

Curriculum Vitae

Matthew M. Dunlop

PERSONAL

Address: Annenberg Center IST #337,
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Telephone: +1 (626) 531 0099
Date of Birth: 1st November 1989
Citizenship: British
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ACADEMIC INTERESTS

Problems at the interface of probability and differential equations: Bayesian inverse problems, uncertainty quantification, imaging, data assimilation, deep learning.

EMPLOYMENT

Postdoctoral Scholar in Computing & Mathematical Sciences 2016 -
California Institute of Technology, USA
Department of Computing & Mathematical Sciences
Supervisor: Prof. Andrew Stuart

EDUCATION

PhD Mathematics and Statistics 2013 - 2016
University of Warwick, UK
Mathematics and Statistics Doctoral Training Centre (MASDOC)
Title: *Analysis and computation for Bayesian inverse problems*
Supervisors: Prof. Andrew Stuart and Dr. Marco Iglesias

Postgraduate Award in Transferable Skills in Science 2013 - 2016
University of Warwick, UK

MSc Mathematics and Statistics (Distinction) 2012 - 2013
University of Warwick, UK
Mathematics and Statistics Doctoral Training Centre (MASDOC)
One year master's degree with taught and research components.
Dissertation title: *On the support of diffusion processes with irregular drift coefficients*
Dissertation supervisor: Prof. Xue-Mei Li

MMath Mathematics (First-class honours) 2008 - 2012
University of Warwick, UK
Four year undergraduate master's degree. Modules taken focused on analysis, probability and differential geometry.
Dissertation title: *Malliavin calculus and applications*
Dissertation supervisor: Prof. Xue-Mei Li

RESEARCH PAPERS

D. Calvetti, M. M. Dunlop, E. Somersalo and A. M. Stuart. "Iterative updating of model error for Bayesian inversion." *Submitted* (2017).

M. M. Dunlop, C. M. Elliott, V. Ha Hoang, A. M. Stuart. "Bayesian formulations of multidimensional barcode inversion." *Submitted* (2017).

M. M. Dunlop, M. A. Iglesias, A. M. Stuart. “Hierarchical Bayesian level set inversion.” *Statistics and Computing* (2016).

M. M. Dunlop, A. M. Stuart. “The Bayesian formulation of EIT: analysis and algorithms.” *Inverse Problems and Imaging* **4** 4 (2016) 1007 - 1036.

M. M. Dunlop, A. M. Stuart. “MAP estimators for piecewise continuous inversion.” *Inverse Problems* **32** 10 (2016) 105003.

WORK IN PROGRESS

Large data and zero noise limits of graph-based semi-supervised learning algorithms, with D. Slepčev, A. M. Stuart, M. Thorpe.

Robust MCMC sampling with non-Gaussian and hierarchical priors in high dimensions, with V. Chen, O. Papaspiliopoulos, A. M. Stuart.

MAP estimators for Bayesian hierarchical models, with T. Helin, A. M. Stuart.

How deep is a deep Gaussian process?, with M. Girolami, A. M. Stuart, A. Teckentrup.

Multiplicative noise in Bayesian inversion.

TEACHING EXPERIENCE

Undergraduate supervisor (Warwick) All Terms, 2011 - 2016

Twice-weekly meetings with small groups of first year undergraduate mathematics students. Duties include explaining, discussing and clarifying material covered in their lectures and marking their assignments.

Teaching assistant

Graduate course, *Introduction to Linear Analysis with Applications* (Caltech) Fall 2016, 2017

Third year course, *Matrix Analysis and Algorithms* (Warwick) Fall 2015

First year course, *Probability A & B* (Warwick) Spring 2015

Second year course, *Analysis III* (Warwick) Fall 2014

RESEARCH STUDY GROUPS

The Stochastic Allen-Cahn Equation 2012 - 2013

Supervisors: Prof. Martin Hairer and Dr. Hendrik Weber

SELECTED TALKS AND UPCOMING TALKS

Iterative updating of model error in Bayesian inversion 12th September 2017

Minisymposium: Dynamics and data in stochastic systems, far from equilibrium
SIAM Conference on Mathematical and Computational Issues in the Geosciences

Dimension robust MCMC sampling with non-Gaussian and hierarchical priors 30th August 2017

Bayesian and Nonlinear Inverse Problems, Lorentz Center, Leiden, Netherlands

Robust hierarchical methods for Bayesian computation 29th May - 2nd June 2017

Minisymposium: Structure exploiting methods in large-scale Bayesian computation

MAP estimation for piecewise continuous inversion

Minisymposium: Bayesian inverse problems with non-Gaussian priors

Applied Inverse Problems 2017, Hangzhou, China

Iterative updating of model error for Bayesian inversion 27th February - 3rd March 2017

Minisymposium: Efficient Algorithms for Bayesian Inverse Problems Governed by PDE Forward Problems
SIAM Conference on Computational Science and Engineering 2017, Atlanta, Georgia, USA

- Bayesian hierarchical methods in inverse problems* 10th August 2016
Inverse Problems Seminar, Helsinki University, Finland
- Iterative updating of model error in Bayesian inversion* 1st July -5th July 2016
Minisymposium: Uncertainty Quantification in Dynamical Systems
- Hierarchical Bayesian level set inversion*
Minisymposium: Uncertainty Quantification
11th AIMS Conference on Dynamical Systems, Orlando, Florida, USA
- Hierarchical Bayesian level set inversion* 13th June 2016
Minisymposium: Stochastic Inverse Problems
ECMI 2016, Santiago de Compostela, Spain
- The Bayesian formulation of EIT: analysis and algorithms* 5th - 8th April 2016
Minisymposium: Large-Scale PDE-constrained Bayesian Inverse Problems (co-organiser)
- Hierarchical Bayesian level set inversion*
Minisymposium: Advances in Sampling Methods for Bayesian Inverse Problems
SIAM Conference on Uncertainty Quantification 2016, Lausanne, Switzerland
- Bayesian level set inversion* 8th November 2015
Sensitivity, Error and UQ for Atomic, Plasma, and Material Data, Stony Brook University, New York, USA
- The Bayesian formulation of EIT* 29th May 2015
SIAM National Student Chapter Conference 2015, University of Reading, UK
- The Bayesian formulation of EIT* 17th April 2015
4th CCA-MASDOC Student Conference, University of Warwick, UK
- MAP estimators for Bayesian inverse problems* 23rd February 2015
EQUIP Lunch Seminar, University of Warwick, UK
- A multiplicative noise model for Bayesian inversion* 11th November 2014
Applied PDEs Seminar, University of Warwick, UK
- Bayesian geometric inverse problems in groundwater flow* 13th May 2014
Reading-Warwick Data Assimilation Meeting, University of Warwick, UK
- Bayesian geometric inverse problems in groundwater flow* 30th April 2014
Postgraduate Seminar, University of Warwick, UK
- MAP estimators for piecewise continuous inversion* 17th March 2014
3rd CCA-MASDOC Student Conference, University of Cambridge, UK

CONFERENCES ORGANISED

- Warwick SIAM Student Conference* 25th November 2015
University of Warwick, UK
Afternoon of talks with two industrial speakers and two student speakers. Targeted at postgraduate and advanced undergraduate students.
- Warwick SIAM Student Conference* 28th October 2015
University of Warwick, UK
Afternoon of talks with two industrial speakers and two student speakers. Targeted at postgraduate and advanced undergraduate students.

SELECTED CONFERENCES AND WORKSHOPS ATTENDED

<i>MCQMC 2016</i> Stanford University, California, USA	14th August - 19th August 2016
<i>Topics in Renormalisation Group Theory and Regularity Structures</i> University of Warwick, UK	11th May - 15th May 2015
<i>UK-Japan Stochastic Analysis School</i> University of Warwick, UK	1st September - 5th September 2014
<i>IPTA 2014: Inverse Problems - from Theory to Application</i> @Bristol, UK	26th August - 28th August 2014
<i>Mathematical and Algorithmic Aspects of Uncertainty Quantification</i> University of Texas at Austin, Texas, USA	28th July - 8th August 2014
<i>MASDOC Short Course on Stochastic Dynamics</i> University of Warwick, UK	29th June - 4th July 2014
<i>Computational Methods for Statistical Mechanics</i> ICMS, Edinburgh, UK	2nd June - 6th June 2014
<i>SIAM Conference on Uncertainty Quantification 2014</i> Savannah, Georgia, USA	31st March - 3rd April 2014
<i>PMPM Research Network</i> ICMS, Edinburgh, UK	8th January - 10th January 2014
<i>Geometry and Analysis of Random Processes</i> University of Cambridge, UK	8th April - 12th April 2013
<i>Example Based Mini-Course on Mathematical Modelling</i> University of Warwick, UK	5th November - 21st November 2012
<i>2012 UK Easter Probability Meeting</i> University of Warwick, UK	26th March - 30th March 2012

COMPUTING SKILLS

MATLAB, Mathematica, C++, PHP, HTML, CSS, SQL, L^AT_EX.

OTHER

Referee for Statistics and Computing, Inverse Problems and Imaging.
President of Warwick SIAM Student Chapter (2015).
Organiser of Warwick SIAM Student Chapter seminar series (2015)
Member of SIAM.