

YONGWU RONG

Professor of Mathematics
Queens College and the Graduate Center, CUNY

Contact Information

Professor of Mathematics
Department of Mathematics
Queens College, CUNY
Flushing, NY 11367
yrong@qc.cuny.edu
(718) 997-5850 (w)

Doctoral Faculty
Mathematics Program
The Graduate Center, CUNY
New York, NY 10016
yrong1@gc.cuny.edu
212-817-8554

<https://yrong.commonscs.gc.cuny.edu/>

Education

Ph.D. in Mathematics, University of Texas at Austin, 1989

B.S. in Mathematics, University of Science & Technology of China, 1983

Professional Experience

Academic Appointments

- Doctoral Faculty, CUNY Graduate Center, 2020–current
- Professor, Queens College, CUNY, 2019 –
- Professor, The George Washington University, 2006 –
Associate Professor, The George Washington University, Fall 1998 - Spring 2006.
Assistant Professor, The George Washington University, Fall 1992 - Spring 1998.
- Research Postdoctoral, Michigan State University, Fall 1989 - Spring 1992.

Visiting Appointments

- Member, Institute for Advanced Study, Princeton, Spring 1999.
- Visiting Researcher, University of Texas at Austin, Summer 1990.

Administrative Appointments

- Associate Provost for Research and International Programs, Queens College, CUNY, 2019 – 2020
- Associate Dean for Research & Strategic Initiatives, Columbian College of Arts and Sciences, The George Washington University, 2014 – 2019.
- Founding Director, The George Washington Institute for Mathematical Sciences, 2011 – 2019.
- Chair, Department of Mathematics, George Washington University, 2011 – 2014.

- Program Director, National Science Foundation. 2001-2003, 2006, 2009 - 2011.

Grants

Selected Major External Grants

- PI. *EXTREEMS-QED: GW Mathematics and Statistics Training, Education, & Research (MASTER)*, with four co-PIs: M. Gualdani, M. Gupta, Y. Lai, and R. Simha, National Science Foundation, DMS-1406984. 2014-2018, \$600,000.
- PI. *JUMP: Joint Undergraduate Mathematics and Physics Scholarships at GW*, with four co-PIs: G. Feldman, L. Medsker, S. Roudenko, and D. Ullman, National Science Foundation, DUE-1259858, 2013-2018, \$614,440.
- Co-PI. *CDI Type II: Collaborative Research: Understanding Complex Biological Networks: A Process Viewpoint*. Co-Principle Investigator, with Chen Zeng (PI), Rahul Simha (Co-PI), National Science Foundation, CMMI-0941228. 2009-2013 (extended to 2014). \$ 1,199,927.
- PI. *Homological Algebra Methods in Topology and Combinatorics*. National Science Foundation grant, DMS-0513918, 2005-2008. \$108,000.

Other grants include conference grants for Knots in Washington from NSF (as co-PI), undergraduate summer research grants from NIST (as PI), educational grants from NSF and from FIPSE (co-PI), undergraduate conference grants from MAA (as PI and as co-PI).

Total amount of external awards obtained: \$1.8+ million as PI, and \$3.3+ million as PI or co-PI.

Selected Internal Grants (from GWU)

- Co-Principal Investigator. *Deep Learning in Big Data Analytics, Series I-II*, with C. Zeng (PI) and L. Medsker (co-PI). GW University Seminars Series Competition, \$2,200 for 2016-17 and \$2,200 for 2017-18.
- PI. *George Washington Institute for Mathematical Sciences*, with six co-PIs: M. Alekseyev (for 2014-16), Y. Lai, X. Ren, E. A. Robinson, S. Roudenko, and C. Zeng. The GW Center and Institute Facilitating Fund (CIFF), 2012-2014 and 2014- 2016. \$170,000 total.
- PI. *GWU Mathematical Application*. with various co-PIs: Y. Lai (2010-13), E. A. Robinson (2009-13), and S. Roudenko (2012-13), G. Wang (2010-11), C. Zeng (2010-13), GW University Seminars Series Competition, 2008-2013, \$9,500 for 4 awards.
- PI for several GW University Facilitating Fund, Columbian College Facilitating Fund award, and the Junior Scholar Incentive Award, GWU, 2014-15, 2013-14, 2009-10, 2001-02, 1995-96, 1994-95.

Publications

Refereed research papers

1. **Y. Rong** and Z. Shen, "A generalization of Hadamard's determinantal inequality," *J. China Univ. Sci. Tech.* 13, No.2, Math. Issue (1983) 272-274.
2. **Y. Rong**, "Continuous linear functionals on the F-space $C_\infty[a, b]$," *J. China Univ. Sci. Tech.* 14 No.1 (1984) 166-169.
3. **Y. Rong**, "The Kauffman polynomial and the two-fold cover of a link," *Indiana Univ. Math. Journ.* Vol. 40 No. 1 (1991) 321-331.
4. **Y. Rong**, "Degree one maps between geometric three-manifolds," *Trans. Amer. Math. Soc.* Vol. 332 No. 1, (1992) 411-436.
5. **Y. Rong** and S. Wang, "The preimages of submanifolds," *Mathematical Proceedings of the Cambridge Philosophical Society*, 112 (1992) 271 -279.
6. **Y. Rong**, "Maps between Seifert fibered spaces of infinite π_1 ," *Pacific Journal of Mathematics*, Vol. 160 No. 1 (1993) 143 -154.
7. **Y. Rong**, "Some knots not determined by their complements," *Quantum Topology, Series of Knots and Everything*, Vol. 3, edited by L. Kauffman and R. Baadhio. (1993) 339-353.
8. **Y. Rong**, "Mutation and Witten invariants," *Topology*, Vol. 33, No. 3 (1994) 499-507.
9. **Y. Rong**, "Degree one maps of Seifert manifolds and a note on Seifert Volume," *Topology and Its Applications*, 64 (1995) 191-200.
10. **Y. Rong**, "Link Polynomials of higher order," *Journ. London Math. Soc.* (2) 56 (1997) 189-208.
11. W. B. R. Lickorish and **Y. Rong**, "On derivatives of link polynomials," *Topology and Its Applications*, 87 (1998) 63-71.
12. I. Kofman and **Y. Rong**, "Approximating Jones coefficients and other link invariants by Vassiliev invariants," *Journ. Knot Theory and Its Ramifications*, Vol. 9, No. 7 (2000) 955-966.
13. M. McDaniel and **Y. Rong**, "Vassiliev invariants from satellites of link polynomials," *Kobe Journal of Mathematics*, 18 (2001) 127-145.
14. **Y. Rong**, "Linear independence of derivatives of link polynomials," *Topology and Its Applications*, 117 (2002) 191-198.
15. L. Helme-Guizon and **Y. Rong**, "A categorification for the chromatic polynomial," *Algebraic and Geometric Topology* (2005) 1365-1388.
16. L. Helme-Guizon, J. Przytycki, and **Y. Rong**, "Torsions in graph cohomology," *Fundamenta Mathematicae*, 190 (2006) 139-177.
17. K. Luse and **Y. Rong**, "Examples of Knots with the Same Polynomials," *Journ. Knot Theory and Its Ramifications*, 15 (2006) 749-759.
18. F. Jasso-Hernandez and **Y. Rong**, "A categorification for the Tutte polynomial," *Algebraic and Geometric Topology*, 6 (2006) 2031-2049.
19. M. Chmutov, S. Chmutov, and **Y. Rong**, "Knight moves for chromatic graph homology," *European Journal of Combinatorics*, 29, No. 1, (2008) 311-321.
20. L. Chen and **Y. Rong**, "Linear Time Recognition Algorithms for Topological Invariants in 3D Digital Spaces." *Pattern Recognition, 19th International Conference on Pattern Recognition* (2008) 1-4.

21. L. Chen and **Y. Rong**, “Digital Topological Method for Computing Genus and the Betti Numbers,” *Topology and Its Applications*, 157 (2010) No. 12, 1931-1936.
22. G. Wang, C. Du, H. Chen, R. Simha, **Y. Rong**, Y. Xiao, and C. Zeng, “Process-Based Network Decomposition Reveals Backbone Motif Structure,” *Proceedings of the National Academy of Sciences*, Vol 107 (2010) No. 23, 10478-10483.
23. K. Luse and **Y. Rong**, “A categorification for the Penrose polynomial,” *Journ. Knot Theory and Ramification*, 1 (2011) 141-157.
24. **Y. Rong**, C. Zeng, C. Evans, H. Chen, and G. Wang, “Topology and dynamics of Boolean networks with strong inhibition,” *Journal Discrete and Continuous Dynamical Systems, Series S*. Vol. 4 (6), 2011, 1565-1575.
25. L. Helme-Guizon and **Y. Rong**, “Khovanov type homologies for graphs,” *Kobe J. Math.*, Vol. 29 (2012) 2543.
26. G. Wang, **Y. Rong**, H. Chen, C. Pearson, C. Du, R. Simha, and C. Zeng, “Process-Driven Inference of Biological Network Structure: Feasibility, Minimality, and Multiplicity,” *PLoS ONE* 7(7): e40330. doi:10.1371/journal.pone.0040330.
27. J. Yang, B. Zhang, C. Liang, **Y. Rong**, "A High-Order Flux Reconstruction Method with Adaptive Mesh Refinement and Artificial Diffusivity on Unstructured Moving/Deforming Mesh for Shock Capturing," *Computers & Fluids*, 2016, <http://dx.doi.org/10.1016/j.compfluid.2016.03.025>
28. B. Zhang, C. Liang, J. Yang, **Y. Rong**, "A 2D Parallel High-Order Sliding and Deforming Spectral Difference Method," *Computers and Fluids* (2016), <http://dx.doi.org/10.1016/j.compfluid.2016.06.019>
29. P. Avdeyev, N. Alexeev, **Y. Rong**, and M. A. Alekseyev., “A Unified ILP Framework for Genome Median, Halving, and Aliquoting Problems under DCJ,” Proceedings of the 15th Annual RECOMB Satellite Workshop on Comparative Genomics (RECOMB-CG 2017), J. Meidanis and L. Nakhleh, editors, *Lecture Notes in Computer Science* 10562 (2017), 156–178.
30. Pavel Avdeyev, Nikita Alexeev, **Yongwu Rong**, Max Alekseyev, A Unified ILP Framework for Core Ancestral Genome Reconstruction Problems, *Bioinformatics*, btaa100 (2020). <https://doi.org/10.1093/bioinformatics/btaa100>
31. S. Aganezov, P. Avdeyev, N. Alexeev, **Y. Rong**, and M. A. Alekseyev. "Orienting Ordered Scaffolds: Complexity and Algorithms", *SN Computer Science* 3 (2022), 308. doi:[10.1007/s42979-022-01198-7](https://doi.org/10.1007/s42979-022-01198-7) arXiv:[1911.11190](https://arxiv.org/abs/1911.11190)

Patents

- L. Chen and Y. Rong, Computing genus and homology groups in 3D digital space, US Patent # 8,478,025 B2 - 2013.
(This patent was built on my joint work with Dr. Li Chen on topology and imaging. I provided mathematical input, and Dr. Chen submitted the patent application, which has been approved by US Patent Office)

Selected Invited Talks

- *Degree one maps between geometric 3-manifolds*, AMS meeting -Special session on Low Dimensional Topology and Combinatorial Groups, Portland, Oregon,

June 1991.

- *3-Manifolds with the same Witten invariants*, Midwest Geometry Conference, May 1993.
- *Link polynomials and Vassiliev Invariants*, Summer workshop in low dimensional topology, Beijing University, Beijing, P. R. China, June 1994.
- *Vassiliev invariants coming from link polynomials*, Chinese University of Hong Kong, November 1997.
- *Degree one maps between 3-manifolds*, Colloquium, Peking University, Beijing, China, April 1999.
- *Quantum invariants in dimension three*, Colloquium, University of Science & Technology of China, Hefei, China, April 1999.
- *Subspaces in the space of Vassiliev invariants*, Knots in Montreal Conference, Montreal, Canada, April 2001.
- *Constructing Links with the same polynomial*, four lectures at the International Workshop on Low Dimensional Topology, Harbin, China, July 2001.
- *Homological Algebra Methods in Graph Theory*, Mathematics Colloquium, University of South Florida, Tampa, Florida, March 2005.
- *A quadruply-graded graph homology for the Bollobas-Riordan polynomial*. Knots in Washington XXI, Washington, DC, December 2005.
- *Khovanov type homology theories for graphs*. International Conference Categorifications in Algebra and Topology, Uppsala, Sweden, September 2006.
- *Homological algebra methods in graph theory*. Colloquium, University of Oklahoma, Norman, OK; and *Categorifications in graph theory*. Colloquium, Oklahoma State University, Stillwater, OK, October 2006.
- *Feynman diagrams and transition polynomial*. Knots in Washington Conference XXIV; Dedicated to the memory of Xiao-Song Lin, Washington, DC, April 2007.
- *Khovanov type homologies for graphs*. Geometric Topology 2007, Beijing, China, June 2007.
- *Feynman diagrams, RNA folding, and the transition polynomial*. Workshop on Algebraic Methods in System Biology and Statistics, SAMSI, Research Triangle, North Carolina, September 2008
- *Mathematics is Beautiful, Mathematics is Useful! -A quick trip from diamonds to the universe through polyhedral*. Guest speaker for the Pi Mu Epsilon Society induction ceremony at the College of William and Mary. March 2010.
- *Categorifications for Graph Polynomials*. 2012 Shanghai Conference on Algebraic Combinatorics, Shanghai, August 2012.
- *Topology and Dynamics of Biological Networks*. The sixth International Congress of Chinese Mathematicians (ICCM), Taipei, Taiwan, July 2013.
- *Applied Pure Mathematics*. Colloquium talk, James Madison University, October 2013.
- *A Unified ILP Framework for Genome Median, Halving, and Aliquoting Problems under DCJ*, with P. Avdeyev, the 15th Annual RECOMB Satellite Workshop on Comparative Genomics (RECOMB-CG 2017), October 2017.

Advising

Ph.D. Dissertation Supervision

- Michael E. McDaniel, 1997.
Dissertation title: *Subspaces of Vassiliev invariants using cabling*.
Placement: Currently Professor and Chair at the Aquinas College in Michigan.
- Laure Helme-Guizon, 2005.
Dissertation title: *A categorification of the chromatic polynomial*.
Placement: Consultant for urban projects in the Republic of Madagascar.
- E. Fanny Jasso-Hernandez, 2007.
Dissertation title: *A homological algebra approach to the Tutte polynomial*.
Placement: Institute of Mathematics, Universidad Nacional Autónoma de México (UNAM) in Mexico.
- Kerry Luse, 2008.
Dissertation title: *Invariants of Knots, Graphs, and Feynman Diagrams*.
Placement: Currently Clare Boothe Luce Associate Professor of Mathematics at the Trinity Washington University in Washington, DC.
- Harpreet Bedi, 2018
(I am the lead advisor with Jozef Przytycki being a co-advisor)
Dissertation title: *Cohomology of Line Bundles with Rational Degree*
Placement: Assistant Professor of Mathematics at Alfred University
- In addition, I provided informal advising for Ilya Kofman, (2000 Ph.D. from University of Maryland at College Park under Bill Goldman, currently a Professor of Mathematics at CUNY College of Staten Island and at the CUNY Graduate Center).
Dissertation title: *Vassiliev invariants of knots and links in S^3 and other 3-manifolds*.

Postdoc Supervision

- Jeremy Trageser, GWIMS Postdoc. Postdoc supported by the George Washington Institute for Mathematical Sciences (GWIMS). I provided funding and mentoring for the postdoc. Fall 2015 – Spring 2017.
Currently at the Sandia National Laboratories
- Gabriel Montoya-Vega, NSF MPS-Ascend Postdoc, CUNY Graduate Center, supported by NSF MPS-Ascend Program, Fall 2022 – Spring 2025.

Senior Thesis Advisor

- Amy L. Nagahashi, 2001
Thesis: *Billiard Links in the 3-Ball*.
Currently at the National Security Agency.

Selected Professional Services and other leaderships

- Reviewer and panel member for the National Science Foundation, the National Defense Science and Engineering Graduate (NDSEG) Fellowship, the Georgian National Science Foundation, the Chinese National Science Foundation, the Russian Open Grant Competition etc.
- Judge for the Siemens National Competition, December 2012 and December 2016. Lead Judge for the Siemens National Competition, December 2015.
- Co-Founder (with J. Przytycki) and Co-Organizer for the Knots in Washington conference, held twice a year since fall 1995.
- Organizer for various AMS special sessions.
- Co-Founder (with M. Emelianenko, S. Roudenko, and P. Shi) and Co-Organizer for the Undergraduate Mathematics Conference, April 2012, and April 2013.
- External Reviewer for several universities.

Hobbies

- **Music:** classical and 1960's.
- **Sports:** soccer, tennis, running (men's 1500m gold medalist in college, marathon runner and Boston Marathon Qualifier)