Curriculum Vitae of Matthew Francis Dixon (Ph.D., M.Sc., M.Eng., ACGI, DIC)

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Education

2007 Ph.D. Applied Mathematics, Mathematics Department, Imperial College, London
2002 M.Sc. Parallel and Scientific Computation (with distinction), University of Reading
1999 M.Eng. Civil and Environmental Engineering, Imperial College, London

Teaching Experience

2012-2013 *Adjunct Professor in Analytics, University of San Francisco, Department of CS*

- Designed and taught MSAN 602 - Computational Analytics I, covering topics in machine learning, data mining and applications in predictive and risk analytics, fraud detection, consumer finance and global development: https://sites.google.com/a/analytics.usfca.edu/msan-602-computational-analytics-i
- Designed and taught MSAN 631 – Applications of Analytics, covering topics in Monte-Carlo simulation, bootstrapping and Bayesian techniques for risk analysis: https://sites.google.com/a/usfca.edu/msan631-applications-of-analytics

2010-2011 *Arthur Krener Assistant Professor, UC Davis Department of Mathematics*
Pre-calculus (class size of 100).

2002-2005 *Teaching Assistant, Imperial College Mathematics and Computer Science*
Differential Equations (Prof John Elgin), Geometry & Linear Algebra (Prof Martin Liebeck), Applied Mathematics (Prof John Gibbon), Vector Field Theory (Prof Richard Craster), Mathematical Methods I (Prof Darren Crowdy), Numerical Analysis I (Prof John Barrett), Differential Equations (Prof John Elgin), MATLAB (Dr Andrew Walton), Introduction to C++ (Prof Wayne Luk)

Consulting in Applied Analytics Research and Development

2011- *Owner of a Quantitative Analytics Consultancy, Quiota LLC, Silicon Valley*
I currently consult and advice a number of analytics companies and projects across the US, where I report to numerous business leaders. Examples of ongoing and past projects include:

- *Consulting Director of Risk, Hedgefacts, Cincinnati, Ohio:* research and implementation of advanced quantitative market risk methodology for commodity hedge fund managers. Applying a range of techniques in computational statistics, econometrics and applied mathematics to forecast portfolio tail risk and develop new stress testing methodology (June'11 - present).
- *Quantitative Analytics Researcher, Thomson Reuters, San Francisco:* research into portfolio risk analytics for Thomson Reuters Eikon platform (June'12-Dec'12).
- *Quantitative Analytics Advisor, Cleantech Group, San Francisco:* research and implementation of a company matching algorithm for enabling venture capitalists to discover new and emerging cleantech companies (Jan'13 - present)
- *Quantitative Analytics Advisor, Frontleaf, San Francisco:* research and implementation of a customer churn risk prediction algorithm for Software-as-a-Service companies. (May'13-present)
- *Quantitative Analytics Researcher, Silver Lake Kraftwerk, San Carlos (April'11-June'12):* research and development of a predictive analytics infrastructure for a George Soros backed energy efficiency and resource innovation private equity fund to collect data and explore the

novel use of machine learning techniques to streamline top-of-the funnel analysis. I developed a Bayesian technique for ranking companies based on likelihood of success which combines classifiers with a page-rank based peer review model for investment syndicates.

2009 *Krener Assistant Professor and Postdoctoral Researcher, Departments of Mathematics and Computer Science, UC Davis (March '09 – April'11)*

- Research into improving linear solvers for integrated groundwater simulation used by the CA state department of water resources for climate impact studies on water usage (with Prof. Z Bai)
- Deployment of large-scale Monte-Carlo simulation methods for on-demand risk estimation on high performance architectures such as graphics processing units (GPUs) and multi-core CPUs (with Prof K. Keutzer, UC Berkeley, and Prof. Jike Chong, CMU Silicon Valley Campus)

2009 *Consultant, Quantitative Risk Methodology*, *Quantitative Market Risk Analytics, Deutsche Bank, London (Jan '09 – Mar '09)* Economic capital estimation using mixed regime covariance matrix estimates. Quantile estimates based on using mixed Gaussian models to represent the loss distribution. I implemented an EM algorithm to estimate the weightings in the mixed Gaussian distribution.

2008 Postdoctoral Researcher, Institute for Computational and Mathematical Engineering, Stanford University (Sep'07-Dec'08)
Design and implementation of numerical algorithms for simulation of elastic shock waves in solids using c++ (NAG/STL) libraries on unix.

2007 *Quantitative Analyst*, *Credit Risk Analytics, Global Financial Risk Management, Barclays Capital, London (Jan '07 – Sep '07)*
Development of multi-factor term-structure models used for estimating the counterparty credit risk of commodity spread options on futures contracts. I developed global constrained optimization algorithms to calibrate the parameters of the stochastic model from historical futures prices and used principal component analysis to construct a filtered covariance matrix and improve stability of the calibration algorithm.

2003 Consultant, Quantitative Risk Methodology, The Bank for International Settlements, Basel (Aug '03-July '04)
Designed and implemented a simulation based corporate bond portfolio credit loss model based on the Merton approach for comparison with the Basel II economic capital estimation method. The multi-factor credit risk model estimated expected and unexpected credit losses and included country transfer risk effects. For large numbers of obligors, importance sampling was used to accelerate convergence.

2001 Quantitative Developer, Lehman Brothers Structured Credit Trading, London (Apr'01-Mar '02)
Development of credit default obligation (CDO) pricing models based on survival credit risk models. Integration of c++ trading analytics library stacks into credit derivative trading systems running on Solaris and SUN workstation clusters.

1999 Software Consultant, Electronic Data Systems, Fort Halstead (*July'99-Aug'00*)
Support of UK Department of Defense war gaming systems and radar simulations on VAX alphas running VMS, fortran 77 and algo. Porting of war games to Windows NTFS clusters with mixed c++ MFC/c/fortran 90 codebase.

Summary of Experience and Technical Skills

My primary experience is in fast and scalable computation for financial modeling, predictive analytics and high volume data analysis.

Business support:	Software product management, risk control and reporting, structured credit trading, commodity trading, private equity
Computational Statistics:	Monte-Carlo, bootstrapping and Bayesian techniques for simulation of probabilistic models and hypothesis testing
Global optimization:	Stochastic global optimization techniques for calibrating financial models
Supervised learning:	SVM, random forest, ada-Boost, logistic regression, naïve Bayes, decision trees
Data mining:	k-means clustering, PAM, hierarchical clustering, apriori, page-rank
Numerical Analysis:	Error analysis of iterative linear solvers and distribution approximations
Computational Math:	Geometric integrators and computational differential geometry for simulation of dynamical systems
Programming:	Python, R, Matlab, c/c++/c#, Fortran
Numerical Prog.:	Lapack, BLAS, PETSc, numpy
Machine learning:	e1071, Skikit learn, rattle in R.
Parallel Prog.:	Scipy (multiprocessor package), OpenMP, CUDA, thrust
Databases:	Hadoop, postgres, MongoDB, SQL

Research Publications, Theses and Posters

2013 M.F.Dixon and M.Zubair, Low Latency Option Analytics for High Frequency Trading, abstract submitted to the fast computation session of the 7th CSDA International Conference on Computational and Financial Econometrics (CFE 2013).

2013 M.F.Dixon and M.Zubair, Calibration of the Heston Model on Multi-Core CPU Clusters, paper in preparation for submission to WHPCF13, SC13.

2013 M.F.Dixon, S.P. Aiello, F. Fapohunda, W. Goldstein, Detecting Mobility Patterns in Mobile Phone Data from the Ivory Coast, poster presentation at Netmob 2013, MIT media lab, May.

2012 M.F. Dixon and J. Chong, A Bayesian Approach to Ranking Private Companies based on Predictive Indicators, accepted for publication in the special track on soft computing in finance and economics, AI Communications.

2011 M.F. Dixon, J. Chong and K. Keutzer, Accelerating Value-at-Risk Estimation on Many-Core and Multi-Core Architectures, the Journal of Concurrency and Computation: Practice and Experience 24, N. 8, Wiley, pp. 895-907 (Impact factor: 0.907)

2011 M.F. Dixon, T. Bradley, J. Chong and K. Keutzer, Monte Carlo Based Financial Market Value-at-Risk Estimation on GPUs, book chapter (25) in GPU Computing Gems Jade Edition, eds. Wen-Mei Hwu, Morgan Kaufmann, ISBN: 978-012-3859-63-1

2011 M.F. Dixon, J. Chong and K. Keutzer, Enabling Technology for More Pervasive and Responsive Market Risk Management Systems, book chapter in the Risk of Investment Products, eds. Michael Wong, World Scientific Press, ISBN: 978-981-4354-98-1

2011 M.F. Dixon, Z. Bai, C.F. Brush, F.I. Chung, E.C. Dogrul and T.N. Kadir, Error Control of Iterative Linear Solvers for Integrated Groundwater Models, Groundwater 49, N. 6, pp. 859-865. (Impact Factor 1.371)

2009 M.F. Dixon, J. Chong and K. Keutzer, Acceleration of Market Value-at-Risk, Proceedings of the 2nd Workshop on High Performance Computational Finance, Supercomputing '09.

2008 M.F Dixon and T. Ringler, A Variational Free-Lagrange Method for Shallow Water,

PAMM 7(1).

2007 Geometric Integrators for Continuum Dynamics, Ph.D. thesis. Advisors: Prof. Darryl Holm and Prof. Sebastian Reich.

2005 M.F. Dixon, A Runtime Adaptive Load Balancing Algorithm for Particle Simulations, Para'04 Conference Proceedings, Lecture Notes in Computer Science.

2004 M.F. Dixon and S. Reich, Symplectic Time-Stepping for Particle Methods, GAMM Mitteilung, Berlin 27, N. 1, pp. 9-24.

2004 M.F. Dixon and C.J.K. Tan, Using Distributed Computers to Deterministically Approximate Higher Dimensional Convection-Diffusion Equations, Issue 2, Volume 28, Journal of Supercomputing, 2004, Kluwer, pp. 235-253, (Impact factor: 0.545)

2003 M.F. Dixon, D. Hagan and C.J.K. Tan, Performance Comparison of Matrix Solvers on Compaq Alpha, Intel Itanium and Intel Itanium II Processors, ICCSA'03 Conference Proceedings, LNCS 2667.

2002 M.Sc. Thesis, Parallel Solution of High-Order Finite Difference Methods. Advisor: Prof. Vassil Alexandrov.

Awards and Scholarships

2010 UC Davis Postdoctoral Scholars Association travel award

2004&2007 1st prize, department of mathematics postgraduate poster competition

2004&2005 UK GET award for research in applied mathematics

2004 3rd prize, Imperial college graduate school of Eng. Phys. Sci. poster competition

1996&97 Royal academy of engineer's (RAE) bursary for summer internships

1996 Imperial college civil engineering departmental commendation

1995 Institution of civil engineer's Queen's Jubilee scholarship

1995 RAE gold crest award

1993 Powell's physics school prize

Selected Talks at Workshops and Conference Sessions

2010 Speaker, SIAM conference on Financial Mathematics and Engineering, San Francisco.

2009 Speaker, Workshop on High Performance Computational Finance, SC'09, Oregon.

2009&10 Speaker, NVIDIA developer's summit session on computational finance, Santa Clara

2008 Speaker, Computational Methods for Exotic Options Pricing and Hedging, Warwick.

2007 Speaker, Numerics in Finance Workshop, Commerzbank, Frankfurt.

Synergistic Activities

2012 Committee member of the Global Association of Risk Professionals San Francisco Chapter

2010- 2013 Chair, IEEE Workshop on High Performance Computational Finance, Supercomputing.

2009 Chair, Thalesians 1st Workshop on GPUs in Finance, Imperial College.

2008 Co-founder of the Thalesians, an educational company in quantitative analytics.

2004 Graduate seminar organizer, Department of Mathematics, Imperial College.

2003 Chair, Special Session on Computational Finance, ICCSA, Montreal.

Personal Data

Nationality: British

Marital status: Married

Citizenship: British

US permanent resident

Referees

Terence Parr, Professor of Computer Science
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