CURRICULUM VITAE WESSELBRUINSMA

ABOUT

wessel.p.bruinsma@gmail.com
Wessel Bruinsma
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LANGUAGES

dutch, native
english, fluent
croatian, basic

INTERESTS

machine learning for environmental science and forecasting, probabilistic modelling with a focus on time series, Bayesian nonparametrics with a focus on Gaussian processes, approximate inference, probabilistic programming, probability theory, and real analysis

EDUCATION

Jan '18 – Jul '22 **PhD in Machine Learning** Machine Learning Group, U. of Cambridge
- Supervised by Richard E. Turner

Oct '15 – Sep '16 **MPhil in Machine Learning** Dept. of Engineering, U. of Cambridge
- Distinction, class rank 1 / ∼20

Sep '12 – Jul '15 **BSc in Electrical Engineering (Hons)** EEMCS, Delft U. of Technology
- Distinction, class rank 1 / ∼100
- Specialisation in mathematics

PROFESSIONAL HISTORY

Oct '22 – now **Senior Researcher** Microsoft Research, Amsterdam
- Research into foundation models for atmospheric modelling

Jul '19 – Sep '19 **Internship (Quantitative Research)** G-Research, London

Sep '16 – Oct '22 **Machine Learning Researcher** Invenia Labs Limited, Cambridge
- Research into modelling multi-output time series, with a focus on electricity markets

Sep '14 – Jul '15 **Technical Specialist** EEMCS Recruitment Days, Delft
- Design and implementation of solutions to scheduling problems

Sep '13 – Jul '14 **Electrical Engineer** TU Delft Solar Boat Team, Delft
- Competed in DONG Solar Energy Challenge 2014 and Solar1 Monte Carlo Cup 2014

SELECTED PUBLICATIONS

[link] Bodnar, C., Bruinsma, W. P., Lucic, A., Stanley, M., Brandstetter, J., Garvan, J., Riechert, M., Weyn, J., Dong, H., Vaughan, A., Gupta, J. K., Tambiratnam, K., Archibald, A., Heider, E., Welling, M., Turner, R. E., and Perdikaris, P. (2024). "Aurora: A Foundation Model of the Atmosphere," in *arXiv preprint: 2405.13063*.

[link] Allen, A., Markou, S., Tebbutt, W., Requeima, J., Bruinsma, W. P., Andersson, T. R., Herzog, M., Lane, N. D., Chantry, M., Hosking, J. S., and Turner, R. E. (2024). "End-to-End Data-Driven Weather Prediction," in *Nature*.

[link] Gordon, J., Bruinsma W. P., Foong, A. Y. K., Requeima, J., Dubois Y., Turner, R. E. (2020). "Convolutional Conditional Neural Processes," *International Conference on Learning Representations (ICLR), 8th*. (Awarded oral presentation.)

SELECTED SOFTWARE

[link] *Stheno*: Probabilistic programming with Gaussian processes in Python

[link] *Aurora*: Implementation of the Aurora model for atmospheric forecasting in Python

[link] *Plum*: Implementation of multiple dispatch in Python

PUBLICATIONS

[link] Allen, A., Markou, S., Tebbutt, W., Requeima, J., Bruinsma, W. P., Andersson, T. R., Herzog, M., Lane, N. D., Chantry, M., Hosking, J. S., and Turner, R. E. (2025). "End-to-End Data-Driven Weather Prediction," in *Nature*.

[link] Selz, T., Bruinsma, W., Craig, G. C., Markou, S., Turner, R. E., Vaughan, A. (2025). "On the Effective Resolution of AI Weather Prediction Models," in *preprint*.

[link] Ashman, M., Diaconu, C., Weller, A., Bruinsma, W. P., and Turner, R. E. (2024). "Approximately Equivariant Neural Processes," in *arXiv preprint: 2406.13488*.

[link] Räisä, O., Markou, S., Ashman, M., Bruinsma, W. P., Tobaben, M., Honkela, A., and Turner, R. E. (2024). "Noise-Aware Differentially Private Regression via Meta-Learning," in *arXiv preprint: 2406.08569*.

[link] Chien, I., Bruinsma, W. P., Gonzalez, J., and Turner, R. E. (2024). "Safe Exploration in Dose Finding Clinical Trials with Heterogeneous Participants," in *International Conference on Machine Learning (ICML), 41th*.

[link] Ashman, M., Diaconu, C., Kim, J., Sivaraya, J., Markou, S., Requeima, J., Bruinsma, W. P., and Turner, R. E. (2024). "Translation-Equivariant Transformer Neural Processes," in *International Conference on Machine Learning (ICML), 41th*.

[link] Bodnar, C., Bruinsma, W. P., Lucic, A., Stanley, M., Brandstetter, J., Garvan, J., Riechert, M., Weyn, J., Dong, H., Vaughan, A., Gupta, J. K., Tambiratnam, K., Archibald, A., Heider, E., Welling, M., Turner, R. E., and Perdikaris, P. (2024). "Aurora: A Foundation Model of the Atmosphere," in *arXiv preprint: 2405.13063*.

[link] Bruinsma, W. P., Markou, S., Requeima, J., Foong, A. Y. K., Andersson, T. R., Vaughan, A., Anthony, B., Hosking, J. S., and Turner, R. E. (2023). "Autoregressive Conditional Neural Processes," in *International Conference on Representation Learning (ICLR), 11th*.

[link] Andersson, T. R., Bruinsma, W. P., Markou, S., Requeima, J., Coca-Castro, A., Vaughan, A., Ellis, A.-L., Lazzara, M., Jones, D. C., Hosking, J. S., and Turner, R. E. (2023). "Environmental Sensor Placement with Convolutional Gaussian Neural Processes" in *Environmental Data Science 2*.

[link] Lalchand, V., Bruinsma, W. P., Burt, D. R., and Rasmussen, C. E. (2022). "Sparse Gaussian Process Hyperparameters: Optimize or Integrate?" in *Advances in Neural Information Processing Systems (NeurIPS), 36th*.

[link] Rawat, A., Requeima, J. R., Bruinsma, W. P., and Turner, R. E. (2022). "Challenges and Pitfalls of Bayesian Unlearning," in *Updatable Machine Learning (UpML), ICML 2022 Workshop on*.

[link] Foong, Y. K., Bruinsma, W. P., and Burt, D. (2022). "A Note on the Chernoff Bound for Random Variables in the Unit Interval," arXiv:2205.07880.

[link] Bruinsma, W. P., Tegnér, M., and Turner, R. E. (2022). "Modelling Non-Smooth Signals with Complex Spectral Structure," in *Artificial Intelligence and Statistics (AISTATS), 25th International Conference on*.

[link] Coker, B., Burt, D., Bruinsma, W. P., Pan, W., Doshi–Velez, F. (2022). "Wide Mean-Field Bayesian Neural Networks Ignore the Data," in *Artificial Intelligence and Statistics (AISTATS), 25th International Conference on*.

[link] Markou, S., Requeima, J. R., Bruinsma, W. P., and Turner, R. E. (2022). "Practical Conditional Neural Processes Via Tractable Dependent Predictions," in *International Conference on Learning Representations (ICLR), 10th*.

[link] Markou, S., Requeima, J. R., Bruinsma, W. P., and Turner, R. E. (2021). "Efficient Gaussian Neural Processes for Regression," in *Uncertainty & Robustness in Deep Learning (UDL), ICML 2021 Workshop on*.

[link] Foong, A. Y. K., Bruinsma, W. P., Burt, D. R., and Turner, R. E. (2021). "How Small can PAC-Bayes be in the Small Data Regime?" in *Advances in Neural Information Processing Systems (NeurIPS), 35th*.

[link] Bruinsma, W. P., Requeima, J., Foong, A. Y. K., Gordon, J., and Turner, R. E. (2021). "The Gaussian Neural Process," in *Advances in Approximate Bayesian Inference (AABI), 3rd Symposium on*. (Awarded contributed talk.)

[link] Xia, R., Bruinsma W. P., Tebbutt W., and Turner R. E. (2021). "The Gaussian Process Latent Autoregressive Model," in *Advances in Approximate Bayesian Inference (AABI), 3rd Symposium on*.

[link] Foong, A. Y. K., Bruinsma W. P., Gordon. J., Dubois, Y., Requeima J., and Turner R. E. (2020). "Meta-Learning Stationary Stochastic Process Prediction with Convolutional Neural Processes," in *Advances in Neural Information Processing Systems (NeurIPS), 33th*.

[link] Bruinsma, W. P., Perim E., Tebbutt W., Hosking J. S., Solin A., Turner R. E. (2020). "Scalable Exact Inference in Multi-Output Gaussian Processes," in *International Conference on Machine Learning (ICML), 37th*.

[link] Gordon, J., Bruinsma, W. P., Foong, A. Y. K., Requeima, J., Dubois, Y., and Turner, R. E. (2020). "Convolutional Conditional Neural Processes," in *International Conference on Learning Representations (ICLR), 8th*. (Awarded oral presentation.)

[link] Berkovich, P., Perim, E., and Bruinsma, W. P. (2019) "GP-ALPS: Automatic Latent Process Selection for Multi-Output Gaussian Process Models," in *Advanced in Approximate Bayesian Inference (AABI), 2nd Symposium on*.

[link] Requiema, J. R., Tebbutt, W. C., Bruinsma, W. P., and Turner, R. E. (2019). "The Gaussian Process Autoregressive Regression Model (GPAR)," in *Artificial Intelligence and Statistics (AISTATS), 22nd International Conference on*.

[link] Bruinsma, W. P. and Turner, R. E. (2018). "Learning Causally-Generated Time Series," in *arXiv preprint:1802.08167*.

[link] Bosma, S., Bruinsma, W. P., Hes, R. P., Bentum, M. J., and Lager, I. E. (2017). "Grating Lobe Prediction in 3D Array Antennas," in *Antennas and Propagation (EuCAP), 11th European Conference on*.

[link] Bruinsma, W. P., Hes, R. P., Bosma, S., Lager, I. E., and Bentum, M. J. (2016). "Radiation Properties of Moving Constellations of (Nano) Satellites: A Complexity Study," in *Antennas and Propagation (EuCAP), 10th European Conference on*.

[link] Bentum, M. J., Lager, I. E., Bosma, S., Bruinsma, W. P., and Hes, R. P. (2015). "Beamforming in Sparse, Random, 3D Array Antennas with Fluctuating Element Locations," in *Antennas and Propagation (EuCAP), 9th European Conference on*.

THESES

[link] Bruinsma, W. P. (2022). "Convolutional Conditional Neural Processes." Department of Engineering, University of Cambridge. Thesis for the degree Doctor of Philosophy.

[link] Bruinsma, W. P. (2016). "The Generalised Gaussian Process Convolution Model." Department of Engineering, University of Cambridge. Thesis for the degree Master of Philosophy.

[link] Bruinsma, W. P., Hes, R. P., Kroep, H. J. C., Leliveld, T. C., Melching, W. M., and aan de Wiel, T. A. (2015). "An Extensible Toolkit for Real-Time High-Performance Wideband Spectrum Sensing." Faculty of Electrical Engineering, Mathematics and Computer Science, Delft University of Technology. Thesis for the degree Bachelor of Science.

AWARDS AND GRANTS

Jan 2022	**Christ's College Excellence in Teaching Prize**
2018 – 2021	**International Doctoral Scholarship (IDS) Grant Covering PhD Fees and Stipend**
Mar 2016	**UfD – Damen Bachelor Award**

INVITED TALKS

Sep 2025	**IAISS 2025** • Aurora: A Foundation Model for the Earth System	Italy
Jul 2025	**AI4X 2025** • Aurora: A Foundation Model for the Earth System	Singapore
Mar 2025	**SLAC Monthly Seminar** • Aurora: A Foundation Model for the Earth System	Online
Oct 2024	**Advancing Ecosystem Carbon Flux Research** • Foundation Models for Earth Systems	Leiden, NL
Jan 2024	**Center for Basic Machine Learing in Life Sciences (MLLS)** • Autoregressive Conditional Neural Processes	Copenhagen, DK
Feb 2022	**Sheffield Machine Learning Group Seminar Series** • Meta-Learning as Prediction Map Approximation	Sheffield, UK
Jan 2019	**Online Winter School on Spectral Methods for Complex Systems** • Spectral Methods in Gaussian Modelling	Online

NEWS COVERAGE

Jun 2024	[link] **Nature News describes Aurora as the first AI to predict air pollution worldwide**
Jun 2024	[link] **Bill Gates mentions Aurora as a tool for weather prediction**
Jul 2024	[link] **NOS, the Dutch national broadcasting agency, mentions Aurora**
Aug 2024	[link] **WSJ interviews Paris Perdikaris, the Aurora team lead**
Oct 2024	[link] **State of AI 2024 report lists Aurora as an advancement**

MACHINE LEARNING SOFTWARE

[link] *Stheno*: Probabilistic programming with Gaussian processes in Python

[link] *Aurora*: Implementation of the Aurora model for Earth system forecasting

[link] *GPAR*: Implementation of GPAR in Python

[link] *NeuralProcesses.jl*: A framework for composing Neural Processes in Julia

[link] *NeuralProcesses*: A framework for composing Neural Processes in Python

[link] *ConvCNP*: Implementation of the ConvCNP in Python

[link] *GPCM*: Implementation of several variants of the Gaussian Process Convolution Model in Python

[link] *OILMM*: Implementation of the OILMM in Python

[link] *MLKernels*: Flexible implementation of kernels in Python

OTHER SOFTWARE

[link] *Plum*: Implementation of multiple dispatch in Python

[link] *LAB*: A generic interface for linear algebra backends in Python

[link] *FDM*: Estimate derivatives with finite differences in Python

[link] *FiniteDifferences.jl*: Estimate derivatives with finite differences in Julia

[link] *Varz*: Painless optimisation of constrained variables in AutoGrad, TensorFlow, PyTorch, and JAX

[link] *Matrix*: Structured matrices in Python

[link] *Algebra*: Algebraic structures in Python

REVIEWING

AABI 2024	**Reviewer**
NeurIPS 2023	**Reviewer**
ICML 2023	**Reviewer**
GPSMDMS 2022	**Reviewer**
ICML 2022	**Reviewer (top 10%)**
AISTATS 2022	**Reviewer**
ICML 2021	**Reviewer**
NeurIPS 2020	**Reviewer**

TEACHING

All below teaching was done at the University of Cambridge.

Easter 2022	**Cosupervisor for two MPhil Projects**	MPhil in Machine Learning and Machine Intelligence
Easter 2021	**Cosupervisor for two MPhil Projects**	MPhil in Machine Learning and Machine Intelligence
Lent 2021	**Supervisor for Inference**	Part IIA, Engineering Tripos
Michaelmas '21	**Supervisor for Introduction to ML**	MPhil in Machine Learning and Machine Intelligence
Easter 2020	**Cosupervisor for MPhil Project**	MPhil in Machine Learning and Machine Intelligence
Lent 2020	**Supervisor for Inference**	Part IIA, Engineering Tripos
Michaelmas '20	**Demonstrator**	AI for the study of Environmental Risks (CDT)
Michaelmas '20	**Demonstrator**	MPhil in Machine Learning and Machine Intelligence
Lent 2019	**Supervisor for Inference**	Part IIA, Engineering Tripos

FULL PORTFOLIO

See wessel.ai/publications and wessel.ai/software for a full overview of my software, publications, posters, theses, talks, and write-ups.