Bradley **Gram-Hansen**

Projects: https://github.com/bayesianbrad • Email: bradleygramhansen@gmail.com • Publications: Google Scholar

Experience

Dataminr, Inc.
Seattle, WA

AI Research Scientist
June 2021 – Present

- Research, build, and deploy into production state-of-the-art AI pipelines leveraging multiple data modalities for Dataminrs' core alerting platform, utilizing statistics, deep learning, machine learning, NLP, and computer vision.
- I work with scientists, engineers, product managers, editorial staff, and other teams to develop and deploy AI / probabilistic models to optimize internal processes. In one project for the editorial staff, I created and deployed a model which sped up the existing workflow by 40%, saving the company around $150,000 annually and helping reduce staff burnout.
- Mentored and supervised interns for research projects and publications.
- Built knowledge graphs to automatically detect and perform real-time alerting on cyber vulnerabilities found across the dark web and web.

Intelligent Networks
London, UK

Chief Technology Officer & Co-founder
June 2020 – June 2021

- Entrepreneurial spirit. Co-founded https://intelligentnetworks.ai, raised $110,000 in funding, and wore many hats: CTO, lead ML engineer, human resources, product manager, sales and many others.
- Built innovative probabilistic machine learning & AI solutions for our enterprise customers using probabilistic programming to forecast and extract anomalous alarms, reducing false alarm incidents by 96% and generating a significant ROI of 86% for our customers.
- Handled GDPR regulatory requirements.
- The data processing, visualization & AI framework was deployed in containerized frameworks (Docker) using AWS (S3, EC2, Amplify, Sagemaker) with Python (PyTest, Pandas, Pytorch, Seaborn, Matplotlib, Scikit-learn, PyMC3, Pyro & Flask).

University of Oxford
Oxford, UK

Machine Learning Researcher
Sept 2016 – Apr 2021

- Created PyLFPPL, an open source compiler that enabled new and existing classes of probabilistic graphical models to be compiled in probabilistic programming systems in a safe, agnostic and automated way. This enabled previously restricted probabilistic programming systems, such as Stan, to be correctly extended to a larger class of models. Work published at AISTATS.
- Collaborated with CERN, Intel, UBC, and NYU teams to develop two novel open source deep learning and Bayesian modeling tool-kits, PPX and PyProb (python, pytorch, numpy, c++, flatbuffers), to convert real-world life science simulators into probabilistic programs. Work published at NeurIPS.
- Created new generative modeling strategies to turn agent-based life science simulators, i.e., OpenMalaria, into probabilistic programs so that efficient inference could be run over the previously intractable simulators. Work published at AABI.
- Developed innovative kernel-based algorithms using Gaussian processes for forecasting and predicting events in health-centric data. Preprint under review.

Frontier Development Lab
Oxford & Frascati, UK & IT

Machine learning scientist
Jun 2018 – Sept 2018

- Collaborated with Nvidia, NASA, ESA and UNICEF to detect Informal settlements using free, low-resolution satellite imagery - it's very blurry! I engineered the prototype and the initial solution that turned spectral signals from satellite images into actionable insights for UNICEF. Work published at ICML and AAAI, and presented to industry and political leaders at the UN AI for social good conference.
- Enabled UNICEF to save $100,000 annually in surveying costs.

Education

University of Oxford, UK Ph.D. in Machine Learning, April 2021

- **Thesis**: Extending Probabilistic Programming Systems and Applying them to Real-World Simulators
  - **Supervisors**: Prof Yee Whye Teh, Dr Tom Rainforth, Dr Atılım Günes Baydin, Prof Philip Torr

University of Nottingham, UK Masters in Mathematics & Physics, July 2015

- **Dissertation:** An Investigation into the Creation of Entanglement Mediated by Interaction
  - **Supervisor:** Alexander Ossipov
- **Thesis:** Quantum Random Walks
  - **Supervisor:** Mădălin Guţă
- Graduated in the top 5%. Equivalent GPA 4.0.

Publications & Pre-prints

Pre-prints

- B. Gram-Hansen, Adam Golinski, C. Schroeder de Witt, P.H.S.Torr, Y.W. Teh, A. G. Baydin and T. Rainforth, *Effective Approximate Inference for Nested Simulator*s, 2021
- B. Gram-Hansen and S.J Roberts, *Multi-layer Stacked Gaussian Processes*, 2021

Published

- Saeid Naderiparizi, Adam Scibior, Andreas Munk, Mehrdad Ghadiri, Atilim Gunes Baydin, B. Gram-Hansen, Christian A Schroeder De Witt, Robert Zinkov, Philip Torr, Tom Rainforth, Yee Whye Teh, Frank Wood, *Amortized rejection sampling in universal probabilistic programming,* The 24th International Conference on Artificial Intelligence and Statistics (**AISTATS**), 2022
- B. Gram-Hansen, Extending Probabilistic Programming Systems, *Extending probabilistic programming systems and applying them to real-world simulators*, Doctoral Thesis, University of Oxford, 2021
- B. Gram-Hansen*, C. Schroeder de Witt, P.H.S.Torr, Y.W. Teh, A. G. Baydin and T. Rainforth, *Efficient Bayesian Inference for Nested Simulators*, The 2nd Symposium on Advances in Approximate Bayesian Inference (**AABI**), 2019
- 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 (**NeurIPS**), 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 (**SC**), 2019, Nominated for Best Paper.
- 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 (**AISTATS**), 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 Thirty-Third AAAI Conference on Artificial Intelligence (**AAAI**), 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*, N.Nardelli, A. Gambardella,R. Zinkov, P. Dokania, Siddharth N. A. B. Espinosa-Gonzalez, Lord A. Darzi, P.H.S. Torr and A. G. Baydin, *Simulation-Based Inference for Global Health Decisions,* 2020, ML for Health Workshop at the International Conference on Machine Learning (**ICML**), 2020
- B. Gram-Hansen*, C. Schroeder de Witt*, P.H.S.Torr, Y.W. Teh, T. Rainforth and AG. Baydin, *Hijacking Malaria Simulators with Probabilistic Programming*, AI for Social Good Workshop at the International Conference on Machine Learning (**ICML**), 2019

Invited Talks

Talks

- *Applying probabilistic programming to construct knowledge graphs*, Dataminr, New York (virtual), US, 2021
- *AI for space*, United Nations: AI for good global summit, Geneva, CH, 2019
- *Probabilistic Programming,* Oxford center for Human Brain Activity, Oxford, UK, 2018
- *Using machine learning to detect informal settlements*. European Space Agency, IT, 2018

Awards

Academic

- 2020 EY (Ernst & Young) Best Technology Business Award, out of 50 teams
- 2019 Runner-up in the Vice-Chancellor's Social Impact Award, out of 300 people
- 2019 NeulPS Travel Award
- 2018 FDL Award for Unexpected Discovery, out of 30 people
- 2016-2020 EPSRC Fully-Funded 4-Year PhD Studentship, 1 of 10 out of 240 people
- 2014 EPSRC Summer Research Award
- 2014 BP Ambition Award, 1 of 20 out of 600 people
- 2012 Eliahou Dangoor Scholarship, 1 of 5 out of 1000 people
- 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 out of 400 people
- 2016 Silver Medal, Fell Running championships, competing against 150 people
- 2005-2007 National Mini-field Youth Hockey champion U13 and U15 out of 25 teams

Reviewing Duties

- ICML 2022 main conference
- AISTATS 2022 main conference
- Neurlps 2021 main conference
- Neurlps 2020 workshop on Deep Learning for the Physical Sciences
- Neurlps 2020 main conference
- AISTATS 2020 main conference
- Neurlps 2019 workshop on Deep Learning for the Physical Sciences
- Neurlps 2019 main conference
- Neurlps 2018 workshop on Deep Learning for the Physical Sciences
- Neurlps 2018 workshop on Critiquing and Correcting Trends in Machine Learning