Coxswain – Cambridge City Rowing Club** June 2021 • Dec 2021

Main coxswain for five rowing crews: coached novices, organised outings, trained multiple senior crews for races.

**Associate – Embryo Ventures** Apr 2020 • Dec 2020

Boosted client engagement fivefold; launched a marketing initiative through portfolio interviews.

**Intern – Iguana Investments** Dec 2019 • Aug 2020

Lead a review of investment strategies, presenting a report on algorithm optimisation and general market outlook.

**Founder and President – Johnian Entrepreneurs' Club** Oct 2019 • Oct 2021

Hosted funding competitions and provided educational resources and investor-partnership opportunities.