

Vidhi Lalchand

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EDUCATION

University of Cambridge, Christ's College
Dept. of Physics & Dept. of Engineering

2017-2022

Ph.D.

Thesis title: *On Hierarchical Gaussian Processes*
Supervisors: Carl E. Rasmussen and Christopher Lester
Notes: Due to graduate in July 2023

M.Phil Scientific Computing (Distinction)

2016

Thesis title: *A meta-algorithm for classification using random recursive tree ensembles: A high energy physics application.*
Supervisors: Anita C. Faul and Christopher Lester

University of London (LSE),
Dept. of Mathematics

2006-2010

M.Sc. Applicable Mathematics (Distinction)

Thesis: Cryptographic Hash Functions.

B.Sc. (Hons)

Major: Mathematics (First)
Notes: University of London, External System

Scientific Computing Proficiency

Probabilistic Programming Languages: pymc3, STAN, pyro
Machine Learning packages: pytorch, gpytorch
OS: Unix

FELLOWSHIPS, AWARDS & HONORS

NeurIPS Scholar Award	2022
NeurIPS Travel Award (Women in Machine Learning, WiML)	2019, 2022
Qualcomm Innovation Fellowship (QIF, Europe)	2020-2021
Doctoral Fellowship for International Students, The Alan Turing Institute, UK	2017-2020
University of London Award for Academic Excellence for External Students	2009

ACADEMIC EMPLOYMENT

Massachusetts Institute of Technology (MIT)
Kavli Institute for Astrophysics and Space Research
Visiting Researcher
Host: Anna-Christina Eilers

March 2023

- Development of scalable unsupervised probabilistic latent variable models for generative modelling of quasar spectra and simultaneous black-hole mass estimation.

University of Cambridge
Dept. of Computer Science
Postdoctoral Researcher
Supervisor: Neil Lawrence

Feb 2022 - Current

- Development of methods for the analysis of single-cell RNA data at scale. Primary research focus: Unsupervised learning, Latent variable modelling, dimensionality reduction, dynamical systems and variational inference.

PEER-REVIEWED PUBLICATIONS (available at [scholar profile](#))

Conference Proceedings

- 2022 **Vidhi Lalchand**, Wessel Bruinsma, David R. Burt, Carl E. Rasmussen. Sparse Gaussian Process Hyperparameters: Optimise or Integrate? In *Advances in Neural Information Processing Systems*, (NeurIPS) 2022.
- 2022 **Vidhi Lalchand***, Aditya Ravuri*, Emma Dann*, Natsuhiko Kumasaka, Dinithi Sumanaweera, Rik G.H. Lindeboom, Shaista Madad, Neil D. Lawrence, Sarah A. Teichmann. Modelling Technical and Biological Effects in single-cell RNA-seq data with Scalable Gaussian Process Latent Variable Models (GPLVM). In *Machine Learning in Computational Biology* (MLCB), 2022.
- 2022 **Vidhi Lalchand**, Aditya Ravuri, Neil D. Lawrence. Generalised GPLVM with Stochastic Variational Inference. In *International Conference on Artificial Intelligence and Statistics* (AISTATS), 2022.
- 2021 Fergus Simpson*, **Vidhi Lalchand*** and Carl E. Rasmussen. Marginalised Gaussian Processes with Nested Sampling. In *Advances in Neural Information Processing Systems* (NeurIPS), 2021.
- 2021 Fergus Simpson, Ian Davies, **Vidhi Lalchand**, Alessandro Vuollo, Nicolas Durrande, Carl E. Rasmussen. KITT: Kernel Identification Through Transformers. In *Advances in Neural Information Processing Systems* (NeurIPS), 2021.
- 2020 **Vidhi Lalchand** and Carl E. Rasmussen. Approximate inference for Fully Bayesian Gaussian process Regression. In *Proceedings of the 2nd Symposium on Advances in Approximate Bayesian Inference*, volume 118 of Proceedings of Machine Learning Research (PMLR), pages 1–12, 2020.

Journals

- 2021 Ryan-Rhys Griffiths, Alexander A. Aldrick, Miguel Garcia-Ortegon, **Vidhi R. Lalchand**, Alpha A. Lee. Achieving Robustness to Aleatoric Uncertainty with Heteroscedastic Bayesian Optimisation. In *Machine Learning: Science and Technology* (MLST), 2021.
- 2021 Hanuka A, Huang X, Shtalenkova J, Kennedy D, Edelen A, Zhang Z, **Lalchand VR**, Ratner D, Duris J. Physics model-informed Gaussian process for online optimization of particle accelerators. *Physical Review Accelerators and Beams*. 2021 Jul 8;24(7):072802.

Workshops

- 2022 **Vidhi Lalchand**, Kenza Tazi, Talay M. Cheema, Richard E. Turner, Scott Hosking. Kernel Learning for Interpretable Climate Science. 16th Bayesian Modelling Applications Workshop, Uncertainty in Artificial Intelligence (UAI), 2022, Eindhoven, Netherlands.
- 2020 **Vidhi Lalchand**, Aditya Ravuri, Neil D. Lawrence. Gaussian Process Latent Variable Flows for Massively Missing data. *3rd Symposium on Advances in Approximate Bayesian Inference* (AABI), 2020.
- 2020 Fergus Simpson, **Vidhi Lalchand** and Carl E Rasmussen. Marginalised Gaussian Processes with Nested Sampling. *3rd Symposium on Advances in Approximate Bayesian Inference* (AABI), 2020.
- 2019 **V. R. Lalchand**. Extracting more from Boosted Decision Trees: A High Energy Physics case study. *Second Workshop on Machine Learning and the Physical Sciences* (NeurIPS), 2019, Vancouver, Canada.
- 2018 **V. R. Lalchand**, A.C. Faul. A Fast and Greedy Subset-of-Data (SoD) Scheme for Sparsification in Gaussian processes. *38th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science & Engineering*, (MaxEnt), 2018.

Review Articles

- 2016 P Treleavan, M Galas and **V Lalchand**. Algorithmic Trading Review. *Association of Applied Computing Machinery*, November 2013.

Preprints

- 2023 **Vidhi Lalchand**, Talay M. Cheema, Laurence Aitchison, Carl E. Rasmussen. Gaussian process parameterised covariance kernels for Non-Stationary Modelling. (In submission)
- 2023 Aditya Ravuri, Francisco Vargas, **Vidhi Lalchand**, Neil D. Lawrence. Dimensionality Reduction as Probabilistic Inference. (In submission)

ACADEMIC SERVICE

Reviewer for JMLR (2023), ICML (2022, top 10%), AISTATS (2022, 2023), NeurIPS (2021, 2022, 2023), Advances in Approximate Bayesian Inference Symposium (2023). Workshop Reviewer: Gaussian Processes, Spatio-temporal Modelling & Decision making system at NeurIPS, 2022.

TEACHING & SUPERVISION

- 2021 TA for Module 4F13: Probabilistic Machine Learning (MPhil, Department of Engineering)
2022 Undergraduate supervision for 3F8: Inference (Part II, Department of Engineering)
2022 Part III Computer Science / M.Phil Advanced Computer Science (Research Supervision):
Kushagr Ahuja (Distinction)
Sarah Zhao (Current)

INVITED TALKS

- Harvard School of Engineering and Applied Sciences, Cambridge, USA** Mar 2023
Can we scale Gaussian process latent variable models to big data?
- MIT Kavli Institute for Astrophysics and Space Research, Cambridge, USA** Mar 2023
Scalable Gaussian process latent variable models for Quasar Spectra reconstruction
- High Performance Computing Seminar (HPC Academy), Cambridge, UK** Sep 2022
Machine Learning & Modern Science
- UAI 16th Bayesian Modelling Applications Workshop, Netherlands** Aug 2022
Kernel learning for Interpretable Climate Science
- GirlsWhoML Workshop, Cambridge, UK** June 2022
Introduction to Deep Learning
- 21st Cambridge PyData Meet-up, Cambridge, UK** July 2020
Modelling with Gaussian Processes ([link](#))
- Jump Trading, London** Dec 2019
Advances in Gaussian Processes
- ML Meets Particle Physics Workshop, Weizmann Institute of Science, Israel** Aug 2019
Hierarchical Probabilistic Mixture Models for density estimation in HEP
- Cavendish Laboratory Graduate Conference, University of Cambridge** Nov 2018
Bayesian Machine Learning in High Energy Physics
- 38th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science & Engineering** July 2018
A progressive framework for Gaussian Process Regression
- CogX 2018, Research Stage** June 2018
Deconstructing Gaussian Processes. ([link](#))

WORK EXPERIENCE

- Citadel Securities, LLC**
Quantitative Strategies Group Aug 2014 - Sep 2016
Non-Compete (Sep 2015 - Sep 2016)

- Proprietary trading and market making for pan-European equities.

Credit Suisse Securities (Europe) Limited, London
Quantitative Research Analyst (Electronic FX and Options) June 2012 - July 2014

- Developed statistical models for automated two-way FX market making and options pricing engine.

University College London (UCL)
Research Associate Nov 2011 - June 2012

- Research focus: Simulation environments for multi-player games.

UBS, London
Quantitative Associate Internship Programme June 2011 - Sept 2011

DISTRACTIONS

Instructor at [Machine Learning Winter School for Scientists](#). Feb 2021

Organiser of the Information Engineering conference (Dept. of Engineering, Cambridge) Sept 2020

Cambridge University: Women In STEM Interview ([link](#)) Nov 2019

The Cambridge Union: Immigrant Identities Panel

Presentation to the Scientific Advisory Board, The Alan Turing Institute, London.

Algorithms for rare event classification in High Energy Physics. June 2018

Asian Voice - *An Unconventional Journey from Banking to Science.* ([link](#)) Aug 2017

Twitter: [@VRLalchand](#)