

Curriculum Vitae: Gareth W. Peters

Contact Information

Gareth William Peters
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Citizenship

Australian

Education

Ph.D. in Statistics (by publication) - University of NSW, Australia

Statistics and Mathematics Department (Expected submission date: August 2009)

- Thesis: Topics in trans-dimensional samplers and likelihood free inference.
- Advisors: Dr.S.A. Sisson, Dr.Y. Fan [UNSW], Dr.P. Shevchenko [CSIRO]
- Scholarships: APA, CSIRO Fellowship (top-up)

M.Sc. (by research) - Cambridge University, Cambridge, England

Statistical Signal Processing Group - Engineering, 2003 to 2005

- Thesis: Sequential Monte Carlo Samplers.
- Advisor: Prof. Araud Doucet [Cambridge]
- Scholarships: Cambridge Commonwealth Trust and Caulfield.

B.Eng. 1st Class Hons. - The University of Melbourne, Australia

Electrical and Communications Engineering, June 1998 to 2003

- **Major:** Signal Processing, Control, Communications; **Minor:** Photonics

B.Sc. (Deans Hons.) - The University of Melbourne, Australia

Science: Mathematics and Physics Departments, 1998 to 2003

- **Major:** Mathematics - applied and financial; **Minor:** Physics

B.Sc. (Science Scholar - Sir John Monash Scholar) - Monash University, Australia

Science: Mathematics and Physics Departments, 1997 to 1998

- Astrophysics and mathematics (transferred to Melbourne University)

V.C.E. Melbourne High School, Melbourne, Australia

- *Tertiary Entrance Rank: 98.5%*

Awards and Honors

Statistical Society of Australia

- **J.B. Douglas Award Winner**, for excellence in postgraduate research in Statistics or Econometrics, 2008.

University of New South Wales

- **Australian Postgraduate Award Scholarship**, 2006 to present.
- Statistics and Mathematics Postgraduate Scholarship Top Up, 2006 to present.

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

- **Ph.D. fellowship and travel bursary**, 2006 to present.

University of British Columbia

- **Canadian International Postgraduate Research Scholarship**, 2005.

University of Cambridge

- **Cambridge Commonwealth Fellowship**, 2003 to 2005.
- Selwyn College Scholar and Caulfield scholarship 2003 to 2005.
- Life time fellow of Cambridge Commonwealth Society.

University of Monash

- **Sir John Monash Scholarship**, 1997.
- Deans honors award in Science Faculty, 1997.

Melbourne High School

- **Science Inquiry Prize**, 1996.

Swinburne University

- Scholarship for study at Parkes Radio Telescope, 2000.
- Scholarship to work at Astrophysics and Super-computing Center, 2000.

Commonwealth Bank of Australia

- Economic and Capital group spot award, 2006.
- Economic and Capital group spot award, 2006.
- Group Risk Management service award, 2006.

Referees

Dr. S.A. Sisson, School of Mathematics and Statistics, UNSW, Australia.

email: Scott.Sisson@unsw.edu.au

phone: +61 2 938 57027

Dr. Y. Fan, School of Mathematics and Statistics, UNSW, Australia.

email: Y.Fan@unsw.edu.au

phone: +61 2 938 57034

Dr. P. Shevchenko, CSIRO - CMIS, Sydney, Australia.

email: Pavel.Shevchenko@csiro.au

phone: +61 2 9325 3218

Research

Research Overview

- One of the leading researchers in *Approximate Bayesian* inference methodology.
- Published in top ranking Statistics; Insurance and Risk; and Wireless Communications Engineering journals. These include: Statistics - Statistics and Computing (ERA ranking A); Probability - SIAM Theory of Probability and its Applications; Actuarial - ASTIN Bulletin; Risk Modelling - Journal of Operational Risk; Wireless Communications and Signal Processing - IEEE Transactions on Signal Processing (ERA ranking A*).
- Regularly invited to present and visit as researcher in international laboratories (QintQ U.K., ETH-RiskLab Switzerland, SAMSI U.S., CSIRO Australia, ISM Japan).
- Reviewer for ASTIN Bulletin and Journal of Operational Risk.
- Winner of J.B. Douglas Award for excellence in postgraduate research (2008).

Research Interests

- **Computational Statistics:**
Development of novel methodology for sampling, integral estimation and filtering in stochastic models. Development of algorithms (Markov chain Monte Carlo MCMC, Adaptive MCMC, Trans-dimensional MCMC, Sequential Monte Carlo (SMC), non-linear filtering, Likelihood-free sampling methodology, Annealing and tempering, rare-event simulation).
- **Bayesian Risk, Commodities, Insurance and Hedge Fund models:**
Development of novel Bayesian models for Operational Risk, Credit Risk, Commodities and Non-life insurance claims reserving. This involves introduction of copula based Bayesian models for correlation structures; estimation and calibration procedures; joint on-line parameter estimation and non-linear filtering; likelihood-free bootstrap procedures; Co-Integrated Vector Autoregression time series models; multivariate latent factor sde models.
- **Stochastic Signal Processing and Wireless Communications:**
Development of novel Bayesian models for wireless communications. This includes development of models for coherent and incoherent channel estimation and detection for OFDM, MIMO and co-operative relay networks. Additionally, this involves methodological development of algorithms utilizing Stochastic Approximation, Adaptive MCMC, SMC Samplers, TD-MCMC, Likelihood-free inference.

Academic Experience

Institute of Statistical Mathematics (ISM), Tokyo, Japan

Invited Graduate Student Researcher August-September 2009

- Invited researcher to participate in non-linear filtering for commodity models.

Statistical and Applied Mathematics Sciences Institute (SAMSI), Durham, NC USA

Invited Graduate Student Researcher September-October 2008

- Invited researcher to participate in Particle Filtering workshop.

ETH University (RiskLab), Zurich, Switzerland

Invited Graduate Student Researcher August-September 2008

**Academic
Experience
(cont.)**

Commonwealth Scientific and Industrial Research Organisation (CSIRO),
Sydney, Australia

Graduate Student Researcher 2006,2007,2008,2009

- Member of Center for Mathematical and Information Sciences (CMIS). I perform research in statistics and financial modelling.

University of British Columbia (Statistics), Vancouver, BC, Canada

Research Assistant, Science: Statistics Department, 2005

- Research focus: non-linear filtering and Sequential Monte Carlo Samplers.

University of British Columbia (Laboratory of Computational Intelligence (LCI)), Vancouver, BC, Canada

Research Assistant, Science: Computer Science, 2005

- Research focus: game theory and machine learning.

Universite Paul Sabatier Toulouse III, Toulouse, France

Invited Graduate Student Researcher April-May 2004

Astrophysics and Super Computing Centre, Melbourne, Australia

Invited Undergraduate Student Researcher December 2000 - April 2001

Plant Sciences and Biotechnology, Melbourne, Australia

Invited Student Researcher August 1995 - December 1995

Publications

Journal Papers - peer reviewed, accepted

1. Peters G.W., Nevat I. and Yuan J. (2008) Stochastic Approximation and Conditional Path Sampling Trans-dimensional MCMC for Channel Estimation in OFDM Systems with Unknown Power Delay Profile. IEEE Transactions on Signal Processing, *to appear*.
2. Fan Y., Peters G.W. and Sisson S.A (2008) Automating and Evaluating Reversible Jump MCMC Proposal Distributions. Statistics and Computing *to appear*.
3. Peters G.W., Shevchenko P. and Wüethrich M. (2008) Model Risk in Claims Reserving within Tweedie's Compound Poisson Models. ASTIN Bulletin *to appear*.
4. Peters G.W., Johansen A. M. and Doucet A. (2007) Simulation of the Annual Loss Distribution in Operational Risk via Panjer Recursions and Volterra Integral Equations for Value at Risk and Expected Shortfall Estimation. Journal of Operational Risk, Vol. 2 No. 3.
5. Peters G.W. and Sisson S.A. (2006) Bayesian Inference, Monte Carlo Sampling and Operational Risk. Journal of Operational Risk, vol. 1, no. 3.
6. Del Moral P., Doucet A., and Peters G.W. (2006) Sharp Propagation of Chaos Estimates for Feynman-Kac Particle Models. Teoriya Veroyatnosterii ee Prime-neniya (to be reprinted in SIAM Theory of Probability and Its Applications), vol. 51, no. 3.

Conference Publications - peer reviewed proceedings, accepted

1. Peters G.W., Shevchenko P. and Wüthrich M. (2008) Model Risk in Claims Reserving within Tweedie's Compound Poisson Models. Astin Colloquim, UK
2. Nevat I., Peters G.W. and Yuan J. (2008) Bayesian Inference in Linear Models With a Random Gaussian Matrix : Algorithms and Complexity, PIMRC, France.
3. Nevat I., Peters G.W. and Yuan J. (2008) Maximum A-Posteriori Estimation in Linear Models With a Random Gaussian Model Matrix: a Bayesian-EM Approach, ICASSP, Las Vegas, USA.
4. Nevat I., Peters G.W. and Yuan J. (2008) OFDM Channel Impulse Response Estimation with Unknown Length using Bayesian Model Order Selection and Model Averaging, VTC 2008, Singapore.

Journal Papers - peer reviewed, submitted

1. Peters G.W., Wüthrich M. and Shevchenko P. (2009) Chain Ladder Method: Bayesian Bootstrap versus Classical Bootstrap. ASTIN Bulletin
2. Peters G.W., Sisson S.A. and Fan Y. (2008) Design Efficiency for "likelihood free" Sequential Monte Carlo samplers. Under Revision
3. Peters G.W., Fan Y. and Sisson S.A. (2008) On Sequential Monte Carlo, Partial Rejection Control and Approximate Bayesian Computation. JASA
4. Peters G.W., Shevchenko P. and Wüthrich (2008) Dynamic Operational Risk: modelling dependence and combining different sources of information. Journal of Operational Risk
5. Nevat I., Peters G.W. and Yuan J. (2008) A Low Complexity MAP Estimation in Linear Models with a Random Gaussian Mixing Matrix. IEEE Transactions on Communications
6. Nevat I., Peters G.W. and Yuan J. (2008) Detection of Gaussian Constellations in MIMO Systems Under Imperfect CSI. IEEE Transactions of Wireless Communications
7. Sisson S.A., Peters G.W. and Fan Y. (2008) Likelihood Free Samplers. Bayesian Analysis.

Conference Publications - peer reviewed proceedings, submitted

1. Peters G.W., Shevchenko P. and Wüthrich (2009) Dynamic Operational Risk: modelling dependence and combining different sources of information, 15th International Conference on Computing in Economics and Finance, 2009.
2. Peters G.W., Kannan B., Lasscock B. and Mellen C. (2009) Rank Estimation and Adaptive Markov chain Monte Carlo for Bayesian Cointegrated VAR Models, 15th International Conference on Computing in Economics and Finance, 2009.
3. Nevat I., Peters G.W. and Yuan J. (2009) Coherent Detection or Cooperative Networks with Arbitrary Relay Functions using "Likelihood Free" Inference. Proc. NEWCOM-ACorn Workshop, Barcelona, Spain.

**Publications
(cont. II)**

Working Journal Papers

1. Peters G.W., Sisson S.A. and Fan Y. (2009) Simulation for Bayesian Models Constructed with Alpha Stable Distributions via Likelihood-Free Inference.
2. Fan Y., Sisson S.A. and Peters G.W. (2009) Improved Efficiency in Approximate Bayesian Computation.
3. Peters G.W., Balkrishnan K. and Lasscock B. (2009) TDMCMC and Adaptive MCMC for CVAR models.
4. Peters G.W., Briers M. and Shevchenko P. (2009) Filtering and Parameters Estimation in Commodities Models.
5. Peters G.W., Wüthrich M. and Shevchenko P. (2009) SMC Samplers PRC-ABC for Claims Reserving in a Likelihood Free setting.
6. Peters G.W., Nevat I., Yuan J., Sisson S.A. and Fan Y. (2009) Relay System Detection and Channel Estimation via Likelihood Inference.
7. Nevat I., Peters G.W., Yuan J., Fan Y. and Sisson S.A. (2009) Model Selection and Model Uncertainty in Relay Systems via Likelihood-Free Inference.

Theses

1. Peters G.W. (2009) *Trans-dimensional Markov Chain Monte Carlo and Likelihood Free Inference*. PhD. Dissertation (in prep.) (supervised by Dr. Sisson S.A., Dr. Fan Y. and Dr. Shevchenko P.), University of New South Wales, Sydney, Australia.
2. Peters G.W. (2005) *Sequential Monte Carlo Samplers*. MSc.(by research) Dissertation (supervised by Dr. Doucet A.), Cambridge University, Cambridge, UK.

Book Reviews

1. Peters G.W. (2008) Review of the book entitled "Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference, Second Ed." by Gamerman D. and Lopes H. for Statistics in Medicine.
2. Peters G.W. (2007) Review of the book entitled "Uncertain Judgements Eliciting Experts Probabilities" by OHagan A. et al. for Journal of the Royal Statistical Society A, 4, 861-1198.

Technical Reports Academic

1. Peters G.W. and Terauds V. (2007) Quantifying Operational Risk, part of report by Sisson S.A. and Franklin J. Low Probability Large Consequence Events, Australian Center for Excellence in Risk Analysis, project no. 06/02.

Industrial, Commercial In Confidence Technical Reports

1. Baronia Capital Pty. Ltd (2008). Vector Auto Regressions and Cointegration Modelling.
2. Operational Risk OpRA System Combining and Aggregation Methodology, (2007). Commonwealth Bank of Australia, Internal Report and Analysis.
3. Operational Risk OpRA System Capital Allocation and Capital Sensitivity Methodology, (2007). Commonwealth Bank of Australia, Internal Report and Analysis.
4. Operational Risk OpRA System Accuracy Testing, (2006). Commonwealth Bank of Australia, Internal Report and Analysis.
5. Operational Risk OpRA System Sensitivity Analysis Report (Convolution, Distribution Choice, Number of Exposures), (2006). Commonwealth Bank of Australia, Internal Report and Analysis.
6. Operational Risk OpRA System Survey Design and Methodology Analysis, (2005). Commonwealth Bank of Australia, Internal Report and Analysis.

Presentations and Invited Talks

1. Ninth Annual J. B. Douglas Awards (Winner), Statistical Society of Australia, Sydney, 2008.
2. 9th World Conference of the International Society for Bayesian Analysis, Hamilton Island, 2008.
3. Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) - AMRA Meeting, 2008.
4. Qintq, Great Malvern, UK, 2008.
5. Baronia Pty. Ltd. Hedge Fund, Sydney, 2007.
6. 2nd World MCMSki of the International Society for Bayesian Analysis, Bormio, Italy, 2008.
7. Australasian Society for Bayesian Analysis, Spring Bayes, Coolangatta, 2007.
8. Commonwealth Scientific and Industrial Research Organisation (CSIRO) - Risk Management Seminar, 2007.
9. University of British Columbia (UBC) - Laboratory for Computational Intelligence Seminar, 2006.
10. University of British Columbia (UBC) - Statistics Department Seminar, 2005.
11. Qintq, Great Malvern, UK, 2005.
12. Cambridge University - Engineering Department Seminar 1, 2005.
13. Cambridge University - Engineering Department Seminar 2, 2005.
14. 6th World meeting of the Bernoulli Society for Mathematical Statistics and Probability and 67th Annual Meeting of the Institute of Mathematical Statistics, Barcelona, Spain, 2004.
15. European Machine Learning Summer School, Berder Island, France, 2004.

Service to the profession

Referee for the following journals: ASTIN Bulletin (1), Journal of Operational Risk (4), Neural Information Processing (1).

Research Collaborators

- Dr. Pavel Shevchenko, CSIRO CMIS, Sydney, Australia.
- Dr. Scott Sisson, Statistics Department, University of NSW, Australia.
- Dr. Yanan Fan, Statistics Department, University of NSW, Australia.
- A.Prof. Jinhong Yuan, Electrical Engineering Department, University of NSW, Australia.
- Ido Nevat, Electrical Engineering Department, University of NSW, Australia.
- Prof. Arnaud Doucet, Institute of Statistical Mathematics, Tokyo, Japan.
- Dr. Mario Wüthrich, RiskLab, ETH, Zurich, Switzerland.
- Prof. Simon Godsill, Statistical Signal Processing Laboratory, Cambridge University, Cambridge, UK.
- Dr. Mark Briers, Qintq, Great Malvern, UK.
- A.Prof. Adam Johansen, Statistics Department, University of Warwick, UK.
- Prof. Pierre del Moral, INRIA, Bordeaux, France.
- A.Prof. Nando de Freitas, Laboratory for Computational Intelligence, University of British Columbia, Vancouver, Canada.

Teaching

Philosophy and Goals

- I will use stimulating and clear materials consisting of quality textbooks, reading materials and web based learning.
- A critical approach will be maintained in that students would be encouraged to question all source material and derive key results.
- **I have the ability to teach classes in both statistics and Electrical Engineering.** Since I also trained as an electrical engineer and I continue to publish actively in Signal processing I believe I have a unique opportunity to convey statistical concepts to an engineering audience as well as a mathematical audience.
- I am keen to develop courses and syllabus for more advanced graduate level courses in statistics.
- I would like to work towards a graduate certificate in University Learning and Teaching.
- I have run laboratories, tutorials and taught classes in several different universities and continents. I have experience at Melbourne University, University of NSW and University of British Columbia.
- I jointly established and ran a set of three teaching franchises in Melbourne called Academic and General Pty. Ltd. The primary focus of these schools was development of curriculum for Mathematics, Sciences and English for children in years 6 through to 1st year university. I spent 5 years developing courses and teaching classes of size 5 to 20 students typically 10 hours per week.
- I am keen to begin to supervise and co-supervise Honors, Masters and Ph.D. students in Statistics and in Electrical Engineering.

Teaching Experience

University of New South Wales, Sydney, Australia

Instructor 2007

- Computer laboratories: Linear Models - Maths 2831/293.

The University of Melbourne, Melbourne, Australia

Ran and managed Electrical Engineering Laboratories 2001-2003

- Stochastic Signals and Systems, 3rd year
- Engineering Communication Systems, 3rd year
- Engineering Electronic Devices and Circuits, 1st year
- Engineering Electromagnetism, 3rd year

Academic and General, Melbourne, Australia

Teacher (mathematic, physics, chemistry, english). 1998 to 2003

Student Supervision

1. Michael Abbott, (2008/2009) Compound Processes, Correlation and Copulas, Co supervised summer student with Dr. Sisson

Private Sector

- I have worked as a junior Electrical Engineer at NEC Australia.
- I have 4 years experience in the Financial Industry.
- I have set up and currently run my own statistical consulting company.
- I have worked both individually and as part of teams. Highlights include successfully leading a team of quantitative analysts and computer scientists for developing and testing a large commercial banking project in a risk setting.

Professional Experience

Quantitative Solutions, Sydney, Australia

Statistical Consultancy

March 2008 to present

- I run my own statistical consultancy business.
- Baronia Capital (client) - large quantitative hedge fund in Australia. Work on filtering and model analysis in co-integrated vector auto regression models.

Commonwealth Scientific and Industrial Research Organisation (CSIRO), Sydney, Australia

CMIS Financial Mathematics and Risk Modelling group.

2007 to present

- Work on filtering, numerical sampling, model development and analysis in Risk (Operational Risk); in Insurance (Non-life claims reserving); in Commodities (Stochastic factor models).

Commonwealth Bank of Australia, Sydney, Australia

Associate Quantitative Analyst - Market and Operational Risk

2005 to 2007

- Performed mathematical modelling, methodological design and development, model validation and testing.
- Worked on Operational Risk modelling, Credit Risk modelling and Market Risk modelling.
- Jointly setup and ran Quantitative Research reading group and seminar series.

NEC Australia, Melbourne, Australia

Junior Engineer

1999, 2000

- Analyzed, designed and tested crystal oscillator systems in mobile phones for synchronization of symbol detection.

Technical Skills Extensive modelling, simulations and methodological development of financial models, time series models, non-linear filtering and sampling theory.

MATLAB experience: Statistical Signal Processing, Fourier transforms, nonlinear numerical methods, statistics (Classical and Bayesian), Machine Learning (Support Vector Machines, Boosting, Classification), Game Theory, Time series. toolboxes: communications, control system, genetic algorithm and direct search, signal processing, statistics, time series, excel link, excel builder

R toolboxes: Micro Array toolbox

Instrumentation and Control: Simulink, LabVIEW and other

Programming: Advanced - Matlab, R, minitab, Excel, VBA, Fortran. Basic - C, Pascal.

Applications: T_EX, L^AT_EX, B_IB_TE_X, Microsoft Office, and other common productivity packages for Windows, OS X, and Linux platforms

Operating Systems: Microsoft Windows XP/2000, Apple OS X, Unix

**Mathematical
Expertise**

Statistics:

Bayesian model development and fitting; Multivariate numerical sampling and simulation; Markov chain theory; Markov chain Monte Carlo; Trans-dimensional MCMC; Sequential Monte Carlo (non-linear filtering); Likelihood Free inference.

Financial Mathematics:

Operational Risk; Non-life Insurance Claims Reserving Models; CoIntegration models in financial time series; sde commodities models and non-linear filtering; Game theory and mechanism design.

Signal Processing and Communications Engineering:

Communications Engineering and Signal Processing; Detection and Channel Estimation; Relay system design; Model selection in channel estimation. Machine Learning Support Vector Machines; Stochastic optimization.