Curriculum Vitae

Name : Zheng Qu
Nationality : Chinese

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Professional Experience

07/2025- **Professor**. School of Mathematical Sciences, Shenzhen University, Shenzhen, China.

03/2024-06/2025 **Senior Research Fellow**. Department of Applied Mathematics, Hong Kong Polytechnic University, HKSAR, China.

09/2015-02/2024 **Assistant Professor**. Department of Mathematics, University of Hong Kong, HKSAR, China.

01/2014-08/2015 **Postdoctoral Fellow**. School of Mathematics, University of Edinburgh, Edinburgh, United Kingdom.

Education

2010-2013 (3 years) **PhD in Applied Mathematics, École Polytechnique**. Palaiseau, France.

2006-2010 (4 years) **Bachelor and Master degree, École Polytechnique**. Palaiseau, France.

2003-2006 (3 years) Tongji University, Shanghai, China.
First three years of education for Bachelor's degree in Applied Mathematics. Interruption of study after being admitted to École Polytechnique.

Research Interests

Large-scale optimization : sum-of-squares method, polynomial optimization, nonconvex quadratic programming, inexact augmented Lagrangian methods, randomized first-order methods, convex analysis, complexity analysis, algorithm design, applications in machine learning.
Operations research and optimal control : approximate dynamic programming, Hamilton-Jacobi equations, attenuation of the curse of dimensionality, max-plus methods.
Nonlinear analysis : ergodicity coefficients, non-commutative consensus, monotone or non-expansive operators, nonlinear Perron-Frobenius theory, variational analysis, Finsler metric.

Publications & Preprints

Journal Publications

1. Zheng Hua and **Zheng Qu**. Exactness and effective degree bound of Lasserre's relaxation for polynomial optimization over finite variety, *Mathematics of Operations Research*, 2025. *DOI:10.1287/moor.2024.0483*
2. Jiawang Nie, **Zheng Qu**, Xindong Tang and Linghao Zhang. A characterization for tightness of the sparse Moment-SOS hierarchy, *Mathematical Programming*, 2025. *DOI:10.1007/s10107- 025-02223-2*

3. **Zheng Qu**, Tianyou Zeng and Yuchen Lou. Globally solving concave quadratic programs via doubly nonnegative relaxation, *Mathematical Programming Computation*, 2025. *DOI:10.1007/s12532-025-00279-x*
4. **Zheng Qu** and Xindong Tang. A correlatively sparse Lagrange multiplier expression relaxation for polynomial optimization, *SIAM Journal on Optimization 34(1), 127-162*, 2024. *DOI:10.1137/22M1515689*
5. Marianne Akian, Stephane Gaubert, **Zheng Qu** and Omar Saadi. Multiply accelerated value iteration for non-symmetric affine fixed point problems and application to Markov decision processes, *SIAM Journal on Matrix Analysis and Applications 43(1), 199-232*, 2022. *DOI:10.1137/20M1367192.*
6. Fei Li, **Zheng Qu**. An inexact proximal augmented Lagrangian framework with arbitrary linearly convergent inner solver for composite convex optimization, *Mathematical Programming Computation 13, 583-644*, 2021. *DOI:10.1007/s12532-021-00205-x.*
7. Xun Qian, **Zheng Qu** and Peter Richtárik. L-SVRG and L-Katyusha with arbitrary sampling, *Journal of Machine Learning Research, 22(112), 1-47*, 2021.
8. Olivier Fercoq, **Zheng Qu**. Restarting the accelerated coordinate descent method with a rough strong convexity estimate, *Computational Optimization and Applications, 75 :63-91*, 2020. *DOI:10.1007/s10589-019-00137-2.*
9. Olivier Fercoq, **Zheng Qu**. Adaptive restart of accelerated gradient methods under local quadratic growth condition, *IMA Journal of Numerical Analysis, 39(4) :2069-2095*, 2019. *DOI:10.1093/imanum/drz007.*
10. Yassamine Seladji, **Zheng Qu**. Polyhedron overapproximation for complexity reduction in static analysis, *International Journal of Computer Mathematics : Computer Systems Theory*, 2018. *DOI:10.1080/23799927.2018.1535525.*
11. Jakub Konečný, **Zheng Qu** and Peter Richtárik. S2CD : Semi-stochastic coordinate descent, *Optimization Methods and Software, 32 :993-1005*, 2017. *DOI:10.1080/10556788.2017.1298596.*
12. Stephane Gaubert, **Zheng Qu**. Checking the strict positivity of Kraus maps is NP-hard, *Information Processing Letters, 118 :35-43*, 2017. *DOI:10.1016/j.ipl.2016.09.008.*
13. **Zheng Qu**, Peter Richtárik. Coordinate descent with arbitrary sampling I : algorithms and complexity, *Optimization Methods and Software, 31(5) :829-857*, 2016. *DOI:10.1080/10556788.2016.1190360.*
14. **Zheng Qu**, Peter Richtárik. Coordinate descent with arbitrary sampling II : expected seprarable overapproxiamtion, *Optimization Methods and Software,31(5) :858-884*, 2016. *DOI:10.1080/10556788.2016.1190361.*
15. Stephane Gaubert, **Zheng Qu** and Srinivas Sridharan. Maximizing concave piecewise affine functions on the unitary group, *Optimization Letters, 10(4) :655-665* , 2016. *DOI:10.1007/s11590-015-0951-y.*
16. Stephane Gaubert, **Zheng Qu**. Dobrushin ergodicity coefficient for Markov operators on cones, *Integral Equations and Operator Theory, 81(1) :127-150*, 2014. *DOI:10.1007/s00020-014-2193-2.*
17. **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.*
18. 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

19. Marianne Akian, Stephane Gaubert, **Zheng Qu** and Omar Saadi. Solving ergodic Markov decision processes and perfect information Zero-sum stochastic games by variance reduced deflated value iteration, *IEEE 58th Conference on Decision and Control **(CDC)**, Nice, France, pp. 5963-5970*, 2019.
20. Xun Qian, **Zheng Qu** and Peter Richtárik. SAGA with arbitrary sampling, *Proceedings of the 36th International Conference on Machine Learning **(ICML)**, PMLR 97:5190-5199*, 2019.
21. Zeyuan Allen-Zhu, **Zheng Qu**, Peter Richtárik and Yang Yuan. Even Faster Accelerated Coordinate Descent Using Non-Uniform Sampling, *Proceedings of the 33rd International Conference on Machine Learning **(ICML)**, PMLR 48:1110-1119*, 2016.

22. **Zheng Qu**, Peter Richtárik, Martin Takáč and Olivier Fercoq. SDNA : Stochastic Dual Newton Ascent for Empirical Risk Minimization, *Proceedings of the 33rd International Conference on Machine Learning **(ICML)**, PMLR 48:1823-1832*, 2016.
23. Dominik Csiba, **Zheng Qu** and Peter Richtárik. Stochastic Dual Coordinate Ascent with Adaptive Probabilities, *Proceedings of the 32nd International Conference on Machine Learning **(ICML)**, PMLR 37:674-683*, 2015.
24. **Zheng Qu**, Peter Richtárik and Tong Zhang. Randomized dual coordinate ascent with arbitrary sampling, *Advances in Neural Information Processing Systems **(NeurIPS)** 28, pp. 865-873*, 2015.
25. **Zheng Qu**. A max-plus based randomized algorithm for solving a class of HJB PDEs, *53rd IEEE Conference on Decision and Control **(CDC)**, Los Angeles, CA, 2014, pp. 1575-1580*.
26. Stephane Gaubert, **Zheng Qu** and Srinivas Sridharan. Bundle-based pruning in the max-plus curse of dimensionality free method, *Proceedings of the 21st International Symposium on Mathematical Theory of Networks and Systems **(MTNS)***, Groningen, 2014.
27. **Zheng Qu**. Contraction of Riccati flows applied to the convergence analysis of the max-plus curse of dimensionality free method. *Proceedings of the 12th biannual European Control Conference **(ECC)**, pp.2226-2231*, 2013.
28. Stephane Gaubert, **Zheng Qu**. Markov operators on cones and non-commutative consensus. *Proceedings of the 12th biannual European Control Conference **(ECC)**, pp.2693-2700,* 2013.
29. Stephane Gaubert, William M. McEneaney and **Zheng Qu**. Curse of dimensionality reduction in max-plus based approximation methods : theoretical estimates and improved pruning algorithms, *IEEE 50th Conference on Decision and Control and European Control Conference **(CDC)**, pp.1054-1061, Orlando*, 2011.

Preprints

1. **Zheng Qu** and Benoit Tran. Entropic regularization of the nested distance, *arXiv:2107.09864*, 2021.
2. Meng Lu and **Zheng Qu**. An adaptive proximal point algorithm framework and application to large-scale optimization, *arXiv:2008.08784*, 2020.
3. Olivier Fercoq, **Zheng Qu**. Restarting accelerated gradient methods with a rough strong convexity estimate, *arXiv:1609.07358*, 2016.

Grants

2024-2027	National Natural Science Foundation of China, Excellent Young Scientists Fund Program (Overseas), "Optimization theory and algorithms", PI.
2023-2026	Research Grants Council of Hong Kong, General Research Funding no. 15303423, "New methods for solving nonconvex and singular generalized Nash equilibrium problems via polynomial optimization", co-I, HKD 602,971.
2022-2025	Research Grants Council of Hong Kong, General Research Funding no. 17317122, "Approximation and analysis of exactness in Lasserre's hierarchy for polynomial optimization", PI, HKD 527,250.
2021-2023	National Natural Science Foundation of China, Science Fund for Young Scholars no. 12001458, "A generic optimization framework for large-scale nonsmooth composite optimization", PI, CNY 240,000.
2017-2018	Big Data Project Fund "Large-Scale Statistical Learning Methods in Cancer Pharmacogenomic Data and Other Spatiotemporal Data", co-I, HKD 160,000.
2017-2020	Research Grants Council of Hong Kong, Early Career Scheme no. 27302016, "Randomized methods in large-scale optimization", PI, HKD 459,423.
2014	London Mathematical Society Research Grant-Conference Grant Scheme 1 (£4,000).
2014	Baidu Visiting Research Grant (CNY 40,000).

Honors and Awards

2023	Invited Spearker in the 2023 International Congress of Chinese Mathematicians (ICCM).
2013	Chinese Government Award for Outstanding Self-Financed Students Abroad.

Teaching Experience

Regular courses :

2015-2024	The University of Hong Kong
(Sep.-Nov.)	Course title "MATH 3603 Probability Theory". Instructor.
2015-2024	The University of Hong Kong
(Jan.-Apr.)	Course title "MATH 3901 Operations Research I". Instructor.
2014	University of Edinburgh
(Sep.-Oct.)	Course title "Computing for Operational Research and Finance". Instructor.
2014	University of Edinburgh
(Feb.-May)	Course title "Optimization Methods in Finance". Teaching Assistant.
2012-2013	École Nationale Supérieure de Techniques Avancées
(Sep.-Nov.)	Course title "Dynamical Systems". Teaching Assistant.

Talks

Conference Presentations

05/2024	• The First Youth Scholars Forum of the Mathematical Programming Branch of the China Operations Research Society, Shenzhen, China.
06/2023	• SIAM Conference on Optimization, Seattle, US.
05/2023	• MOS 2023, Chengdu, China.
05/2021	• SIAM Conference on Optimization, online.
04/2021	• HKBU Virtual Conference on Mathematics, Statistics and Data Science, online.
05/2019	• The sixth International Conference on Continuous Optimization, Berlin, Germany.
05/2017	• SIAM Conference on Optimization, Vancouver, Canada.
08/2016	• The fifth International Conference on Continuous Optimization, Tokyo, Japan.
08/2016	• Conference on Applied Mathematics, Hong Kong.
05/2016	• The ninth China-R Conference, Beijing, China.
12/2015	• International Workshops on Singal Processing, Optimization and Compressed Sensing (SPOC), Guangzhou, China.
07/2015	• The 22nd International Symposium on Mathematical Programming, Pittsburgh, USA.
07/2015	• The 32nd International Conference on Machine Learning, Lille, France.
05/2015	• The 3rd Optimization and Big Data Workshop. Edinburgh, UK.
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.

Research Visits

02/2025	Workshop on Optimization and Learning Seminar, Tianyuan Mathematics Research Center, Kunming, China
04/(2023& 2024)	Structured Quartet Research Ensembles (SQuaREs), American Institute of Mathematics, San Jose, US.
06-07/2019	Research visit at Simon Fraser and The University of British Columbia, Canada.
06-07/2017	Research visit at CMAP, Ecole Polytechnique, France.
01/2017	Research visit at Department of Mathematics, NUS, Singapore.
07-08/2014	Research visit at the Baidu Big Data Lab , Baidu Inc, Beijing, China.

Other Scientific Activities

Reviewer for :

1. Foundations of Computational Mathematics
2. Mathematical Programming Computation
3. Mathematical Programming, Series A
4. SIAM Journal on Optimization
5. Journal of Machine Learning Research
6. Optimization Methods and Software
7. Journal of Optimization Theory and Applications
8. Linear Algebra and Applications
9. IEEE Transactions on Automatic Control
10. Conference on Neural Information Processing Systems (NeurIPS) (top 10% highest average area chair ratings in 2020)
11. International Conference on Machine Learning (ICML)
12. International Conference on Artificial Intelligence and Statistics
13. European Conference on Control
14. Conference on Decision and Control

Organizer of

1. The First Youth Scholar Forum of the Mathematical Programming Branch of the Operations Research Society of China, Shenzhen, May 2024.
2. Minisymposium 'Algorithms and Complexity Results for Large-Scale Constrained Optimization', SIAM Conference on Optimization, online, 2021.

Co-organizer of

1. Optimization and Machine Learning, HKU-IMR online seminars, February-May 2022.
2. HKU Workshop on Scientific Computing and Optimization, online, December 12-13, 2020.
3. 2016 Conference on Applied Mathematics, Hong Kong, August 2016.
4. Invited session at the International Symposium on Mathematical Programming (ISMP). Pittsburgh, USA, July 2015.
5. The 3rd Edinburgh "Optimization and Big Data" workshop. May 2015.
6. All Hands Meeting on Big Data Optimization (weekly innovative, interactive and interdisciplinary research seminar). University of Edinburgh.
7. Invited session : "First-order methods in large-scale optimization" in the 4th IMA Conference on Numerical Linear Algebra and Optimisation. Birmingham, UK, September 2014.