# SHREYAS PADHY

PhD Candidate | Machine Learning Group | University of Cambridge
(sp2058@cam.ac.uk) | (shreyaspadhy.github.io)

## EDUCATION

**University of Cambridge** **October 2021 - July 2025 (expected)**
PhD in Engineering
Supervised by Dr. Jośe Miguel Hernández-Lobato

**Johns Hopkins University** **August 2017 - May 2019**
MSE in Biomedical Engineering
Overall GPA: 4.0

**Indian Institute of Technology Delhi** **July 2013 - May 2017**
B.Tech in Engineering Physics
Overall GPA: 8.871/10 (Department Rank 4)

## EMPLOYMENT

**ML Scientist, Atinary Technologies** **November 2024 - current**
*50% position (Lausanne, Switzerland)*

- Fundamental ML Research in Bayesian Optimisation and Molecular Discovery

**Research Scientist Intern, Meta Reality Labs** **June 2024 - October 2024**
*Under mentorship of Michael Paskett and Allen Yin (Burlingame, CA)*

- Worked on generative models for improved data efficiency in training and personalization of wrist-wearable neural interfaces.

**Research Intern, Microsoft Research** **May 2023 - August 2023**
*Under mentorship of James Hensman and John Winn (Cambridge, UK)*

- Developed time-series Gaussian Process models for sparse, discrete count data using negative binomial likelihoods.
- Developed temporal models of source information for large-scale, distributed knowledge graph databases using INFER.net and Bayesian linear models.

**AI Resident, Google Brain** **August 2019 - August 2021**
*Under mentorship of Balaji Lakshminarayanan and Jasper Snoek (Cambridge, MA)*

- Published research in *NeurIPS 2020* and *JMLR 2023* on Spectral-normalized Neural Gaussian Process (SNGP), a competitive single-model approach on prediction, calibration and out-of-domain detection.
- Core contributor for the Uncertainty Baselines open-source library in Python, Jax, and Tensorflow.
- Published multiple topics of research in *ICML Workshops* on one-vs-all losses, Mahalanobis distance for OOD detection, and batch normalisation for improved predictive uncertainty.

## SELECTED PUBLICATIONS

### CONFERENCES

- **DEFT: Efficient Finetuning of Conditional Diffusion Models by Learning the Generalised $h$-transform.**
Shreyas Padhy*, Alexander Denker*, Francisco Vargas*, Kieran Didi*, Simon Mathis* et al. ***(NeurIPS 2024)*** arXiv.
- **Improving Linear System Solvers for Hyperparameter Optimisation in Iterative Gaussian Processes.**
Jihao Andreas Lin, Shreyas Padhy, Bruno Mlodozeniec, et al. ***(NeurIPS 2024)*** arXiv.
- **A Generative Model of Symmetry Transformations.**
James Allingham, Bruno Mlodozeniec, Shreyas Padhy, Javier Antorán, David Krueger, Richard E. Turner, Eric Nalisnick, José Miguel Hernández-Lobato. ***(NeurIPS 2024)*** arXiv.
- **Stochastic Gradient Descent for Gaussian Processes Done Right**.
Shreyas Padhy*, Jihao Andreas Lin*, Javier Antoran*, Austin Tripp, Alexander Terenin, Csaba Szepesvari, José Miguel Hernández-Lobato, David Janz. ***(ICLR 2024)*** arXiv.

- **Transport Meets Variational Inference: Controlled Monte Carlo Diffusions**.
  Shreyas Padhy*, Francisco Vargas*, Denis Blessing, Nikolas Nüsken. ***(ICLR 2024)*** arXiv.
- **Sampling from Gaussian Process Posteriors using Stochastic Gradient Descent**
  Shreyas Padhy*, Jihao Andreas Lin*, Javier Antoran*, David Janz, José Miguel Hernández-Lobato, Alexander Terenin. ***(NeurIPS 2023 (Oral))*** arXiv.
- **Sampling-based inference for large linear models, with application to linearised Laplace**.
  Shreyas Padhy*, Javier Antoran*, Riccardo Barbano, Eric Nalisnick, David Janz, and José Miguel Hernández-Lobato. ***(ICLR 2023)***. arXiv
- **Simple & principled uncertainty estimation with deterministic deep learning via distance awareness.**
  Jeremiah Zhe Liu, Zi Lin, Shreyas Padhy, Dustin Tran, Tania Bedrax-Weiss, and Balaji Lakshminarayanan. ***(NeurIPS 2020)***

### PREPRINTS

- **Kernel Regression with Infinite-Width Neural Networks on Millions of Examples.**
  Ben Adlam, Jaehoon Lee, Shreyas Padhy, Zachary Nado, Jasper Snoek. arXiv.

### JOURNALS

- **A Simple Approach to Improve Single-Model Deep Uncertainty via Distance-Awareness.**
  Jeremiah Liu*, Shreyas Padhy*, Jie Ren*, Zi Lin, Yeming Wen, Ghassen Jerfel, Zack Nado, Jasper Snoek, Dustin Tran, and Balaji Lakshminarayanan. ***(JMLR 2023)***.arXiv

### WORKSHOPS

- **Warm Start Marginal Likelihood Optimisation for Iterative Gaussian Processes**.
  Jihao Andreas Lin, Shreyas Padhy, Bruno Mlodozeniec, José Miguel Hernández-Lobato. *Approximate Advances in Bayesian Inference, 2024.* arXiv
- **Learning Generative Models with Invariance to Symmetries**.
  James Allingham, Javier Antoran, Shreyas Padhy, Eric Nalisnick, and José Miguel Hernández-Lobato. *NeurReps Workshop at* ***NeurIPS 2022****.*
- **A Simple Fix to Mahalanobis Distance for Improving Near-OOD Detection.**
  Jie Ren, Stanislav Fort, Jeremiah Liu, Abhijit Guha Roy, Shreyas Padhy, and Balaji Lakshminarayanan. ***ICML 2021*** *Workshop on Uncertainty and Robustness in Deep Learning.*
- **Evaluating prediction-time batch normalization for robustness under covariate shift.**
  Zachary Nado, Shreyas Padhy, D. Sculley, Alexander D'Amour, Balaji Lakshminarayanan, and Jasper Snoek. ***ICML 2020*** *Workshop on Uncertainty and Robustness in Deep Learning.*
- **Revisiting One-vs-All Classifiers for Predictive Uncertainty and OOD Detection in Neural Networks.**
  Shreyas Padhy, Zachary Nado, Jie Ren, Jeremiah Liu, Jasper Snoek, and Balaji Lakshminarayanan. ***ICML 2020*** *Workshop on Uncertainty and Robustness in Deep Learning.*
- **Uncertainty Baselines: Benchmarks for Uncertainty & Robustness in Deep Learning**.
  Zachary Nado et. al., *Bayesian Deep Learning Workshop, 2021.* arXiv

## AWARDS AND ACHIEVEMENTS

- **Qualcomm Innovation Fellowship 2023**: Among 11 finalists invited for the online finals.
- **Qualcomm Innovation Fellowship 2022**: Among 12 finalists invited to Amsterdam.
- **Trinity-Henry Barlow Scholarship 2021**: Awarded by Trinity College, University of Cambridge.
- **Harding Distinguished Postgraduate Scholars Programme 2021**: Awarded by the Harding Foundation.
- **Outstanding Reviewer Award** at ICML 2024.
- **Outstanding Reviewer Award** at ICML 2022.
- **Summer Undergraduate Research Award 2015**: For undergraduate research in microwave imaging.
- **Top 7% GPA Merit Scholarship**: In 2013, 2014, 2015, and 2016 Fall Semesters for exceptional performance at the Indian Institute of Technology Delhi.

## PROFESSIONAL ENGAGEMENTS

### Talks

- Invited Talk on **Stochastic Gradient Descent for Bayesian ML** at SIAM UQ, Trieste, *March 2024*.
- Guest Lecture on **Conditioning in SDEs**, Advanced Machine Learning course, Cambridge *February 2024*.
- Invited Talk on **Stochastic Gradient Descent for GPs** at Atinary Technologies, Lausanne, *February 2024*.
- Invited Talk on **Stochastic Gradient Descent for GPs** at NeurIPS@Cambridge, *December 2023*.
- Invited Talk on **Stochastic Gradient Descent for GPs** at Microsoft Research Cambridge, *October 2023*.
- **SDEs and Schrodinger Bridges**, presented at the Cambridge MLG Reading Group, *July 2023*.
- Invited Talk on **Sampling-Based Inference**, at NeurIPS @ Cambridge, *December 2022*.
- **Out-of-Distribution Generalisation**, presented at the Cambridge MLG Reading Group, *October 2022*.
- **Optimal Transport Metrics**, presented at the Cambridge MLG Reading Group, *February 2022*.

### Reviewing And Organisation

- Area Chair for AISTATS 2024.
- Reviewer for NeurIPS (2023, 2022, 2021), ICML (2024, 2023, 2022), ICLR (2023), AISTATS (2023), AAAI (2024, 2023).

## TEACHING

**Machine Learning for Signal Processing, Fall 2018** : *Graduate Course, by Dr. Najim Dehak, JHU*
Developing weekly assignments and homeworks, and grading for 50+ students.
**Intro. to Computational Medicine, Fall 2018** : *Graduate Course, by Dr. Michael Miller, JHU*
Developing homeworks and course notes, extended codebase to Python, and grading for 60+ students.
**Gateway Computing: Python, Spring 2019** : *Undergraduate Course, by Dr. Kwame Kutten, JHU*
Developing homeworks, weekly assignments and programming assignments in Python.

## TECHNICAL PROJECTS

Uncertainty Baselines
*Core contributor, Google Brain*

UNet-Zoo
*Maintainer and developer*

## TECHNICAL STRENGTHS

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|---|---|
| **DL Frameworks** | Jax (Flax, Optax, Haiku, Numpyro, Blackjax), Tensorflow, PyTorch (Pyro), Keras |
| **Computer Languages** | Python, C++, Verilog |
| **Medical Imaging** | TOAST++, FSL, SPM, Freesurfer |