# Bradley.J Gram-Hansen

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"Life is nothing but an electron looking for a place to rest"

## EDUCATION

### UNIVERSITY OF OXFORD

DPhil in Autonomous Intelligent Machines and Systems
Supervisors : Prof Yee Wyhe Teh • Dr Tom Rainforth
Dr Atılım Günes Baydin • Prof Phil Torr
Expected completion July 2020 | Oxford, UK

### UNIVERSITY OF NOTTINGHAM

MMath in Mathematics
2011 - 2015 | Nottingham, UK
Grade: 75% avg over 4 years. First

## LINKS

Github:// bayesianbrad
Google Scholar:// Publications
LinkedIn:// bradleygramhansen
Twitter:// @bayesianbrad
Blog:// Bradley's Blog

## SKILLS

### TECHNICAL SKILLS

Probabilistic Programming
Markov Chain Monte Carlo
Gaussian Processes
Regression
Neural Networks
Deep Learning
Bayesian Inference
Time Series
Differential Equations
Relativity
Analysis
Quantum and Classical Mechanics
Quantum and Classical Information Theory
Linear Algebra
Stochastic Processes
Quantum Field Theory
Mathematical Biology
Non-linear Systems

### PROGRAMMING SKILLS

Python• Shell• C++ • Matlab
Clojure • Git • Docker & Singularity
LaTeX• HTML

### SPECIFIC LIBRARIES

Pytorch • Pyprob • Matplotlib • Seaborn
Numpy • Scit-learn • SciPy • PyMC3

### INTERPERSONAL SKILLS

Team player • Patient • Organised
Motivator • Responsible • Adaptive
Hard-working • Good Listener • Observant

### DISABILITIES

Mildly Dyslexic • Dyspraxic
Having learning disabilities enables me to empathise with others who suffer the same difficulties.

### REFERENCES

Several available upon request.

## EXPERIENCE

### FRONTIER DEVELOPMENT LAB Open Collaborative Intership with the European Space Agency, Oxford University, SA Catapult, NVidia and UNICEF

June 2018 – Oct 2018 | Oxford, UK & ESA Esrin, IT

- Focused on the task of using freely available data to help AID-agencies and NGOs perform their operations in a cost-effective and efficient manner.
- Developed an automated inference framework that was computationally efficient, in both monetary and computational cost, for automatically detecting informal settlements in a low-resolution satellite image. This was the first time any such thing had been done with this type of low-resolution data structure.

### CLASSICAL FOUNDATIONS TUTORING Mathematics Tutor

Apr 2016 – June 2016 | Nottinghamshire,UK

- Perform one-to-one tuition with a wide variety of different pupils.
- Adapt to the different needs and questions asked by each pupil, which ranged from GCSE lower tier to A2-level mathematics.
- Enable the pupil to develop as a character and open their mind to other aspects of mathematics.
- Inspire the pupil to see that they had the potential to achieve.

### EPSRC INTERN Performed Research on Relativistic Quantum Maps

June 2014 – Sept 2014 | University of Nottingham, UK

- Research performed in the Mathematical Physics group, supervised by Dr Gerardo Addesso and Dr Antony Lee.
- Worked on developing novel techniques for analysing quantum channels and quantum maps in a relativistic framework using Gaussian states.

## RESEARCH

### OXCSML AND TORR VISION GROUP Oct 2016 – Present | Oxford, Uk

- Designing probabilistic programming languages and interpretable AI systems, with a focus on social and scientific applications.
- Created a customisable probabilistic programming system for "First-order models", enabling new classes of inference algorithms to be deployed in probabilistic programming systems.
- Developed a framework for overriding any industrial simulator, written in any language and connecting it to a generic probabilistic programming systems to perform parallezible and statistically correct inference.
- Developed my own framework and algorithm for performing inference on small data-sets with Gaussian Processes.

### MATHEMATICAL PHYSICS GROUP Sept 2013 – May 2014 & Sept 2014 - May 2015 | Nottingham, UK

- Dissertation : An Investigation into Electron-Proton Entanglement in the Hydrogen Atom. Supervisor: Dr Alexander Ossipov.
- Thesis : An Insight into Quantum Random Walks. Supervisor: Dr Madalin Guta.

## AWARDS

### ACADEMIC

| | |
|---|---|
| 2019 | Nominated for Vice-Chancellor's Social Impact Award |
| 2018 | FDL Award for Unexpected Discovery |
| 2016-2020 | EPSRC Fully-Funded 4-Year PhD Studentship |
| 2014 | EPSRC Summer Research Award |
| 2014 | BP Ambition Award |
| 2012 | Eliahou Dangoor Scholarship |
| 2012 | PWC High Flyers Award |
| 2011 | Sir Peter Mansfield High Achiever Scholarship |
| 2011-2015 | St Ann's Experian Scholarship |
| 2011-2015 | First in the Family Scholarship |
| 2010 | Excellent Dedication and Contribution A-level Physics |
| 2010 | Interest and Enthusiasm A-level Mathematics |

### SPORTING

| | |
|---|---|
| 2016 | IronMan Copenhagen 11th in Age Group, Qualified to Represent UK for Long Distance Duathlon |
| 2016 | Silver Medal, Nottinghamshire Fell Running Championships |
| 2005-2007 | National mini field youth hockey champion U13 and U15 |

## INVITED TALKS

- Invited by the UN to give a talk on AI for space at the AI for good global summit. 2019.
- Invited to the Oxford centre for Human Brain Activity to give a talk on Probabilistic Programming. 2018.
- Invited to ESA Esrin to give a talk on using machine learning to detect informal settlements. 2018.

## PUBLICATIONS

### PUBLISHED PAPERS

- AG. Baydin, L. Heinrich, W. Bhimji, B. Gram-Hansen, G. Louppe, L. Shao, K, Cranmer and F.Wood, Efficient Probabilistic Inference in the Quest for Physics Beyond the Standard Model The International Conference on Neural Information Processing Systems 2019
- AG. Baydin, L. Heinrich, W. Bhimji, B. Gram-Hansen, G. Louppe, L. Shao, K, Cranmer and F.Wood, Etalumis: Bringing Probabilistic Programming to Scientific Simulators at Scale The International Conference for High Performance Computing, Networking, Storage, and Analysis 2019
- B. Gram-Hansen*, Y, Zhou*, T. Kohn, T. Rainforth, H. Yang and F. Wood, A Low-Level Probabilistic Programming Language for Non-Differentiable Models The 22nd International Conference on Artificial Intelligence and Statistics 2019
- B. Gram-Hansen*, P. Helber*, I. Varatharajan, F. Azam, A. Coca-Castro, V. Kopackova and P. Bilinski, Mapping Informal Settlements in Developing Countries using Machine Learning and Low Resolution Multi-spectral Data The AAAI/ACM Conference on AI Ethics and Society 2018
- B. Gram-Hansen*, Y, Zhou*, T. Kohn, T. Rainforth, H. Yang and F. Wood, Hamiltonian Monte Carlo for Probabilistic Programs with Discontinuities The International Conference on Probabilistic Programming 2018

### WORKSHOP PAPERS

- B. Gram-Hansen*, C. Schroeder de Witt*, P.H.S.Torr, Y.Whye Teh, T. Rainforth and AG. Baydin, Hijacking Malaria Simulators with Probabilistic Programming AI for Social Good Workshop at the International Conference on Machine Learning 2019
- B. Gram-Hansen, P. Helber, I. Varatharajan, F. Azam, A. Coca-Castro, V. Kopackova and P. Bilinski, Generating Material Maps to Map Informal Settlements Machine Learning for the Developing World Workshop at the 32nd Conference for Neural Information Processing Systems 2018

### PRE-PRINTS

- B. Gram-Hansen and S.J Roberts, Multi-layer Stacked Gaussian Processes 2019

## REVIEWING DUTIES

- Neurlps 2019
- Neurlps 2018 workshop on Deep Learning for the Physical Sciences
- Neurlps 2018 workshop on Critiquing and Correcting Trends in Machine Learning