Zheng Qu

School of Mathematics
University of Edinburgh
James Clerk Maxwell Building
EH9 3FD Edinburgh, UK

Tel. :   +44(0)131 650 5074
Email :   zheng.qu@ed.ac.uk
Web :   http://www.maths.ed.ac.uk/~zqu/

Nationality : Chinese

Professional Experience

01/2014-	**Postdoctoral researcher**. School of Mathematics, University of Edinburgh, United Kingdom. I am a member of the Edinburgh Research Group in Optimization and Edinburgh Data Science. My current research is related to randomized algorithms for big data optimization problems. I am working with Peter Richtárik.

Education

2010-2013 (3 years)	**PhD in Applied Mathematics**. École Polytechnique, France. Thesis title "Numerical solutions of high dimensional optimal control problems and nonlinear Perron-Frobenius theory", under the direction of Stéphane Gaubert (INRIA and CMAP, École Polytechnique) and Shanjian Tang (Fudan University, Shanghai), thesis defended in Oct. 2013
2009-2010 (1 year)	**Master in Applied Mathematics**. Université Pierre et Marie Curie, France. Program "Optimization, Game theory and Modelling in Economics". Master thesis title "Stochastic algorithms for an optimized operation of a transport system for self-service and complexity studies", under the direction of Frédéric Meunier (CERMICS, ENPC).
2009-2010 (1 year)	**Engineering degree of École des Ponts et Chaussées**. France. Additional training program of Polytechnique engineering cycle. Department IMI (Ingénierie des mathématiques et de l'informatique).
2006-2010 (4 years)	**Engineering degree of École Polytechnique**. France. Program "Optimization, Communication and Signal processing". Research report title : "Scheduling of coupled tasks and applications on radar", under the direction of Philippe Baptiste (CNRS, LIX).
2003-2006 (3 years)	Tongji University, China. First three years of education for Bachelor's degree in Applied Mathematics. Interruption of study after being admitted to École Polytechnique.

Research Interests

Big data optimization : randomized coordinate descent (serial, parallel, distributed, accelerated and primal-dual variants), semi-stochastic gradient descent, complexity analysis, Fenchel duality, convex analysis, algorithm design, high performance computing, random set theory, applications in machine learning.

Optimization, operations research and optimal control : approximate dynamic programming, facility location, semidefinite programming, Hamilton-Jacobi equations, numerical methods, attenuation of the curse of dimensionality.

Nonlinear analysis : ergodicity coefficients, non-commutative consensus, monotone or non-expansive operators, nonlinear Perron-Frobenius theory, variational analysis, Finsler metric.

Publications & preprints

Preprints

1. **Zheng Qu**, Peter Richtárik. Coordinate descent with arbitrary sampling I : algorithms et complexity, *arXiv :1412 :8060* , 2014.

2. **Zheng Qu**, Peter Richtárik. Coordinate descent with arbitrary sampling II : expected separable overapproximation, *arXiv :1412 :8063* , 2014.

3. **Zheng Qu**, Peter Richtárik and Tong Zhang. Randomized dual coordinate ascent with arbitrary sampling, *arXiv :1411.5873*, 2014.

4. Jakub Konečný, **Zheng Qu** and Peter Richtárik. S2CD : Semi-stochastic coordinate descent, *arXiv :1412 :6293* [1], 2014.

5. **Zheng Qu**, Peter Richtárik. Randomized direct search methods, *Working Paper (available upon request), 20 pages*, 2014.

6. Olivier Fercoq, **Zheng Qu** and Peter Richtárik. Accelerated parallel and proximal coordinate descent for strongly convex functions, *Working Paper (available upon request), 25 pages*, 2014.

7. **Zheng Qu**, Peter Richtárik. Primal-dual gradient methods for structured convex problems, *Working Paper (available upon request), 20 pages*, 2014.

8. Stephane Gaubert, **Zheng Qu** : Checking the strict positivity of Kraus maps is NP-hard, *arXiv :1402.1429*, 2014.

Journal Publications

8. Stephane Gaubert, **Zheng Qu** : Dobrushin ergodicity coefficient for Markov operators on cones, *Integral Equations and Operator Theory, pp.1-24,* 2014. DOI : 10.1007/s00020-014-2193-2.

9. **Zheng Qu** : Contraction of Riccati flows applied to the convergence analysis of a max-plus curse of dimensionality free method, *SIAM Journal on Control and Optimization, 52(5) :2677-2706,* 2014. DOI : 10.1137/130906702.

10. Stephane Gaubert, **Zheng Qu** : The contraction rate in Thompson metric of order-preserving flows on a cone - application to generalized Riccati equations, *Journal of Differential Equations, 256(8) :2902-2948,* 2014. DOI : 10.1016/j.jde.2014.01.024.

Refereed Conference Publications

11. Olivier Fercoq, **Zheng Qu**, Peter Richtárik and Martin Takáč : Fast distributed coordinate descent for non-strongly convex losses, *IEEE International Workshop on Machine Learning for Signal Processing*, 2014.

12. **Zheng Qu** : A max-plus based randomized algorithm for solving a class of HJB PDEs, *to appear in Proc. of Conference on Decision and Control*, 2014.

13. Stephane Gaubert, **Zheng Qu** and Srinivas Sridharan : Bundle-based pruning in the max-plus curse of dimensionality free method, *21st International Symposium on Mathematical Theory of Networks and Systems*, 2014.

14. **Zheng Qu** : Contraction of Riccati flows applied to the convergence analysis of the max-plus curse of dimensionality free method. *In Proc. of European Control Conference, pp.2226-2231*, 2013.

15. Stephane Gaubert, **Zheng Qu** : Markov operators on cones and non-commutative consensus. *In Proc. of European Control Conference, pp.2693-2700*, 2013.

16. Stephane Gaubert, William M. McEneaney and **Zheng Qu** : Curse of dimensionality reduction in max-plus based approximation methods : theoretical estimates and improved pruning algorithms. *In Proc. of Conference on Decision and Control, pp.1054-1061*, 2011. Doi=10.1109/CDC.2011.6161386.

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1. Accepted to poster presentation at the 7th NIPS Workshop on Optimization for Machine Learning.

Teaching Experience

2014 (Sep.-Oct.)	University of Edinburgh Course title "Computing for Operational Research and Finance", 5 lectures (1 hour each) and 5 lab sessions (1 hour each). (70 postgraduate students)
2014 (Feb.-May)	University of Edinburgh Course title "Optimization Methods in Finance", I covered one lecture and one lab session for this course. (30 postgraduate students) Professor responsible for the course : Peter Richtárik.
2013 and 2012 (Sep.-Nov.)	École Nationale Supérieure de Techniques Avancées Course title "Dynamical Systems", 7 practical work sessions (2 hours each). (18 3rd year undergraduate students) Professor responsible for the course : Frédéric JEAN.

Talks

Conference Presentations

12/2014	• The 53rd Conference on Decision and Control. Los Angeles, USA.
09/2014	• The 4th IMA Conference on Numerical Linear Algebra and Optimisation. Birmingham, UK.
07/2013	• The 12th European Control Conference. Zurich, Switzerland.
07/2013	• SIAM Annual Meeting. San Diego, California, USA.
06/2013	• International Linear Algebra Society 2013 meeting. Providence, USA.
05/2013	• SMAI 2013. Seignosse, France.
11/2011	• The 50th Conference on Decision and Control. Orlando, USA.

Seminars and Workshops

09/2014	• All Hands Meeting on Big Data Optimization. University of Edinburgh.
06/2014	• All Hands Meetings on Big Data Optimization. University of Edinburgh.
02/2014	• All Hands Meetings on Big Data Optimization. University of Edinburgh.
03/2014	• EGRO (Edinburgh Research Group in Optimization) seminar. University of Edinburgh.
02/2013	• PGMO (Program Gaspard Monge pour l'Optimisation et la Recherche Opérationnelle). France.
03/2012	• Seminar Digiteo on Optimization. École Polytechnique, France.
11/2011	• The Second Monterey Workshop on Computational Issues in Nonlinear Control. California, USA.

Awards and Grants

2014	London Mathematical Society Research Grant-Conference Grant Scheme 1, granted 4,000 £.
2014	Baidu Visiting Research Grant, granted 4,000 £.
2013	Chinese Government Award for Outstanding Self-Financed Students Abroad (no more than 500 Ph.D. students are granted the award each year all over the world).

Research Visits

2014	Research visit at the Baidu Big Data Lab (collaboration with Prof Tong Zhang, head of the lab), Baidu Inc, Beijing, China, July 1 - August 30.

Summer Schools

2012	Stochastic Optimization, Numerical Analysis Summer School CEA-EDF-INRIA, Cadarache, France, June 25-July 6.
2011	Sino-French Summer Institute 2011 in Stochastic Modeling and Applications, Beijing, China, Juin 13-July 1.

Other Scientific Activities

Reviewer for :

1. Mathematical Programming, Series A
2. Journal of Machine Learning Research
3. Linear Algebra and Applications
4. IEEE Transactions on Automatic Control
5. European Conference on Control
6. Conference on Decision and Control

Co-organizer of

1. Invited session at the International Symposium on Mathematical Programming (ISMP). Pittsburgh, USA, July 2015.

2. The 3rd Edinburgh "Optimization and Big Data" workshop. May 2015.

3. All Hands Meeting on Big Data Optimization (weekly innovative, interactive and interdisciplinary research seminar). University of Edinburgh.

4. Invited session : "First-order methods in large-scale optimization" in the 4th IMA Conference on Numerical Linear Algebra and Optimisation. Birmingham, UK, September 2014.