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Research Interests

1. **Applied Math and Computational Science:** Multi-scale modeling, analysis, and simulation of complex systems, nonconvex/nonsmooth analysis, nonlinear PDEs, bifurcation theory, nonlinear finite element methods, large-scale and multi-scale computations, primal-dual algorithms, computational complexity.
2. **Engineering Science and Mechanics:** Nonconvex/nonsmooth mechanics, large deformation elasto-plasticity, fluid dynamics, chaotic and dissipative dynamics, bio-mechanics, multi-scale modeling and simulation of phase transitions in material science, multi-functional structural mechanics, structural optimization and design.
3. **Operations Research and Systems Engineering:** Global optimization, nonlinear and nonsmooth programming, integer programming, network optimization, information theory, decision science, distributed parameter control, energy systems optimization and control, duality in social network systems.

Postdoctoral Experiences

1. Postdoctoral Fellow (Math), Harvard Univ., 1989-1991, Advisor: Shing-Tung Yau.
2. Postdoctor & Lecturer (Mechanics), Yale Univ., 1988-89, Advisor: E.-T. Onat.
3. Postdoctoral Associate, M.I.T. (Appl Math), 1986-88, Advisor: Gilbert Strang.

Educational History

1. Ph.D. in Engineering Mechanics and Applied Math, Tsinghua Univ., Beijing, 1986
2. M.S. in Space Engineering, Beijing Univ. of Aeronautics and Astronautics, 1982
3. B.S. in Manufacturing and Material Science, Hefei University of Technology, 1978

Professional Appointments

1. Alex Rubinov Chair Professor of Mathematics, University of Ballarat, 2009-
2. S.C. Fang Chair Professor, Tsinghua University, Beijing, 2006-09
3. Professor of Mathematics and Engineering Science (with Tenure), Director of Center for Numerical Simulation and Modeling, Louisiana Tech, 2002-2003.
4. Assistant and Associate Professor, Virginia Tech. 1992-2009.
5. Assistant Professor, University of Michigan, Ann Arbor, 1991-1992.
6. Associate Professor, Hefei University of Technology, 1986-1992.

Honorary and Adjunct Positions

1. Adjunct Professor, Hunan University, 2009-
2. Honorary Professor, China Jilian University, Hangzhou, 2009-
3. Honorary Professor, Anhui Univ. of Science and Technology, 2000-

Editorships

1. Editor-in-Chief: Encyclopedia of Duality in Engineering Science, Springer, 2006-
2. Co-Editor-in-Chief of Book Series:

- (1) *Advances in Mechanics and Mathematics (AMMA)* (with Ray W. Ogden), Springer, 2002-present
 - (2) *Modern Mechanics and Mathematic (MMM)* (with Martin Ostoja-Starzewski) Taylor & Francis, 2002-present
 - (3) *Optimization and Control of Complex Systems* (with H.D. Serali), Taylor & Francis, 2008-present
3. Member of Editorial Board:
- (1) *Advances in Material and Mechanics*, Springer/High Education Publisher, 2010-
 - (2) *Discrete and Continuous Dynamical Systems-B*. AIMS Press, 2001-present;
 - (3) *Journal of Global Optimization*, Springer, 1999-present;
 - (4) *Journal of Industrial and Management Optimization*. AIMS Press, 2004-present
 - (5) *Optimization Letters*. Springer, 2005-present.
 - (6) *Electronic Journal of Technology in Mathematics*, 2006-present.

Current Research Grant

AFOSR/NL: Division of Mathematics, *Canonical Duality Theory And Algorithms For Solving Some Challenging Problems In Global Optimization And Decision Sciences*, 2009-2014: \$750,000 (sole PI)

Previous Research Grants

1. Division of Computer & Information Science & Engineering, NSF: *Primal-Dual Method and Algorithm for large Scale Computation with Applications in Engineering Mechanics*, CCF-0514768, 2005-2009 (sole PI).
2. Division of Operations Research & Production Systems, National Science Foundation, CMMI-0455807, 2005-2006 (Co-PI).
3. International Union of Theoretical and Applied Mechanics Symposium Grant 2001-2002 (PI).
4. National Science Foundation, Division of Civil and Structural Engineering, CMS-0123932, 2001-2003 (PI).
5. Virginia Tech Millennium Grant, 1999-2000 (PI);
6. National Science Foundation, Division of Applied Mathematics, DMS-9400565, June, 1994 - June 1997 (PI).
7. International Chinese Research Grant of Republic of China, Taiwan (1992 summer)
8. Interdisciplinary Research Grant, University of Michigan (1991-1992).
9. NSERC International Fellowship Grant (1990-1991)
10. Lee Hysan Foundation, Hong Kong (1998-99).
11. National Natural Science Foundation of China, Outstanding Young Investigator Grant, 1988-1990 (PI).

Professional Leaderships

1. Vice President and Secretary-in-General, *International Federation of Global Optimization*, 2009-
2. Co-Chair, *1st World Congress on Global Optimization*, June 1-5, 2009, Hunan, China.
3. Co-Chair, *2nd International Workshop on Duality and Advances in Optimization*, May 23-24, 2009, Tsinghua University, Beijing, China.

4. Co-Chair, *International Workshop on Duality and Advances in Optimization*, Tsinghua University, Beijing, December 14-16, 2006.
5. General Co-Chairman, *First International Conference on Complementarity, Duality, and Global Optimization with Application in Engineering and Science*, August 15-17, 2005, Virginia Tech, Blacksburg, USA.
6. Co-Chairman, *International Symposium on Modern Mechanics and Mathematics*, University of Kleele, UK, August 26-29, 2003.
7. Co-Chair, *IUTAM Symposium on Duality, Complementarity and Symmetry in Nonlinear Mechanics*, August 13-16, 2002, Shanghai, China.
8. Vice-Chairman, *the 4th International Conference in Nonlinear Mechanics*, August 13-16, 2002, Shanghai, China.
9. Co-organizer, *International Conference on Optimization and Control with Applications*, August 17-20, 2002. The Yellow Mountains International Hotel, Anhui, China.
10. Co-organizer, *First Capitol City Symposium on Ultra-Thin Structures*, April 22-24, 2002. The George Washington University.
11. Co-Chairman, *International Symposium on Non-Smooth and Non-Convex Mechanics*, June 27-30, 1999 Virginia Tech. Blacksburg, VA, USA.
12. Co-Organizer, *International Symposium on Complementary-Dual Variational Principles and Numerical Methods*. July 14-19, 1997, Stanford University, USA.

Keynote, Plenary, and Invited Lectures at International Conferences.

1. [Main Speaker, International Conference on Numerical Analysis & Optimization-Theory and Application](#), December 17-21, 2011, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia.
2. Keynote Speaker, [1st International Symposium on Optimization and Complex Systems](#), Dec. 13-16, 2011, Shanghai niversity, Shanghai, China
3. Invited Lecture, [Int. Workshop on Global Optimization](#), July 11-12, 2011, Izmir University of Economics, Turkey.
4. Invited Lecture, [International Workshop on Optimization and Scientific Computation](#), May 28-29, 2011, Nanjing Normal University, China.
5. Invited Lecture, [52th Workshop on Nonlinear Optimization, Variational Inequalities, and Equilibrium Problems, International School of Mathematics "G. Stampacchia"](#), Erice, Italy, July 2-10, 2010.
6. Invited Lecture, International Conference on Optimization and Control (ICOCO-10), Gueiyang, China, July 18-23, 2010.
7. Plenary Speaker, [International Conference on Optimization, Simulation and Control, Ulaanbaatar, Mongolia](#), July 25 - 28, 2010
8. Invited Speaker: Canonical Dual Solutions to General Sum of Quartic Polynomial Optimization Problems with Applications in Euclidean Distance Geometry [The 4th Australia-China Workshop on Optimization: Theory, Methods, and Applications](#). 9-11, December, 2009, University of Ballarat, Australia.
9. Plenary Lecture: Complete Solutions to a Class of Nonconvex Variational-Boundary Value Problems with Implications for Phase transitions and Computational Science, [The 3rd International Conference on Modeling of Complex Systems](#), CMCS'09, Doha, Qatar, May 5-7, 2009.

10. Plenary Lecture, Canonical Duality Theory: Unified Understanding of Global Optimization, [The First World Congress on Global Optimization with Applications](#), Hunan University, Changsha, China, June 1-5, 2009.
11. Invited Lecture, Unified solution to a class of nonconvex distributed parameter systems, *International [Conference on Mathematical Control Theory](#) in honor of D.L. Russell for his 70th Birthday*, May 15-17, 2009, Beijing, China.
12. Invited Speaker, Dual feedback control in nonconvex systems, [The 4th International Conference on Optimization and Control with Applications \(OCA2009\)](#) June 6-11, 2009, Harbin and Wudalianchi, China
13. Invited Lecture, Canonical duality theory – Unified understanding of global optimization. International Workshop on Global Optimization, Tsinghua, China, May 23-24, 2009.
14. Invited Lecture, Canonical duality theory for solving some challenging problems in machine learning and decision science, *AFOSR Workshop on Mathematical Foundation of Machine Learning*, January 26-27, 2009, Arlington, VA.
15. Invited Lecture, Advances of Canonical Duality Theory in Global Optimization and Applications. [Foundations of Computer-Aided Process Operations \(FOCAPO\) 2008](#), June 29-July 2, 2008, Cambridge, MA
16. Invited lecture, Understand and Control Chaos: Canonical Duality Approach. [9th Conference on Dynamical Systems, Theory and Applications](#), Lodz, Poland, December 17-20, 2007.
17. Invited Lecture, Complete Solutions to a Class of Nonconvex Variational, Boundary Value Problems with Applications, [5th Internal Conf. on Nonlinear Analysis and Convex Analysis, May 31-June 4, 2007](#), Hsinchu, Taiwan
18. Shu-Cherng Fang Distinguished Lecture, Introduction of Canonical Duality Theory. Tsinghua University, June 12, 2007.
19. Plenary Lecture. [The 2nd International Conference on Complementarity, Duality, and Global Optimization in Science and Engineering](#), February 28 - March 2, 2007, J. Wayne Reitz Union, University of Florida, Gainesville, FL.
20. Invited Lecture, [International Conference on Nonlinear Programming with Applications \(NPA2006\), May 29 - June 1, 2006](#), Fudan University, Shanghai, China.
21. Keynote Lecture (three-hours), *International Workshop on Duality and Advances in Optimization*, Tsinghua University, Beijing, December 14-16, 2006.
22. Plenary Lecture, [11th Asian Technology Conference in Mathematics](#) (ATCM 2006), 12 - 16 December, 2006.
23. Invited Lecture (Optimization), *First AMS Joint International Mathematical Meeting with Taiwanese Mathematical Society and 2005 TWM Annual Meeting*, December 14-18, 2005 Taiwan.
24. Invited speaker, International Workshop on Optimization, May 28-30, 2005, Tongji, University, Shanghai.
25. Plenary speaker and scientific committee member, *the 3rd International Conference on Optimization and Control with Applications*, July 25-31, 2004, Chongqing, China.
26. Invited Lecture, the *3rd International Conference on Computational Modelling and Simulation of Materials*, May 29-June 4, 2004, Acireale, Sicily, Italy.

27. Penal speaker, *International Conference of Heterogeneous Materials Mechanics* (ICHMM-2004), June 21-26, 2004, Chong Qing, China.
28. Invited Lecture, *International Colloquium on Theoretical and Numerical Convex Analysis and Nonsmooth Mechanics* in Honor of the 80th Birthday of J.J. Moreau. November 17-19, 2003. Montpellier, France.
29. Keynote Lecture, the *International Conference on Non-smooth and Non-convex Mechanics*, Aristotle University of Thessaloniki, July 5-6, 2002, Greece.
30. Plenary Lecture, *The 7th Asian Technology Conference in Mathematics*, (ATCM2002), 17th-21st, December, 2002, Multimedia University, Malaysia
31. Plenary Lecture, *International Conference on Optimization and Control with Applications*, August 18-22, 2002. The Yellow Mountains, Anhui, China.

Current Post-Doctoral Associates:

Dr. Changzhi Wu, Dr. Jiapu Zhang, Dr. Daniel Silva

Post-doctors Advised within five years:

1. Dr. Ning Ruan, 2007-2009
2. Dr. Guo-Shang Liu, 2008-2009
3. Dr. Yubo Yuan, 2006-2007
4. Dr. Jinsoo Hwang, 2005-2006

Thesis Committees Served for Graduate Students at Virginia Tech,

F. Botelho (PhD), 2006- Dept of Math, Chair
 H. Yu (PhD), 2004-2008, Dept of Math, Chair
 R. Sopakayang (PhD), 2007- Dept. of Engineering Science and Mechanics
 Weifong Rao (PhD), 2005-2009, Dept of Material Science, co-Chair
 Bin Li (PhD), 2005-2009, Dept of Electrical and Computer Engineering
 Nannan He (PhD), 2006-2009, Dept of Electrical and Computer Engineering
 Saurabh Bisht (PhD), 2005-2009, Dept of Engineering Science and Mechanics
 A. Ionita (PhD), 1998-2002, Dept of Engineering Science and Mechanics, Chair
 D.X. Cai (MS), 1996-1999, Dept of Math, Chair
 H. Liu (MS), 1997-1999, Dept of Math, Chair
 B.Chen (PhD), 1996-1999, Dept of Engineering Science and Mechanics

Visiting Positions Held

1. Visiting Professor, Department of Structural Engineering, The National Technique University of Athens, Summer 2002.
2. Visiting Professor, Department of Mechanical Engineering, University of California, Berkeley, Summer 2001.
3. Visiting Assistant Professor, Department of Mechanical Engineering and Applied Mechanics, University of Michigan, 1991-1992.
4. Research Officer, Dept. Civil and Structural Engineering, University of Hong Kong, 1988.
5. Visiting Scholar, Dept. of Ocean Engineering, M.I.T., 1987-88.

Professional Organizations and Activities

1. American Academy of Mechanics
2. Mathematical Programming Society
3. INFORMS
4. Society for Industrial and Applied Mathematics (SIAM)

5. [Pacific Optimization Research Activity Group \(POP\)](#).

Social Activities and Leadership

1. President of Chinese Association of Scholars and Students (CASS) in Great Boston Area, 1987-1988.
2. Vice President of CASS at MIT, 1987-1988.
3. President of Chinese Faculty Association at the Univ. of Michigan, 1991-1992.

Professional Services

1. Scientific Committees served for
 - 1) [International Conference on Optimization, Simulation and Control](#), Ulaanbaatar, Mongolia, July 25 - 28, 2010
 - 2) The 10th Conference on Dynamical Systems -- Theory and Applications (DSTA 2009), Łódź, Poland, 7-10 December 2009.
 - 3) [The Forth International Conference on Optimization and Control with Applications \(OCA2009\)](#) June 6-11, 2009, Harbin and Wudalianchi, China
 - 4) International Organizing Committee Chair, [The Fourth Sino-Japanese Optimization Meeting](#), 8/27-30, 2008, Tainan, Taiwan.
 - 5) [The 7th International Conference on Optimization: Techniques and Applications \(ICOTA7\), Kobe, Japan, Dec. 12-15, 2007.](#)
 - 6) *The 2nd International Conference on Complementarity, Duality, and Global Optimization*, Gainesville, Florida, February 28 - March 2, 2007
 - 7) *International Conference on Nonlinear Programming with Applications (NPA2006)*, May 29 - June 1, 2006, Fudan University, Shanghai, China.
 - 8) *The 1st and 2nd International Conference on Non-smooth and Non-convex Mechanics*, Aristotle University of Thessaloniki (A.U.Th.), June, 2002 and 2006.
 - 9) *The 2nd and 3rd International Conference on Optimization and Control with Applications (OCA2002 and OCA-2004)*, China.
 - 10) *The 7th International Conference on Optimization and Technology*, Ballarat, Australia, December, 2004.
 - 11) *The 12th International WOSC Congress and the 4th IIGSS Workshop*, March 24 - 26, 2002 Pittsburgh, Pennsylvania, USA Sheraton Station Square Hotel.
2. Grant proposals reviewed for the following funding agencies:
 - 1) National Science Foundation, DMS, DCII, and CISE.
 - 2) US Army Research Office.
 - 3) Chile National Science Foundation.
 - 4) South Africa National Research Foundation (NRF).
 - 5) Australian Research Council
3. Book proposals reviewed for the following publishers:
 - 1) American Society of Mechanical Engineering (ASME)
 - 2) John Wiley & Sons
 - 3) Kluwer Academic Publishers (more than 15 manuscripts)
 - 4) Chapman & Hall/CRC (more than six manuscripts)
 - 5) Springer (more than 15 manuscripts)
 - 6) World Scientific Press.
4. Manuscripts reviewed for the following journals:
5. AIAA Journal
6. Applied Mathematics Letters

- 7 Applied Mechanics Review
- 8 Discrete and Continuous Dynamical Systems
- 9 IEEE Dynamics of Continuous and Discrete Impulsive Systems
- 10 International Journal of Computers and Mathematics Application
- 11 Int. J. of Solids and Structures
- 12 Int. J. Non-Linear Mechanics
- 13 Journal of Computer Methods in Applied Mechanics and Engineering.
- 14 Journal of Differential Geometry
- 15 J. of Elasticity
- 16 Journal of Global Optimization (more than 25 papers).
- 17 J. Math Anal. Appl.
- 18 J. Mathematical Physics
- 19 J. Nonlinear Dynamics
- 20 Journal of Systems Science and Complexity
- 21 Mathematical and Computer Modelling
- 22 Mathematics Review
- 23 Math. Mech. Solids
- 24 Meccanica
- 25 Optimization and Control, Application and Methods.
- 26 Optimization and Engineering
- 27 Optimization Letters
- 28 Phil. Trans. of the Royal Society: Mathematical, Physical and Engineering Sciences
- 29 Philosophical Magazine
- 30 Physica Status Solidi
- 31 Proceedings A of the Royal Society
- 32 Quarterly Journal of Applied Math and Mechanics
- 33 Z. Angew Math Mech. (ZAMM)
- 34 Z. Angew Math Phys (**ZAMP**)

Consulting

- Ford Motor Company (1991-92);
- Starmart Offshore Oil Company (1996-2002);
- Kluwer Academic Publishers (1998-2004);
- Chapman & Hall/CRC Press (since 1999);
- Springer Science and Business Media (since 2004).

Publications

I. Monographs, Encyclopedia, Handbooks, Edited Books and Special Issues

1. Gao, D.Y., [*Duality Principles in Nonconvex Systems: Theory, Methods and Applications*](#). Kluwer Academic Publishers, Boston/Dordrecht/London, 2000, xviii+454pp.
2. Gao, D.Y., R.W. Ogden and G. Stavroulakis, [*Nonsmooth and Nonconvex Mechanics: Modelling, Analysis and Numerical Methods*](#). Kluwer Academic Publishers, Boston/Dordrecht/London, 2001, xlv+471pp.
3. Gao, D.Y. and R.W. Ogden, [*Advances in Mechanics and Mathematics, AMMA2002*](#), Kluwer Academic Publishers, Boston/Dordrecht/London. 2002, xvii+302 pp.
4. Gao, D.Y., [*Complementarity, Duality and Symmetry in Nonlinear Mechanics, Proceedings of IUTAM Symposium*](#), Kluwer Academic Publishers, Boston/Dordrecht/London, 434pp.
5. Gao, D.Y. and R.W. Ogden, [*Advances in Mechanics and Mathematics, AMMA 2003*](#), Kluwer Academic Publishers, Boston/Dordrecht/London, 336p.
6. Gao, D.Y. and K.L. Teo, *Duality in Global Optimization and Control*. Special issue of *Journal of Global Optimization*. 2004.
7. Gao, D.Y. and R.W. Ogden, [*Advances in Mechanics and Mathematics, III*](#). Springer, 2005, 336p.
8. Gao, D.Y. and Sherali, H., [*Advances in Applied Mathematics and Global Optimization*](#), Springer, 520pp.
9. Gao, D.Y. and Sherali, H.D., *Complementarity and Duality in Global Optimization*. Special issue of *Journal of Global Optimization*. 2004.
10. Gao, D.Y. and Motreanu, D., [*Handbook on Nonconvex Analysis and Applications*](#), International Press, 2010, 680pp.
11. Fang, S-C, Floudas, C., and Gao, D.Y., Recent Developments in Global Optimization, Special Issue of *Journal of Global Optimization*. 2011

II. Articles in Encyclopedia

1. Gao, D.Y., [*Duality-Mathematics*](#), *Wiley Encyclopedia of Electrical and Electronics Engineering*, 6, 1999, 68-77.
2. Gao, D.Y., [*Mono-Duality in Convex Optimization*](#), in *Encyclopedia of Optimization*, C. A. Floudas and P.M. Pardalos (eds). Kluwer Academic Publishers, 2001. Vol. 1, pp. 482-485.
3. Gao, D.Y., [*Bi-Duality in Nonconvex Optimization*](#), in *Encyclopedia of Optimization*, C. A. Floudas and P.M. Pardalos (eds). Kluwer Academic Publishers, 2001. Vol. 1, pp. 477-482.
4. Gao, D.Y., [*Tri-duality in Global Optimization*](#), in *Encyclopedia of Optimization*, C. A. Floudas and P.M. Pardalos (eds). Kluwer Academic Publishers, 2001. Vol. 1, pp. 485-491.

III Review Articles

5. Gao, D.Y. (2009). [Canonical duality theory: Unified understanding and generalized solution for global optimization problems](#), *Computers & Chemical Engineering*, 33:1964–1972. doi:10.1016/j.compchemeng.2009.06.009
6. Gao, D.Y. and Sherali, H.D. (2008). [Canonical duality: Connection between nonconvex mechanics and global optimization](#), in *Advances in Appl. Mathematics and Global Optimization*, 249-316, Springer, 2009
7. Gao, D.Y. (2008). [Advances in canonical duality theory with applications to global optimization](#), *Proceedings of the Fifth International Conference on Foundations of Computer-Aided Process Operations (FOCAPO 2008)*, M. Ierapetriou, M. Bassett and S. Pistikopoulos (eds.), Omni Press, pp.73-82.
8. Gao, D.Y. (2007) [Understand and control chaos in dynamical systems: Canonical duality approach and triality theory](#), *Modeling, Simulation and Control of Nonlinear Engineering Dynamical Systems* J. Awrejcewicz (ed.) Springer.
9. Gao, D.Y. (2003). Nonconvex [semi-linear problems and canonical duality solutions](#), *Advances in Mechanics and Mathematics*, II, Kluwer, 261-311.

IV Papers to appear

9. Gao, D.Y., Ruan, N. and Pardalos, P.M. (2011), [Canonical dual solutions to sum of fourth-order polynomials minimization problems with applications to sensor network localization](#), in *Sensors: Theory, Algorithms, and Applications*, V. Boginski, P.M. Pardalos, Y.Y. Ye, and C. Commander (eds). Springer Optimization and Its Applications 61, DOI 10.1007/978-0-387-88619-0_3,
10. Gao, D.Y., Ruan, N, Layne T. Watson, L.T., Easterling, D. R., and Thacker, W.I., Canonical Dual Approach for Solving Box and Integer Constrained Minimization Problems via a Deterministic Direct Search Algorithm, accepted by *Optim. Methods and Software*.
11. Tu, Shikui, Sun, K, Gao DY, and Xu, Lei (2011) Learning versus Optimization based on Binary Factor Analysis, to appear in *J. Global Optimization*.
12. Wang, ZB, Fang, S-C., Gao, D.Y. and Xing W.X. Canonical Dual Approach to Solving the Maximum Cut Problem, to appear in *J. Global Optimization*
13. Liu, G.S., Gao, DY and Wang, SY (2012) Canonical Duality Theory for Solving Non-Monotone Variational Inequality Problems, to appear in *J. Global Optimization*
14. Gao, D.Y. Kelarev, A.V. Yearwood, J.L. Optimization of matrix semirings for classification systems, *Bulletin Aust. Math. Soc.*
15. Gao, D.Y. and Wu, C.Z. [On the Triality Theory for a Quartic Polynomial Optimization Problem](#), to appear in *J. Industrial and Management Optimization*
16. Gao, D.Y. Hajilarov, E. Kelarev, A.V. Yearwood, J.L. Optimization of clustering systems based on Munn semirings, *Semigroup Forum*, submitted.

V. Papers in Refereed International Journals

17. Santos, H.A.F.A. and Gao D.Y. (2011) [Canonical dual finite element method for solving post-buckling problems of a large deformation elastic beam](#), *Int. J. Nonlinear Mechanics*, doi:10.1016/j.ijnonlinmec.2011.05.012

18. Zhu, J., Wang, C. & [Gao, D.](#) (2011). Global optimization over a box via canonical dual function. *Journal of Computational and Applied Mathematics* 235, no. 5, 1141-1147.
19. Yuan, YB, Gao, DY, and Fang, S-C (2011). Global Optimal Solutions to a Class of Quadrinomial Minimization Problems with One Quadratic Constraint, *J. Global Optimization*
20. Zhang J., Gao, D.Y. and Yearwood, J. (2011) [A novel canonical dual computational approach for prion AGAAAAGA amyloid fibril molecular modeling.](#) *Journal of Theoretical Biology* 284 (2011) 149 - 157 doi:10.1016/j.jtbi.2011.06.024
21. Gao, D.Y. and Ruan, N. (2010) [Solutions to quadratic minimization problems with box and integer constraints,](#) *J. Global Optimization*, 47:463–484 DOI 10.1007/s10898-009-9469-0
22. Ruan, N., Gao, D.Y., Jiao, Y. (2010). [Canonical dual least square method for solving general nonlinear systems of quadratic equations,](#) *Comput Optim Appl*, 47:335-347. DOI 10.1007/s10589-008-9222-5
23. Zhu, J., Zhou, J. & [Gao, D.](#) (2010). Global optimization by canonical dual function. *Journal of Computational and Applied Mathematics* 234, no. 2, 538-544.
24. Feng, Z.S., Zheng, Shenzhou, and Gao, D.Y. (2009). Traveling wave solutions to a reaction-diffusion equation, *Z. angew. Math. Phys.* 60 (2009) 756-773 published online: March 4, 2009, DOI: 10.1007/s00033-008-8092-0
25. Zhang, X., Zhu, J., Gao, D. Y. (2009). Solution to nonconvex quadratic programming with both inequality and box constraints, *Optimization and Engineering* 10:183–191.
26. Liu, J., Gao, D. Y. Gao, Y. (2009). Canonical duality for solving nonconvex and nonsmooth optimization problem, *Optimization and Engineering* 10:153–165.
27. Gao, D.Y., N. Ruan, and Sherali, H. (2009). [Solutions and optimality criteria for nonconvex constrained global optimization problems with connections between canonical and Lagrangian duality,](#) *J. Global Optimization*, 45:473-497, also published on line: DOI 10.1007/s10898-009-9399-x
28. Feng, Z.S., and Gao, D.Y., (2009). [An asymptotic expression of the Schrödinger equation,](#) *Z. angew. Math. Phys.* DOI 10.1007/s00033-007-7102-y
29. Fang, S.-C., Gao, D.Y., Shue, R.L., and Xin, W.X. (2009). [Global optimization for a class of fractional programming problems,](#) *Journal of Global Optimization* 45:337–353 DOI 10.1007/s10898-008-9378-7
30. Zhu, J., Tao, S. & [Gao, D. Y.](#) (2009). *A study on concave optimization via canonical dual function.* *Journal of Computational and Applied Mathematics* 224, no. 2, 459--464.
31. Gao, D.Y. and Ogden, R.W. (2008) [Closed-form solutions, extremality and nonsmoothness criteria in a large deformation elasticity problem,](#) *ZAMP*, 59 (2008) 498–517
32. Gao, D.Y. and Ogden, R.W. (2008) [Multiple solutions to non-convex variational problems with implications for phase transitions and numerical computation,](#) *Quarterly J. Mech. Appl. Math.* . 61 (4), 497-522

33. Gao, D.Y. and Yu, H.F. (2008). [Multi-scale modelling and canonical dual finite element method in phase transitions of solids](#), *Int. J. Solids Struct.* 45 (2008) 3660–3673
34. Feng, Z.S. and Gao, D.Y. (2008) A nonconvex dissipative system and its applications, *J.Global Optimization.* 40 (4), 637 – 651.
35. Gao, D.Y. and Ruan, N. (2008) [Solutions and optimality criteria for nonconvex quadratic-exponential minimization problem](#), *Math. Meth. Operations Research*, 67 (3), 479-491.
36. Wang, Z.B., Fang, S.-C., Gao, D.Y., and Xin, W.X., [Global extremal conditions for multi-integer quadratic programming](#), *J. Industrial and Management Optimization.* 4(2), 213-226
37. Gao, D.Y. and Wei-Chi Yang (2008), Complete Solutions to Minimal Distance Problem between Two Nonconvex Surfaces, *Optimization.* Vol. 57(5), 705-714. DOI: 10.1080/02331930802355309.
38. Fang, S.-C., Gao,D.Y., R.-L. Sheu, and S.Y. Wu (2008) [Canonical Dual Approach for Solving 0-1 Quadratic Programming Problems](#), *J. Industrial and Management Optimization.*4 (1), 125-142
39. Gao, D.Y., [Solutions and optimality criteria to box constrained nonconvex minimization problems](#), *J. Industrial and Management Optimization.* 3(2):293-304, 2007.
40. X. Wang, Z. Feng, L. Debnath and D.Y. Gao, (2008) Burgers-Korteweg-de Vries equation and it approximation, *International Journal of Computer Mathematics*, Vol. 85 (6), 853-863.
41. Xuan, Zhaocheng Feng, Zhao-Sheng, and Gao, D.Y. (2007). FEM Approach for Complementary Bounds of Stress Intensity Factors in Bimaterials, *Int. J. Nonlinear-Mechanics.* 42 336– 341
42. Gao, D.Y., Duality in distributed-parameter control of nonconvex and nonconservative dynamical systems with applications, *Nonlinear Dynamics and Systems Theory*, 6(3), 257-279, 2006.
43. [Gao, D.Y., Complete solutions to a class of polynomial minimization problems](#), *J. Global Optimization*, 35, 131-143, 2006.
44. [Gao, D.Y. Sufficient conditions and perfect duality in nonconvex minimization with inequality constraints](#), *J. Industrial and Management Science*, 1:59-69, 2005
45. [Gao, D.Y. Complementary variational principle, algorithm, and complete solutions to phase transitions in solids governed by Landau-Ginzburg equation](#), *Mathematics and Mechanics of Solid*, 9:285-305, 2004.
46. [Gao, D.Y., Canonical duality theory and solutions to constrained nonconvex quadratic programming](#), *Journal of Global Optimization*, 29:377-399, 2004.
47. [Gao, D.Y., Perfect duality theory and complete set of solutions to a class of global optimization](#), *Optimization*, 52 (4-5), pp. 467-493, 2003.
48. Gao, David Y., [Complementarity, polarity and triality in nonsmooth, nonconvex and nonconservative Hamiltonian systems](#), *Philosophical Transactions of the Royal Society: Mathematical, Physical and Engineering Sciences.* Vol. 359, 2347-2367, [Abstract](#).

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VII. Book Review, Preface, and Recreation Articles

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VIII. Dissertations

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Invited Lectures and Colloquium Talks at Institutions

1. Colloquium Lecture at the Department of Math, University of Melbourne, Sept. 12, 2011. Title: Canonical Duality and Triality: Unified Understanding and Analytical Solutions for Nonconvex, Nonsmooth and Discrete Problems in Complex Systems
2. Colloquium Lecture at the Department of Mechanical Engineering, Zhejiang University, June 8, 2011. Title: Advances in Nonconvex/Nonsmooth Mechanics Canonical Duality Theory
3. Colloquium Lecture in Institute of Automatic Control, Harbin Institute of Technology, June 10, 2011. Title: Modeling, Optimization, and Control of Complex Systems: Canonical Duality Approach
4. Colloquium lecture at the Institute of Complex Systems, University of New Castle, June 19, 2010. Title: Optimization and Control of Complex Systems: Canonical Duality Approach,
5. Colloquium lecture at Department of Mathematics, Royal Melbourne Institute of Tech, Dec. 7, 2009. Title: Canonical Duality Theory: Unified Understanding to Global Optimization and Complex Systems
6. Unified understanding of mathematical science, School of Science, China Jilian University, June 15, 2009.
7. Recent progress in global optimization, Academy of Mathematics & Systems Science, Chinese Academy of Sciences, Beijing, May 27, 2009
8. Unified understanding for modeling, simulation, and control of complex systems, Beijing University of Technology, May 22, 2009.

9. Canonical duality theory: unified understanding for modeling, simulation, and control of complex systems, Department of Mechanical and Energy Engineering, University of North Texas, May 19, 2009.
10. General closed solutions to a class of nonlinear equations, Department of Mathematics, Harvard University, August 1, 2008.
11. Canonical duality theory and applications in global optimization, Dept of Industrial and Systems Engineering, University of Florida, April 22, 2008
12. Canonical duality theory for solving some challenging problems in mechanics and global optimization, Dept Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Jan. 29, 2008.
13. Canonical Duality Approaches for Solving a Class of NP-hard Problems in Global Optimization and Nonconvex Systems, Department of Electric Engineering and Computer Science, *MIT*, May 11, 2007
14. Duality and Triality: Unifying Mathematical Modeling, Methods, and Computational Science, Department of Computer Science and Engineering, *The Chinese Univ. of Hong Kong*, June 5, 2007.
15. Two lectures on Canonical Duality Theory with Applications in Nonconvex Analysis and Global Optimization, Department of math, *Tongji Univ.*, June 7-8, 2007
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21. Complete Solutions to a Class of Nonconvex Variational Problems with Implications for Numerical Computation and Global Optimization, *Pacific Institute for mathematical Science*, Nov. 23, 2007.
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45. Large-Scale Computation and Simulation: A Duality Approach, College of Engineering and Science, Louisiana Tech University, December 14, 2001.
46. Duality and Triality: Unifying Mathematics and Natural Sciences, Colloquium talk at Department of Math., University of Glasgow, January 18, 2001
47. Closed solution for large deformation mechanics and applications, Two-hours lecture at the *Department of Engineering Mechanics and Technology, Tong-ji University*, January 11, 2000.
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51. Philosophical Principles of Natural Systems, Two-hours Institute Address at *Huainan Institute of Technology*, January 4, 2000.
52. General Analytic Solutions and Duality Theory for Fully Nonlinear Variational/Boundary Value Problems Governed by Nonsmooth Constitutive Laws. *Department of Mathematics, George Mason University*, March 26, 1999.
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78. Complete solutions to a class of nonconvex finite deformation problems with applications, *43rd Annual Technical Meeting Society of Engineering Science*, Penn State University, August 13–16th, 2006.
79. Canonical Duality Theory and Method for Solving Non-convex and Non-conservative Hamilton Systems with Applications, The 112th Annual Meeting of AMS, San Antonio, Texas, January 12-15, 2006.
80. Canonical Duality Theory and Algorithm for Solving Semi-Linear Nonconvex Variational/PDE Systems with Applications, AMS Conference, *Nonlinear PDE Evolutionary Systems and their control*, October 15-16, 2005 East Tennessee State University of Johnson City, TN.
81. Stability criteria and dual feedback control against chaotic vibration of large deformed beam structure, *ASME International Mechanical Engineering Congress and Exposition*, Nov. 5-11, 2005, Orlando, Florida (session co-Chair).
82. Complete solutions to polynomial minimization problems with application, *INFORMS Annual Meeting*, San Francisco, November 13-16, 2005.
83. Triality theory and algorithm for solving nonconvex variational problems with applications to phase transitions and chaotic dynamics, 2005 Middle West Numerical Analysis Conference, University of Iowa, May 19-21, 2005.
84. Polarity principle and algorithm for electrodynamics. *Symposium on Developments in Continuum Electrodynamics at The 40th Annual Meeting of Society of Engineering Science*. Ann Arbor, MI, October 12-15, 2003.
85. Complementary principle and algorithm to phase transition in finite deformation solids, *G.A. Maugin Symposium*, Ann Arbor, MI, October 12-15, 2003.
86. Complete solutions and triality to Landau-Ginzburg equations in imperfect ferroelectrics, *The 4th International Conference on Nonlinear Mechanics*, August 13-16, 2002, Shanghai, China.
87. Triality and primal-dual algorithm for ginzburg-landau equation, Symposium on Ginzburg-Landau Equation in Superconductivity and Related Topics at the *Fourth International Conference on Dynamical Systems and Differential Equations*, Wilmington, NC, USA, May 24-27, 2002
88. Generalized min-max theory and sequential canonical dual transformation method, *Symposium on Recent Trends in Nonlinear Analysis*, Wilmington, NC, USA, May 24-27, 2002
89. Triality and new phenomena in non-smooth, non-convex and non-conservative Hamilton systems, Symposium on Hamilton Systems at the *Fourth International Conference on Dynamical Systems and Differential Equations*, Wilmington, NC, USA, May 24-27, 2002
90. Stability and controllability for non-convex distributed-parametrical systems: a duality approach and new phenomena. *Fifth SIAM Conference on Control and Its Applications*, July 11-14, 2001, Town & Country Hotel, San Diego, California, USA

91. Duality reformulation and extended min-max theory for nonsmooth global optimization with applications. *The 17th International Symposium on Mathematical Programming*, Atlanta, August 7-14, 2000.
92. Dual feedback control against chaotic vibrations, *Year 2000 International Conference on Dynamical Systems and Differential Equations*, Kennesaw State University, Atlanta, Georgia, USA, May 18 to 21, 2000
93. General analytic solutions and duality theory for nonconvex variational/boundary value problems with applications in dynamical post-bifurcation of nonlinear structures, *NSF-CBMS Regional Research Conference on Mathematical Control Theory of Coupled Systems of Partial Differential Equations*. Lincoln, Nebraska, August 5-9, 1999.
94. Von Karman's paradox and extended plate theory with applications in post-buckling analysis, *Symposium on Modern Trends in the Foundation of the Theory of Shells and Plates in honor of Professor D. Frederick*, Blacksburg, June 27-30, 1999
95. Post-buckling analysis of nonlinear dynamical thick beam model and dual variational principles, *The 7-th Int. Conf. on Nonlinear Vibrations and Control*, Virginia Tech, June, 1998.
96. *International Conference on Dynamics and Control of Partial Differential Equations*, CIMAT, Guanajuato, Mexico, November 29-30, 1997.
97. *The International ISAAC'97 Congress*, June 3-7, 1997, Delaware, USA.
98. On the triality theory in finite deformation elasticity, *SIAM 45th Anniversary meeting*, Stanford University, July 14-19, 1997
99. *The 16th International Symposium on Mathematical Programming*, Lausanne, Switzerland, August 24-29, 1997. 30 min. invited talk
100. *1996 AMS-IMS-SIAM Summer Research Conference on Optimization Methods in Partial Differential Equations*, June 16-20, 1996, Mount Holyoke, sponsored by AMS. 30 min. invited talk,
101. *U.S.-China Workshop on Mechanics and Manufacturing Science*, Beijing, August, 1996, sponsored by NSF and NNSF of China. 50 min invited talk,
102. *Int. Conf. Complementarity Problems*, Baltimore, MD, Nov. 1-4, 1995. 30 min. invited talk.
103. *The 15th International Symposium in Math. Programming*, Ann Arbor, MI, 1994, 30 min. invited talk and Chair for Variational Inequality and Complementarity Session.
104. *The 4th Int. Conf. of System Research, Informatics and Cybernetics*, Baden-Baden, W. Germany, Aug. 1988. 30 min. invited talk.
105. *The 2nd National Conf. on Engineering Computational Mechanics*, July, 1986, Shanghai, China.
106. *The 1st National Conference on Modern Mathematics and Mechanics*, Beijing University, Aug. 1986. 45 minute invited lecture.
107. *National Congress of Natural Philosophy*, July, 1986, Yellow Mountain, Anhui, 1 hour invited lecture, excellent paper award.

Contributed Talks at Professional Conferences

108. Analytic solution to 3-d finite deformation problems of elasticity, *ASME International Mechanical Engineering Congress and Exposition*, Nov. 5-11, 2005, Orlando, Florida.
109. Canonical dual transformation and algorithm for solving nonconvex variational problems with applications to phase transitions and chaotic dynamics, 2005 International Conference on Scientific Computation and Differential Equations, May 23-27, 2005. Nagoya, Japan.
110. Duality Theory and Analytic Solutions in Phase Transitions with Applications, *2001 Mechanics And Materials Conference*, June 27-29, 2001, Sheraton San Diego Hotel and Marina.
111. *SIAM Annual Meeting*, Westin Rio Mar Beach Resort and Country Club, Puerto Rico, July 10 -14, 2000. Three talks:
 - a. Duality Method for Parametric Controlling of Chaotic Systems: An Potentially Powerful New Approach and Applications,
 - b. Prima-Dual Method and Triality Theory for Nonsmooth Global Optimization and
 - c. General Analytic Solutions and Duality Methods for Fully Nonlinear, Nonsmooth Variational/Boundary Value Problems.
112. Duality control in dynamical post-bifurcation of nonlinear smart beam, *The 8th Conference on Nonlinear Vibrations, Stability and Dynamics of Structures*, July 23-27, 2000. In Honor of Dean T. Mook and Friedrich Pfeiffer on the Occasion of their 65th Birthday Virginia Polytechnic Institute and State University Blacksburg, Virginia
113. Canonical dual transformation and generalized Caratheodory condition in global optimization, *International Conference On Advances In Convex Analysis And Global Optimization*, Honoring the memory of C. Caratheodory (1873-1950) June 5-9, 2000 - Pythagorion, Samos, Greece.
114. Triality theory and general solutions for nonconvex/nonsmooth variational problems with applications in nonconvex dynamics and differential geometry *Sixteenth Southeastern Analysis Meeting* March 17-18, 2000, Dept. of Math., University of Virginia.
115. Duality and Triality in Nonconvex-Nonsmooth Systems: A Powerful Approach for Nonlinear Phenomena with Applications *Perspectives in Applied Mathematics: A Scientific Conference in Honor of Gil Strang on the Occasion of his 65th Birthday*. Cambridge, MA, USA December 3-4, 1999.
116. Analytic solutions for 3-D nonconvex-nonsmooth finite deformation elastoplasticity with applications in Nonsmooth-Nonconvex Mechanics, International Symposium in Honor of P.D. Panagiotopoulos. Virginia Tech, June 27-29, 1999 (Symposium organizer).
117. Minimax and triality theory in nonconvex, nonsmooth optimization with applications *Sixth SIAM Conference on Optimization*, Sheraton Atlanta Hotel, Atlanta, Georgia, May 10-12, 1999
118. Analytic solutions and duality theory in fully nonlinear partial differential systems with applications, *1999 SIAM Annual Meeting* (PDE session Chair) Sheraton Atlanta Hotel, Atlanta, Georgia, May 12-15, 1999

119. Post-buckling analysis of nonlinear dynamical thick beam model and dual variational principles, *The 7-th Int. Conf. on Nonlinear Vibrations and Control*, Virginia Tech, June, 1998.
120. On the Hellinger-Reissner's Open Problem and the General Analytic Solution in Finite Deformation Theory. *Thirteenth US Congress of Appl. Mechanics*, Gainesville, Florida, June 21-26, 1988.
121. *Fifth Pan American Congress on Applied Mechanics*, January, 2-4, 1997, San Juan, Puerto Rico.
122. *14th U.S. Army Symposium on Solid Mechanics*, 16-18 October, 1996, Myrtle Beach, South Carolina.
123. *Symposium on Nonlinear Elasticity in Honor of J.L. Eriksen, ASME Mechanics and Materials Conference*, The Johns Hopkins University, Baltimore, MD, June 12-14, 1996. 25 min. invited talk.
124. *The 18th Southeastern Conference on Theoretical and Applied Mechanics*, April 14-16, 1996, Tuscaloosa, AL.
125. *SIAM Annual Meeting*, Three contributed talks, Charlotte, NC, Oct. 23-26, 1995
126. *SIAM Annual Meeting*, San Diego, CA, July 25-29, 1994.
127. *The 17th Southeastern Conference on Theoretical and Applied Mechanics*, Hot Springs National Park, Arkansas, April 10-12, 1994.
128. *Int. Conf. Computational Methods in Structural and Geotechnical Engineering*, Hong Kong, Dec. 12-14, 1994. Invited by the Conference Chairman.
129. *Int. Sym. Methods and Appl. of Analysis*, Hong Kong, Dec. 16-19, 1994
130. *The 3rd SIAM Conference on Geometric Design*, Nov. 1993, Tempe, Arizona. Chair for Surface Modeling session.
131. *The 2nd Int. Conf. Indust. Appl. Math.*, Washington, D.C. USA, July, 1991.
132. *The 17th Int. Union of Theoretical & Applied Mechanics*, Grenoble, France, Aug. 1988.
133. *The 20th Midwestern Mechanics Conference*, Purdue University, 1987.
134. *International Conference on Nonlinear Mechanics*, Shanghai, May, 1985.
135. *The 2nd National Conference on Plastic Forming*, October 10-15, 1981, Jinan, Shandong.