# Justin Bunker

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Cambridge, United Kingdom

## Research Interests

Machine learning, Bayesian inference, generative models, probabilistic modeling, and applications to finance and quantitative trading

## Education

**University of Cambridge**                                                                 **Cambridge, UK**
*PhD in Machine Learning*                                                                      *2020–2025*
- **Splunk Scholar** – Fully funded by Splunk Inc.
- Thesis submission: January 2025
- Research focus: Generative models, diffusion models, Bayesian methods, applications to remote sensing and ice monitoring
- Published in Journal of Machine Learning Research (JMLR)

**University of Cambridge**                                                                 **Cambridge, UK**
*MPhil in Machine Learning and Machine Intelligence, Distinction*                               *2018–2019*
- Thesis: *Extending and Applying the Gaussian Process Autoregressive Regression Model*
- Covered: Linear models, neural networks, kernel methods, graphical models, Bayesian inference
- Group project: Variational inference for continual learning

**Concordia University**                                                                       **Montreal, QC**
*Independent Student (Part-time)*                                                               *2017–2018*
- Mathematics and Statistics courses
- GPA: 4.30/4.30

**Concordia University**                                                                       **Montreal, QC**
*Bachelor of Computer Engineering, Great Distinction*                                           *2012–2016*
- **Computer Engineering Medal** recipient
- GPA: 4.04/4.30
- Russell Breen Scholarship recipient
- Developed AI algorithm that won in-class competition

**Dawson College**                                                                             **Montreal, QC**
*DEC in Electronics Engineering Technology*                                                     *2009–2012*
- Graduated with honors

## Research Experience

**University of Cambridge**                                                                 **Cambridge, UK**
*PhD Researcher*                                                                               *2020–2025*
- Developed novel diffusion models for generating synthetic SAR imagery of Arctic sea ice
- Applied generative models to improve segmentation performance with limited labeled data
- Collaborated with domain experts in remote sensing and cryosphere modeling
- Published research in top-tier machine learning venues (JMLR)

**University of Cambridge**                                                                 **Cambridge, UK**
*Research Assistant*                                                                           *2019–2020*
- Collaborated with Splunk Inc. on machine learning research projects
- Developed mixture modeling techniques for complex data distributions
- Co-authored research paper on mixture modeling methodologies

# Publications

## Journal Articles

**2024**: **Bunker, J.** & Lambley, H. "Autoencoders in Function Space." *Journal of Machine Learning Research (JMLR)*, accepted.

## Conference Papers & Technical Reports

**2024**: **Bunker, J.** et al. "Pothole Detection Using Machine Learning." [Details to be updated]

**2020**: **Bunker, J.** et al. "Mixture Modeling for [Title]." Research collaboration with Splunk Inc.

## Theses

**2025**: **Bunker, J.** "[PhD Thesis Title]." PhD Thesis, University of Cambridge. [Forthcoming]

**2019**: **Bunker, J.** "Extending and Applying the Gaussian Process Autoregressive Regression Model." MPhil Thesis, University of Cambridge.

# Presentations

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| **EGU25** | **Vienna, Austria** |
| *Conference Presentation* | *2025* |

- "Synthetic SAR Imagery Generation Using Diffusion Models for Ice Floe Monitoring"
- Presented novel application of diffusion models to cryosphere remote sensing

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| **Physics X** | **London, UK** |
| *Invited Talk* | *2024* |

- "Autoencoders in Function Space"
- Presented JMLR paper on functional autoencoders

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| **University of Cambridge** | **Cambridge, UK** |
| *Internal Symposium* | *2023* |

- "Introduction to JAX for Machine Learning"
- Technical tutorial on JAX framework for ML research

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| **University of Cambridge** | **Cambridge, UK** |
| *Recurring Seminar* | *2022–2024* |

- "Introduction to Machine Learning for Civil Engineering Researchers"
- Annual presentation to incoming postdoctoral researchers (2022, 2023, 2024)

# Teaching Experience

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| **University of Cambridge** | **Cambridge, UK** |
| *Supervisor* | *2022–2024* |

- Supervised small-group teaching sessions for **3M1: Mathematical Methods**
- Part IIA Engineering Tripos (3 years: 2022, 2023, 2024)
- Topics: Calculus of variations, numerical methods, partial differential equations

## MEng Project Supervision

**2024**: **Shuohan Tao** – "Enhancing the Normalizing Flow on the Function Space"

**2024**: **Prithvi Raj** – "Thermodynamic Integration"

**2021**: **Jay Wong** – "Design of Experiments for Bayesian Partition Models"

# Professional Experience

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| **Vigilant Global – A DRW Company** | **Montreal, QC** |
| *Software Developer* | *Nov 2016–Sep 2018* |

- Implemented features for proprietary trading software tools
- Refactored codebases to optimize performance and incorporate modern frameworks
- Designed full-stack system for training candidates in simulated trading scenarios
- Applied quantitative and analytical skills in high-frequency trading environment

**Société Générale**                                                    **Montreal, QC**
*Software Developer (Co-op)*                                         *Jan 2015–Aug 2015*
- Implemented features in C# for collateral monitoring application in trading operations
- Migrated financial reports to SSRS framework
- Managed full development lifecycle from design to production deployment
- Presented technical work to stakeholders in business setting

**Ericsson**                                                            **Montreal, QC**
*Software Developer (Co-op)*                                         *Aug 2013–Dec 2013*
- Developed Python automation scripts for OSS network benchmarking
- Reduced data extraction time from 8 hours to 2 hours through process optimization

## Technical Skills

**Languages**: Python, C/C++, JAX, JavaScript, Java, C#, MATLAB

**ML/AI**: PyTorch, TensorFlow, JAX, scikit-learn, probabilistic programming

**Methods**: Deep learning, generative models, Bayesian inference, kernel methods, optimization

**Tools**: Git, Linux, LaTeX, Jupyter, SQL, Docker

## Awards & Scholarships

**2020–2024**: **Splunk Scholar** – Full PhD funding from Splunk Inc.

**2016**: **Computer Engineering Medal** – Top graduating student, Concordia University

**2012–2016**: **Russell Breen Scholarship** – Academic excellence, Concordia University

## Languages

**English**: Native speaker

**French**: Native speaker                                               *Fully bilingual*

## Additional Information

Currently completing advanced study in quantitative finance and investments, with particular interest in applying machine learning to financial modeling and algorithmic trading