Mary I. Letey

maryletey@fas.harvard.edu • mary@letey.net • Personal Website

Education

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

Perimeter Institute for Theoretical Physics Sep 2022 • June 2023
Perimeter Scholars International MSc

University of Cambridge, England Oct 2018 • June 2022
St John's College, Undergraduate Mathematical Tripos

University of Colorado, Boulder June 2014 • May 2018
135 Credit Hours in Undergraduate Computer Science and Mathematics

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 continuously dependent on an input function.

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
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 scattering 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, Pytorch, JaX** **C++, C** **Linux**

Fellowships and Awards

Graduate Prize Fellowship Sep 2023
Harvard University

Perimeter Scholar International Sep 2022
Perimeter Institute, 45000 CAD

Royal Society Bursary June 2022
For summer research in Cosmology, 3000 GBP