

# Curriculum Vitae: Dr. Gareth W. Peters

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## Contact Information

**Dr. Gareth William Peters**  
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## Citizenship

Australian

## Education

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

Statistics and Mathematics Department (Submission date: December 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)
- Awards: J.B.Douglas Award Statistical Society of Australia; (nominated- pending decision) International Society of Bayesian Analysis (ISBA) Savage Award.

**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

International Society of Bayesian Analysis (ISBA)

- **(Nominated)** Savage Award (2010).

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.

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

**Prof. A. Doucet**, Canadian Research Chair, Department of Statistics and Department of Computer Science, University of British Columbia (UBC), Vancouver, Canada.  
email: arnaud@stat.ubc.ca

**Prof. J. Yuan**, School of Electrical and Electronic Engineering, UNSW, Australia.  
email: j.yuan@unsw.edu.au  
phone: +61 (2) 9385 5993

**Dr. P. Shevchenko**, Principal Research Scientist, Financial Risk Management, CMIS - Commonwealth Scientific and Industrial Research Organisation (CSIRO), Sydney, Australia.

email: Pavel.Shevchenko@csiro.au  
phone: +61 2 9325 3218

# Research

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## Research Overview.

- Established Quantitative Risk Solutions Laboratory **QRSLab** in the statistics department of UNSW. This is a joint venture with several academic and industrial risk professionals and quantitative analysts. Its agenda is to develop novel methodological research solutions for practical risk modelling scenarios. [http://web.maths.unsw.edu.au/peterga/index\\_files/QRSLab](http://web.maths.unsw.edu.au/peterga/index_files/QRSLab)
- Undertaking researcher in *Approximate Bayesian* inference methodology with several journal papers in this exciting new area of statistics.
- 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).
- Review regularly for ASTIN Bulletin, Insurance:Mathematics and Economics, Journal of Applied Probability, Journal of Operational Risk, IEEE transactions on Signal Processing, Journal of Theoretical Probability, Communications in Statistics - Simulation and Computation, Neural Information Processing NIPs, AISTats 2011, Electronic Journal Of Statistics
- Winner of J.B. Douglas Award for excellence in postgraduate research (2008).
- Nominated (decision pending) for ISBA savage award (2010).

## Research 5+ year plan

The main areas of research focus in my plan involves developing novel statistical sampling methodology in the areas of computational statistics; statistical modelling for financial risk in Banking and Insurance under Basel II, Basel III and Solvency II and wireless communications.

### **STATISTICAL METHODOLOGY:**

Of particular interest in statistical methodological development is the area of approximate Bayesian computation (ABC) or likelihood-free approaches. This is a recent Bayesian statistical inference approach which opens up Bayesian modelling and sampling methodology to the possibility of working with intractable likelihood models, either due to inability to evaluate a likelihood point-wise or inefficiency in this evaluation. These new class of methods circumvent this complication, however their properties and the associated sampling methodologies such as those based on Markov Chain Monte Carlo or Sequential Monte Carlo are relatively under explored. My publications demonstrates a strong record in developing novel ABC methodology from the perspective of model development, sampling methodology both on-line via Sequential Monte Carlo methods and off-line via Markov Chain Monte Carlo methodology. This has particularly focussed on alpha stable based univariate and multivariate models. I aim to continue to develop this area of research.

In addition I have recently explored developments of adaptive Particle Markov Chain Monte Carlo methodology in the contexts of non-linear and non-Gaussian state space model filtering and static parameter estimation. Of direct interest to me here is exploring state of the art adaption strategies and their impact on particle based MCMC

sampling mechanisms, both from an efficiency perspective and theoretical perspective. In particular I aim to develop efficient matrix variate adaptive PMCMC samplers coupled with the discrete particle filter to study an important class of financial models based on reduced rank regressions and Markov switching regimes.

- **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, ABC and Likelihood-free sampling methodology, Annealing and tempering, rare-event simulation).

**STATISTICAL RISK MODELLING and ALGORITHMIC TRADING:**

In the context of statistical research development for financial and risk modelling, I aim to continue to develop models for Operational Risk under Basel II. Additionally, with the important advent of Solvency II regulation beginning to arise, I will continue to develop loss distributional approach models and chain ladder claims reserving methodology in light of addressing capital estimation under Solvency II. In particular relevant statistical quantifications and estimation of the MCR and SCR quantities specified under such regulatory standards. Additionally, I will continue to develop the insurance models and analytic expression I have recently derived for alpha-stable compound processes in multi-risk and multi-period settings under different Operational Risk insurance mitigations. I intend to combine these ideas to develop novel multivariate dynamic dependence structures via Levy copula based models. Many open model selection and estimation questions remain in this area of copula dependence modelling, especially with respect to Bayesian model selection and estimation. The joint estimation of parameters under such models can be addressed using advanced adaptive MCMC methodology, as I have begun to explore in recent journal papers I have on Operational Risk modelling.

The second area of financial modelling I am developing involves efficient filtering and calibration for multi-factor latent stochastic differential equation models. Examples of particular interest are those used in economics models for commodity futures. After non-trivial discretization schemes are applied to such s.d.e. models, e.g. Milstein schemes, the latent process model in discrete time is often non-Gaussian and highly non-linear, possibly even intractable with respect to the transition density of the latent states. In such settings, calibration of model parameters and estimation of quantities such as spot price and convenience yield are challenging. These are key quantities used in algorithmic trading strategies and so are required to be estimated. Utilising advanced PMCMC methodology here is proving promising and I intend to continue to develop this approach.

The third area of research involves Cointegrated Vector Auto-regression models, a special class of reduced rank regression time series models. Recently I have developed novel adaptive MCMC sampling schemes as well as matrix variate likelihood-free methodology for parameter estimation, accounting for structural breaks resulting from the open and close of markets. I intend to continue to develop these models by incorporating them as price models in Limit order book modelling and then the resulting estimation of execution strategies via partially observed Markov Decision Processes.

- **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; POMDP for execution strategies on Limit Order Books.

## **STATISTICAL SIGNAL PROCESSING:**

In the context of statistical research development for wireless relay systems I intend to focus effort with collaborators on developing novel statistical models and estimation methodology for relay networks. In particular under the topic of spectrum scarcity. In aim to develop fundamental and practical statistical methods for dynamic wireless cooperative cognitive radio networks to resolve the problem of spectrum scarcity.

Telecommunications networks, such as mobile cellphones, television, satellite, paging and military radar, are all currently experiencing a severe shortage of radio spectrum to communicate through. This is widely acknowledged to be a fundamental and critical problem for researchers in the field of wireless communications to address. This is a problem on a global scale which is compounded by the highly lucrative auction market for licensing of large portions of the radio spectrum and strict regulations imposed to enforce this licensing.

A large part of the licensed and regulated spectrum is either not utilized or under utilized in terms of time and space slots. Studies have demonstrated that between the 30 Mhz and 3 Ghz frequency bands, on which all mobile cellphone, television, satellite, paging and military radar transmission occur, all display measured utilisation rates less than 25%. Cognitive radio (CR) is perceived to be a suitable solution for dynamic exploitation of unused spectrum, which can significantly increase utilisation rates in this band.

The majority of the world's modern communications systems are wireless networks. Therefore, the mobile devices on these networks transmit through a medium which is stochastic in nature. It is precisely the stochastic nature of this medium that can result in the phenomenon of fading, where one experiences transmission loss. Cooperative relay communication techniques enable a mobile user to benefit from the different transmission characteristics experienced by other mobile users in the network. This is similar to a distributed virtual multi-antenna transmission environment, combining the advantages of both diversity technology and relay transmission technology. As a result, significant spatial diversity gains can be achieved and the systems transmission performance can be improved in a cooperative communication system without adding additional antennas.

Combining the benefits of cognitive radio with cooperative relay networks will leverage from the spatial diversity gains whilst providing a flexible system for spectrum utilisation which can be overlaid on current infrastructure. Therefore the specific research aims in this area involve; developing novel statistically robust methodology to efficiently utilize spectrum and exploit spatial diversity in *cognitive radio* (CR) based *cooperative wireless communication* networks; develop practical stochastic models for the wireless channels and interferences experienced in an environment where cognitive radio operation is permitted, and then to develop communication receivers which are robust under these stochastic models; development and enhancement of the general theoretical and practical statistical understanding of such communications networks; and finally from a practical perspective to asses and verify the theoretically optimal and practically achievable system performance gains.

- **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**

**Statistics Department - Oxford University**, Oxfordshire, England

*Invited lecturer* January-February 2012

- Invited researcher to work on statistical modelling of risk and Sequential Monte Carlo.

**CNRS - Telecom Lille**, Lille, France

*Invited lecturer* November-December 2011

- Invited researcher to work on statistical modelling of interference in wireless communications.

**INRIA - University of Bordeaux**, Bordeaux, France

*Invited lecturer* December 2011

- Invited researcher to work on financial risk modelling and Sequential Monte Carlo.

**Institute of Statistical Mathematics (ISM)**, Tokyo, Japan

*Invited lecturer* December 2011

- Invited researcher to present on commodity models.

**Commonwealth Scientific and Industrial Mathematics (CSIRO) - Mathematics, Informatics and Statistics**, Tasmania, Australia

*Visiting Scientist* February 2010; June 2010 and November 2010 3mths

- Invited to participate in research on population dynamics.

**Institute of Statistical Mathematics (ISM)**, Tokyo, Japan

*Invited lecturer* August-September 2010

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

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

*Invited Lecturer* November 2009

- Invited researcher to present at transition workshop on Particle Filtering and collaborate with colleagues in Duke Statistics Department.

**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

**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:

#### *Statistical Methodology and Applications*

1. Hossack G.R., **Peters G.W.** and Hayes K., (2012) “Estimating nonlinear ecological state space models with flexible observation error”. *Methods in Ecology and Evolution* (to appear) [arXiv:]
2. Burgman M., Franklin J., Hayes, K., Hossack G.R., **Peters G.W.** and Sisson S.A., (2012) “Modelling extreme risks in Ecology” *Risk Analysis*, to appear. [arXiv:0912.4729]
3. **Peters G.W.**, Fan Y. and Sisson S.A. (2012) “On Sequential Monte Carlo, Partial Rejection Control and Approximate Bayesian Computation”. *Statistics and Computing*, to appear, [arXiv:0808.3466v2].
4. **Peters G.W.**, Sisson S.A. and Fan Y. (2010) “Likelihood-free Bayesian inference for  $\alpha$ -stable models”. *Computational Statistics and Data Analysis*, to appear 38 pages. [arXiv:0912.4729]
5. Cornebise J. and **Peters G.W.** (2010) “Comments on ‘Particle Markov Chain Monte Carlo’”. *Journal of the Royal Statistical Society Series B - comments on read paper*, 72(3),269342. [arXiv:0911.3866]
6. Bornn L., Cornebise J. and **Peters G.W.** (2010) “Discussion of ‘Riemann manifold Langevin and Hamiltonian Monte Carlo methods’ ” by M. Girolami and B. Calderhead. *Journal of the Royal Statistical Society Series B - comments on read paper*. [arXiv:1011.0057]
7. **Peters G.W.** and Cornebise J. (2010) “Comments on ‘Particle Markov Chain Monte Carlo’”. *Journal of the Royal Statistical Society Series B - comments on read paper*, 72(3),269342. [arXiv:0911.3866]
8. Fan Y., **Peters G.W.** and Sisson S.A (2009) “Automating and Evaluating Reversible Jump MCMC Proposal Distributions”. *Statistics and Computing*, 19, 401-429.
9. Sharp Propagation of Chaos Estimates for Feynman-Kac Particle Models. Pierre Del Moral, Arnaud Doucet, Gareth Peters, Teoriya Veroyatnosteri i ee Primeneniya (to be reprinted in SIAM Theory of Probability and Its Applications), vol. 51, no. 3, (2006)

#### *Financial Mathematics, Risk and Insurance*

1. **Peters G.W.**, Briers M., Shevchenko P.V. and Doucet A., (2012) “Calibration and filtering for multi factor commodity models with seasonality: incorporating panel data from futures contracts.” *Methods in Computing and Applied Probability*, (to appear) [arXiv:1105.5850]
2. **Peters G.W.**, Shevchenko P., Young M. and Yip W., (2011) “Analytic Loss Distributional Approach Model for Operational Risk form Alpha-Stable Doubly Stochastic Compound Process and Implications for Capital Allocation”. *Insurance: Mathematics and Economics*, (to appear) [arXiv:1102.3582].
3. **Peters G.W.**, Balakrishnan K., Lasscock B., Mellon M. and Godsill S. (2011) “Bayesian Cointegrated Vector Autoregression models incorporating alpha-stable noise for inter-day price movements via Approximate Bayesian Computation”. *to appear Bayesian Analysis*. [arXiv:1008.0149v1]
4. **Peters G.W.**, Byrnes A.D., Shevchenko P.V. (2011) “Impact of Insurance for Operational Risk: Is it worthwhile to insure or be insured for severe losses ?”. *Insurance: Mathematics and Economics*, 48, 287-303. [arXiv:1010.4406]



5. **Peters G.W.**, Balkrishnan K. and Lasscock B. (2010) “Model selection and Adaptive Markov Chain Monte Carlo for Bayesian Cointegrated VAR Models”. *Bayesian Analysis*, 5(3), 465-492. [arXiv:1004.3830]
6. **Peters G.W.**, Wüthrich M. and Shevchenko P. (2010) “Chain Ladder Method: Bayesian Bootstrap versus Classical Bootstrap”. *Insurance: Mathematics and Economics*, 47(1), 36-51. [arXiv:1004.2548]
7. **Peters G.W.**, Shevchenko P. and Wüthrich (2009). “Dynamic Operational Risk: modelling dependence and combining different sources of information”. *Journal of Operational Risk*, 4(2), 69-104. [arXiv:0904.4074]
8. **Peters G.W.**, Shevchenko P. and Wüthrich M. (2009) “Model Uncertainty in Claims Reserving within Tweedie’s Compound Poisson Models”. *ASTIN Bulletin* 39(1), 1-33. [arXiv:0904.1483 ]
9. **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*, 2(3).
10. **Peters G.W.** and Sisson S.A. (2006) “Bayesian Inference, Monte Carlo Sampling and Operational Risk”. *Journal of Operational Risk*, 1(3).

#### ***Signal Processing and Communications Engineering***

1. **Peters G.W.**, Nevat I., Sisson S.A., Fan Y. and Yuan J. (2010) “Bayesian Symbol Detection in Wireless Relay Networks via Likelihood Free Inference”. *IEEE Transactions on Signal Processing*, 58, 5206-5218. [arXiv:1007.4603]
2. Nevat I., **Peters G.W.** and Yuan J. (2010). “Detection of Gaussian Constellations in MIMO Systems Under Imperfect CSI”. *IEEE Transactions of Communications*, 58(4), 1151-1160.
3. **Peters G.W.**, Nevat I. and Yuan J. (2009). “Channel Estimation in OFDM Systems with Unknown Power Delay Profile using Trans-dimensional MCMC”. *IEEE Transactions on Signal Processing, IEEE Trans. on Signal Processing*, 57(9), 3545-3561.
4. 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*, to appear.

#### **Conference Publications - peer reviewed proceedings, accepted:**

1. Nevat I., **Peters G.W.**, Yuan J and Collings I. (2012) “Location-aware Cooperative Spectrum Sensing via Gaussian Processes”. *AusCTW New Zealand* (to appear).
2. Nevat I., **Peters G.W.**, Yuan J and Collings I. (2012) “System Identification in Wireless Relay Networks via Gaussian Process Iterated Conditioning on the Modes Estimation”. *WCNC Paris* (to appear).
3. Nevat I., **Peters G.W.** and Yuan J. (2012) “Blind Spectrum Sensing in Cognitive Radio over Fading Channels and Frequency Offsets”. *WCNC - Paris 2012* (to appear) .
4. **Peters G.W.**, Briers M., Shevchenko P. and Doucet A. (2011) “Adaptive Particle Markov chain Monte Carlo for Multi-factor Commodity Models.”, *Computational and Financial Econometrics, CFE-2011, London School of Economics*.
5. Veerhuis P., **Peters G.W.** and Gerlach R. (2011) “A Timely Analysis of Unconventional Monetary Policy via Dynamic Nelson Seigel Models”, *Computational and Financial Econometrics, CFE-2011, London School of Economics*.

6. Dong A., **Peters G.W.** and Wuethrich M. (2011) "Adaptive Markov chain Monte Carlo for Paid-Incurred Loss Reserving Models", *Computational and Financial Econometrics, CFE-2011, London School of Economics*.
7. Lasscock B., **Peters G.W.** and Balikrishnan K. (2011) "Rank Estimation in Cointegrated Vector Auto-Regression Models via Automated Trans-Dimensional Markov chain Monte Carlo". *CAMSAP-Special Session*, [arXiv:0912.4729].
8. Nevat I., **Peters G.W.**, Doucet A. and Yuan J. (2011) "Channel Tracking in Relay Systems via Particle MCMC". *VTC, San Francisco*.
9. Nevat I., Han C., **Peters G.W.** and Yuan J. (2011) "Spectrum Sensing in Cooperative Cognitive Networks with Partial CSI". *ICASSP, Nice, France*.
10. 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*.
11. Nevat I., **Peters G.W.** and Yuan J. (2009) "Coherent Detection or Cooperative Networks with Arbitrary Relay Functions using 'Likelihood Free' Inference". *Proceedings of NEWCOM-ACorn Workshop, Barcelona, Spain*.
12. Nevat I., **Peters G.W.** and Yuan J. (2009) "Channel Estimation in OFDM Systems with Unknown Power Delay Profile using Trans-dimensional MCMC via Stochastic Approximation". *in Proc. IEEE Vehicular Technology Conference, VTC09, Barcelona, Spain*.
13. **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*.
14. **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*.
15. **Peters G.W.**, Shevchenko P. and Wüthrich M. (2008) "Model Risk in Claims Reserving within Tweedie's Compound Poisson Models". *Astin Colloquium, UK*.
16. Nevat I., **Peters G.W.** and Yuan J. (2008) "Bayesian Inference in Linear Models With a Random Gaussian Matrix : Algorithms and Complexity". *PIMRC, France*.
17. 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*.
18. 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, Singapore*.

### Journal Papers - peer reviewed, submitted in review:

1. Korotsil I., **Peters G.W.**, Regan D. (2011) "Vaccine paper... ." [arXiv:]
2. Korotsil I., **Peters G.W.**, Cornebise J. and Regan D. (2011) "Adaptive Markov Chain Monte Carlo Forward Simulation for Statistical Analysis in Epidemic Modelling of Human Papilloma Virus." [arXiv:]
3. **Peters G.W.**, Nevat I., Yuan J. and Collings I., (2011) "Semi-Blind System Identification in Wireless Relay Networks via Gaussian Process Iterated Conditioning on the Modes Estimation." [arXiv:1106.3409]

4. Nevat I., **Peters G.W.**, Collings I. and Yuan J., (2011) “Co-operative Spectrum Sensing with Partial CSI”. [arXiv:1104.2355]
5. Hayes K., Hossack G.R., Barry S. and **Peters G.W.**, (2011) “Severe uncertainty and information-gap theory: A commentary for ecologists and environmental managers”. [arXiv:]
6. Dean T., Singh S., Jasra A. and **Peters G.W.** (2010) “Parameter estimation for Hidden Markov Models with intractable likelihoods”. [arXiv:1103.5399].
7. **Peters G.W.**, Hayes K., Hossack G. (2010) “Ecological non-linear state space model selection via adaptive particle Markov chain Monte Carlo (AdPMCMC)”. [arXiv:1005.2238v1].
8. Nevat I., **Peters G.W.**, Doucet A. and Yuan J. (2011) “Channel Tracking for Relay Networks via Adaptive Particle MCMC.” [arXiv:1006.3151v2]
9. Nevat I., **Peters G.W.** and Yuan J. (2011) “Blind Spectrum Sensing in Cognitive Radio over Fading Channels and Frequency Offsets” - [arXiv:1006.3155v1]
10. Sisson S.A., **Peters G.W.**, Fan Y. and Briers, M. (2010) “Likelihood Free Samplers”. *Australian and New Zealand Journal of Statistics*.

#### Conference Publications - peer reviewed proceedings, submitted in review:

1. Shihao Yan, Malaney Robert, Nevat I. and **Peters G.W.** (2012) “An Information Theoretic Location Verification System for Wireless Networks” - [arXiv:] (Globecom US)
2. Gu W., **Peters G.W.**, Clavier L., Septier F. and Nevat I. (2012) “Receivers for Cooperative Communications in Alpha-Stable Interference plus Gaussian Noise” - [arXiv:] (International Symposium on Wireless Communication Systems)
3. Clavier L., Wei G., Septier F., **Peters G.W.** and Nevat I. (2011) “Interference Modelling and Cooperative Communications” - [arXiv:] (Future Networks Conference)

#### 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. Boronia 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. SAMSI Transition Workshop for Program on Sequential Monte Carlo Methods, SAMSI, North Carolina, Nov. 2009.
2. Seminar Series University of NSW, Sydney, Australia, 2009.
3. Boronia Capital Pty. Ltd. Hedge Fund, Sydney, 2009.
4. Workshop for International Computing and Economics, University of Technology, Sydney, 2009.
5. Seminar Series University of NSW, Sydney, Australia, 2009.
6. Ninth Annual J. B. Douglas Awards (Winner), Statistical Society of Australia, Sydney, 2008.
7. 9th World Conference of the International Society for Bayesian Analysis, Hamilton Island, 2008.
8. Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) - AMRA Meeting, 2008.
9. Qintq, Great Malvern, UK, 2008.
10. Boronia Capital Pty. Ltd. Hedge Fund, Sydney, 2007.
11. 2nd World MCMSki of the International Society for Bayesian Analysis, Bormio, Italy, 2008.
12. Australasian Society for Bayesian Analysis, Spring Bayes, Coolangatta, 2007.
13. Commonwealth Scientific and Industrial Research Organisation (CSIRO) - Risk Management Seminar, 2007.
14. University of British Columbia (UBC) - Laboratory for Computational Intelligence Seminar, 2006.
15. University of British Columbia (UBC) - Statistics Department Seminar, 2005.
16. Qintq, Great Malvern, UK, 2005.
17. Cambridge University - Engineering Department Seminar 1, 2005.
18. Cambridge University - Engineering Department Seminar 2, 2005.
19. 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.
20. European Machine Learning Summer School, Berder Island, France, 2004.

**Management,  
Administrative  
and other  
Relevant  
Activities**

In terms of demonstration of types of such activities:

- Organizing committee of the international (Monte Carlo Quasi Monte Carlo) MCQMC conference to be held in Sydney, Australia 2012. (jointly with Prof. Ian Sloan.)
- Developed jointly with industry contacts a Quantitative Risk Solutions Laboratory (QRSLab) at the University of NSW. Including initiation, memorandum of understanding, laboratory board and university recognition.
- Developed a scholarship protocol and obtained scholarship money from industry partners for PhD. students including professional placement - Boronia Manged Funds QRSLab scholarship; Deloitte QRSLab scholarship and CSIRO QRSLab scholarship.
- I am the web master for the Department of Mathematics and Statistics at UNSW.
- I am the High Performance Computing staff representative for Statistics in the Faculty of Science at UNSW.
- I provide additional volunteer support and consultation times for all students across the university through the specifically designed lunch time Student Support Scheme.

**Services to the  
profession**

Regular referee for the following journals:

- AISTats 2011 - invited reviewer.
- ASTIN Bulletin (2)
- IEEE transactions (2)
- Insurance: Mathematics and Economics (8).
- Journal of Operational Risk (7)
- Journal of Theoretical Probability (1)
- Communications in Statistics - Simulation and Computation (1)
- Neural Information Processing NIPs (1)
- Electronic Journal Of Statistics (1)

**Research  
Collaborators**

- Dr. Pavel Shevchenko, CSIRO CMIS, Sydney, Australia.
- Dr. 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. Jinhong Yuan, Electrical Engineering Department, University of NSW, Australia.
- Prof. Simon Godsill, Statistical Signal Processing Laboratory, Cambridge University, Cambridge, UK.
- A.Prof. Adam Johansen, Statistics Department, University of Warwick, UK.
- Prof. Pierre del Moral, INRIA, Bordeaux, France.
- Dr. Scott Sisson, Statistics Department, University of NSW, Australia.
- Dr. Yanan Fan, Statistics Department, University of NSW, Australia.

# Teaching

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## 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 lecture 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 have experience lecturing and developing Masters level courses with complete syllabus design. I have developed a Machine Learning and Information Theory 13 week course.
- I have experience lecturing large statistical service courses, having co-ordinated and managed an Engineering service course with 500+ students per lecture.
- I am keen to develop courses and syllabus for more advanced graduate level courses in statistics.
- I have run laboratories, tutorials and taught classes in several different universities and continents.
- I am keen to continue 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

*Lecturer (full tenure)- Statistics Department* 2010

- Semester 2: second year - Linear Models - Maths 2831/293.
- Semester 2: second year - Statistics for Engineers - MATH2089.
- Semester 1: masters statistics - Data Mining with Business Applications.

### University of New South Wales, Sydney, Australia

*Lecturer (full tenure) - Statistics Department* 2009

- Second year Statistics: Linear Models - Maths 2831/293.
- Second year Statistics: Statistics for Civil Engineers.

### 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**

**2010**

1. Alice Xiaodan Dong, (2009+) Actuarial Claims Reserving statistical models, (Ph.D. Candidate) (Sydney University - Statistics) Co supervised
2. Tran Huy, (2009+) Numerical Simulation Techniques for SDE Models in Finance, (MSc. Candidate Semester 1) (UNSW - Statistics)
3. Shamin Kinathil, (2009+) Nonlinear Filtering for Non-Stationary Multivariate Cointegration Models, (MSc. Candidate Semester 2) (UNSW - Statistics)
4. Blaise Standish, (2009+) Modelling Execution Strategies for Algorithmic Trading via MDP's, (MSc. Candidate Semester 1) (UNSW - Statistics joint project with Boronia Capital Pty Ltd [David Oliver])
5. Aaron Byrnes, (2009+) Copulas and Compound Sums with Assessment of the Impact of Insurance, (honors Candidate) (UNSW - Statistics)
6. Chen Yang, (2009+) Extended Dynamic Operational Risk Modelling with Dependence (frequency and severity), (honors Candidate) (UNSW - Statistics)

**2009**

1. Marc Piggott, (2009/2010) Filtering and State Space Modells, Co supervised summer student with Dr. Nevat

**2008**

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



# Private Sector

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- I have worked as a junior Electrical Engineer at NEC Australia.
- I have 5 years experience in the Financial Industry.
- I have set up and currently run my own statistical consulting company Quantitative Risk Solutions.
- 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.
- Boronia Capital Pty Ltd (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<sub>E</sub>X, L<sup>A</sup>T<sub>E</sub>X, B<sub>I</sub>B<sub>T</sub>E<sub>X</sub>, 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.