

# Curriculum Vitae - Henry Liu

## Personal

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## Research Interests

I am interested in many areas in Graph Theory and Combinatorics, including extremal graph theory, connectivity in graphs, colourings of graphs, probabilistic combinatorics, hypergraphs, algebraic graph theory, and discrete geometry.

## Positions Held

2025 to present	Associate Professor, Beijing Normal-Hong Kong Baptist University, Zhuhai, China.
2017 to 2024	Associate Professor, Sun Yat-sen University, Guangzhou, China.
2015 to 2017	Post-doctoral researcher, Central South University, Changsha, China.
2009 to 2014	Post-doctoral researcher, Universidade Nova de Lisboa, Lisbon, Portugal.
2007 to 2008	Marie Curie experienced researcher, University College London, London, UK.
2006 to 2007	Post-doctoral researcher, Universitat Politècnica de Catalunya, Barcelona, Spain.
2006	Post-doctoral researcher, Alfréd Rényi Institute of Mathematics, Budapest, Hungary.
2001 to 2006	Graduate instructor, The University of Memphis, Memphis, USA.

## Visiting Positions

2024	Alfréd Rényi Institute of Mathematics, Budapest, Hungary (July).
2023	Shanghai Jiao Tong University, Shanghai, China (November).
2023	University of Cambridge, Cambridge, UK (July to August).
2019	Nankai University, Tianjin, China (July).
2018	Ajou University, Suwon, South Korea (August).
2017	Korea Advanced Institute of Science and Technology, Daejeon, South Korea (June).
2017	Ajou University, Suwon, South Korea (June).
2017	Fudan University, Shanghai, China (March).
2016	Yokohama City University, Yokohama, Japan (April to May).
2015 to 2016	Nankai University, Tianjin, China (November and December 2015, March, June and October 2016).
2009	Gunma National College of Technology, Maebashi, Japan (May to July).
2007	Universidad de Alcalá, Alcalá de Henares, Spain (June).
2006	National University of Singapore, Singapore (May to June).
2005	Microsoft Research, Redmond, USA (May).
2005	University of Washington, Seattle, USA (March to May).
2004	Eidgenössische Technische Hochschule (ETH), Zürich, Switzerland (May to July).
2002	University of Cambridge, Cambridge, UK (August to December).
2002	Microsoft Research, Redmond, USA (May to June).

## University Education

2001 to 2006	PhD in Mathematics, The University of Memphis, USA. Advisor: Prof. Béla Bollobás. Dissertation title: Recent Extremal Problems in Combinatorics.
2000 to 2001	Certificate of Advanced Study in Mathematics (Part III of the Mathematical Tripos), University of Cambridge, UK (College: Trinity College).
1999 to 2000	MSci in Mathematics, University College London, UK.
1996 to 1999	BSci in Mathematics, University College London, UK.

## Academic Experience

2025 to present	Beijing Normal-Hong Kong Baptist University, China. Teaching undergraduates, including Calculus and Linear Algebra.
2017 to 2024	Sun Yat-sen University, China. Teaching graduates and undergraduates, including Differential Geometry, Functional Analysis, Numerical Approximation Theory, Liberal Arts Mathematics, Optimisation Theory, Algorithm Design and Complexity, Operations Research, Stochastic Operations Research, and Computer Graphics. Thesis supervisor at master and PhD level.
2010 to 2011	Universidade Nova de Lisboa, Portugal. Thesis supervisor at master level.
2001 to 2006	The University of Memphis, USA. Teaching undergraduates, including College Algebra, Foundations of Mathematics, and Elementary Calculus.

## Research Fellowships and Awards

- 2020 Research fellowship (reference: 11931002), awarded by National Natural Science Foundation of China, Sun Yat-sen University, Guangzhou, China, 800,000 Chinese Yuan.
- 2016 Research fellowship (reference: 2016T90756), awarded by China Postdoctoral Science Foundation, Central South University, Changsha, China, 150,000 Chinese Yuan.
- 2015 Research fellowship (reference: 2015M580695), awarded by China Postdoctoral Science Foundation, Central South University, Changsha, China, 80,000 Chinese Yuan.
- 2015 Research fellowship, awarded by International Cooperation Interchange Plan of Central South University, Central South University, Changsha, China, 600,000 Chinese Yuan.
- 2014 Research fellowship (reference: PEst-OE/MAT/UI0297/2014), awarded by Portuguese Science Foundation, Universidade Nova de Lisboa, Lisbon, Portugal.
- 2011 Research fellowship (reference: PEst-OE/MAT/UI0297/2011), awarded by Portuguese Science Foundation, Universidade Nova de Lisboa, Lisbon, Portugal.
- 2010 Research fellowship (reference: PTDC/MAT/113207/2009, FCT/MCTES/PT), awarded by Portuguese Science Foundation, Universidade Nova de Lisboa, Lisbon, Portugal, 18,000 Euros.
- 2009 Research fellowship (reference: 2008 ISFL-1-297, FCT/MCTES/PT), awarded by Portuguese Science Foundation, Universidade Nova de Lisboa, Lisbon, Portugal.
- 2007 Research fellowship awarded by the “Phenomena in High Dimensions: in analysis, combinatorics, convexity, probability and mathematical physics” project (a Marie Curie Research Training Network), University College London, London, UK, 30,000 UK Pounds.
- 2006 Research fellowship awarded by the “Combinatorial Structure of Intractable Problems” project, Universitat Politècnica de Catalunya, Barcelona, Spain.
- 2006 Research fellowship awarded by the “Combinatorial Structure of Intractable Problems” project, Alfréd Rényi Institute of Mathematics, Budapest, Hungary.
- 2000 Studentship in Mathematics, awarded by Trinity College Cambridge, Cambridge, UK, 1,000 UK Pounds.
- 1997 Fillon prize (for examination performance), awarded by University College London, London, UK.

## Research Papers (corresponding author indicated by \*)

38. P. Hu, T. Lan, H. Liu\*, *Degree powers in graphs with a forbidden bipartite graph*, preprint.
37. W. Li, H. Liu\*, *Interval edge-colouring of circulant graphs*, preprint.
36. Y. Shi, S. Fujita, H. Liu\*, *The size of digraphs with restricted rainbow connection number*, preprint.
35. Y. Shi, H. Liu\*, *Star colouring of circulant graphs*, preprint.
34. H. Liu\*, *Rainbow cycles through specified vertices*, submitted.
33. P. Siriwong, R. Boonklurb, H. Liu\*, S. Singhun, *Cops and Robber on Cartesian products and some classes of hypergraphs*, submitted.
32. R. Tang, H. Liu\*, Y. Shi, C. Wang, *List rainbow connection number of graphs*, *Discrete Appl. Math.* 389 (2026), 157–173.
31. Q. Cai, S. Fujita, H. Liu\*, B. Park, *Monochromatic  $k$ -connection of graphs*, *Discrete Appl. Math.* 360 (2025), 328–341.
30. S. Fujita\*, H. Liu, B. Park, *The size of graphs with restricted rainbow 2-connection number*, *J. Combin. Math. Combin. Comput.* 116 (2020), 183–200.
29. H. Liu, C. Magnant\*, A. Saito, I. Schiermeyer, Y. Shi, *Gallai-Ramsey number for  $K_4$* , *J. Graph Theory* 94 (2020), 192–205.
28. Y. Lan, H. Liu, Z. Qin, Y. Shi\*, *Degree powers in graphs with a forbidden forest*, *Discrete Math.* 342 (2019), 821–835.
27. H. Liu\*, T. Sousa, *Turán function and  $H$ -decomposition problem for gem graphs*, *Discuss. Math. Graph Theory* 38 (2018), 717–741.
26. S. Fujita, H. Liu\*, A. Sarkar, *Highly connected subgraphs of graphs with given independence number*, *European J. Combin.* 70 (2018), 212–231.
25. L. Chen, X. Li, H. Liu, J. Liu\*, *On various (strong) rainbow connection numbers of graphs*, *Australas. J. Combin.* 70 (2018), 137–156.
24. H. Lei, H. Liu\*, C. Magnant, Y. Shi, *Total rainbow connection of digraphs*, *Discrete Appl. Math.* 236 (2018), 288–305.

## Research Papers (continued) (corresponding author indicated by \*)

23. H. Lei, S. Li, H. Liu\*, Y. Shi, *Rainbow vertex connection of digraphs*, J. Comb. Optim. 35 (2018), 86–107.
22. L. Feng, P. Zhang, H. Liu, W. Liu\*, M. Liu, Y. Hu, *Spectral conditions for some graphical properties*, Linear Algebra Appl. 524 (2017), 182–198.
21. H. Liu, T. Sousa\*, *Decompositions of graphs into fans and single edges*, J. Graph Theory 85 (2017), 400–411.
20. X. Yang, W. Liu\*, H. Liu, L. Feng, *Incidence graphs constructed from  $t$ -designs*, Appl. Anal. Discrete Math. 10 (2016), 457–478.
19. S. Fujita\*, H. Liu, A. Sarkar, *Highly connected subgraphs of graphs with given independence number (extended abstract)*, Discrete Mathematics Days - JMADA16, Electron. Notes Discrete Math. 54 (2016), 103–108.
18. L. Feng, J. Cao, W. Liu\*, S. Ding, H. Liu, *The spectral radius of edge chromatic critical graphs*, Linear Algebra Appl. 492 (2016), 78–88.
17. H. Liu, O. Pikhurko, T. Sousa\*, *Monochromatic clique decompositions of graphs*, J. Graph Theory 80 (2015), 287–298.
16. S. Fujita, H. Liu\*, C. Magnant, *Monochromatic structures in edge-coloured graphs and hypergraphs - a survey*, Int. J. Graph Theory Appl. 1 (2015), 3–56.
15. S. Fujita, H. Liu\*, C. Magnant, *Rainbow  $k$ -connection in dense graphs*, J. Combin. Math. Combin. Comput. 93 (2015), 33–52.
14. H. Liu\*, Á. Mestre, T. Sousa, *Total rainbow  $k$ -connection in graphs*, Discrete Appl. Math. 174 (2014), 92–101.
13. R.P. Carpentier, H. Liu\*, M. Silva, T. Sousa, *Rainbow connection for some families of hypergraphs*, Discrete Math. 327 (2014), 40–50.
12. H. Liu, T. Sousa\*, *Monochromatic  $K_r$ -decompositions of graphs*, J. Graph Theory 76 (2014), 89–100.
11. H. Liu\*, Á. Mestre, T. Sousa, *Rainbow vertex  $k$ -connection in graphs*, Discrete Appl. Math. 161 (2013), 2549–2555.
10. H. Liu, T. Sousa\*, *Monochromatic  $K_r$ -decompositions of graphs (extended abstract)*, Electron. Notes Discrete Math. 43 (2013), 121–127.
9. S. Fujita, H. Liu\*, *The balanced decomposition number of  $TK_4$  and series-parallel graphs*, Discuss. Math. Graph Theory 33 (2013), 347–359.
8. S. Fujita, H. Liu\*, C. Magnant, *Rainbow  $k$ -connection in dense graphs (extended abstract)*, Proceedings of EuroComb '11, Electron. Notes Discrete Math. 38 (2011), 361–366.
7. S. Fujita, H. Liu\*, *Further results on the balanced decomposition number*, Proceedings of the Forty-First Southeastern International Conference on Combinatorics, Graph Theory and Computing, Congr. Numer. 202 (2010), 119–128.
6. S. Fujita, H. Liu\*, *The balanced decomposition number and vertex connectivity*, SIAM J. Discrete Math. 24 (2010), 1597–1616.
5. H. Liu, Y. Person\*, *Highly connected coloured subgraphs via the regularity lemma*, Discrete Math. 309 (2009), 6277–6287.
4. H. Liu, R. Morris\*, N. Prince, *Highly connected monochromatic subgraphs of multicoloured graphs*, J. Graph Theory 61 (2009), 22–44.
3. H. Liu, R. Morris\*, N. Prince, *Highly connected multicoloured subgraphs of multicoloured graphs*, Discrete Math. 308 (2008), 5096–5121.
2. H. Liu, *A new lower bound for the convex decomposition number of point sets in the plane*, manuscript.
1. H. Liu, R. Morris, N. Prince, *Highly connected monochromatic subgraphs of multicoloured graphs: addendum*, manuscript.

## Selected Conference Talks

- *Rainbow cycles through specified vertices*, Sum(m)it 280, on the occasion of the 70th birthdays of Peter Frankl, Zoltán Füredi, Ervin Györi and János Pach, Alfréd Rényi Institute of Mathematics, Budapest, Hungary (2024).
- *Degree powers in graphs forbidding broom forests and double brooms*, Eleventh Shanghai Conference on Combinatorics, Shanghai Jiao Tong University, Shanghai, China (2024).
- *Monochromatic  $k$ -connection of graphs*, Eighth Workshop on Graph Theory and Combinatorics, Shanghai Jiao Tong University, Shanghai, China (invited speaker) (2023).
- *Connected subgraphs in coloured graphs: recent developments*, The 3rd East Asia Workshop on Extremal and Structural Graph Theory, Okinawa, Japan (invited speaker) (2023).
- *Degree powers in graphs with a forbidden forest*, 1147th Meeting of the AMS, Special Session in Structural Graph Theory, University of Hawai'i at Mānoa, Honolulu, USA (2019); and The Japanese Conference on Combinatorics and its Applications (JCCA 2018) in Sendai, Sendai, Japan (2018).

## Selected Conference Talks (continued)

- *Highly connected subgraphs in sparse graphs*, The 16th KIAS Combinatorics Workshop, Korea Institute for Advanced Study, Seoul, South Korea (invited speaker); Young Graph Theorists Workshop, Fudan University, Shanghai, China (both in 2017); The Third Sino-Japan Symposium on Graph Theory, Combinatorics and their Applications, Northwestern Polytechnical University, Xi'an, China; 2016 International Conference on Graph Theory, Combinatorics and Applications, Zhejiang Normal University, Jinhua, China (invited speaker); and The Japanese Conference on Combinatorics and its Applications (JCCA 2016) in Kyoto, Kyoto University, Kyoto, Japan (all in 2016).
- *Connected subgraphs in edge-coloured graphs*, Workshop on Graph Theory and Combinatorial Optimization, Nankai University, Tianjin, China (invited speaker) (2015).
- *Rainbow connection in hypergraphs*, Bordeaux Graph Workshop, LaBRI, Université Bordeaux 1, Talence, France (2012).
- *Rainbow  $k$ -connection in dense graphs*, EuroComb '11, Eötvös Loránd University, Budapest, Hungary (2011).
- *The balanced decomposition number of a graph*, 8th French Combinatorial Conference, Université de Paris XI - Sud, Orsay, France; and 41st Southeastern International Conference on Combinatorics, Graph Theory and Computing, Florida Atlantic University, Boca Raton, USA (both in 2010).
- *Highly connected coloured subgraphs and the regularity lemma*, Additive Combinatorics in Lisbon, Universidade de Lisboa, Lisbon, Portugal (2010).
- *Some favourite problems*, Doc-Course on Random and Quasirandom Graphs, Humboldt-Universität zu Berlin, Berlin, Germany (2008).
- *Highly connected subgraphs in multicoloured graphs*, COMBSTRU Final Workshop, Universitat Politècnica de Catalunya, Barcelona, Spain; Horizon of Combinatorics, Lake Balaton, Hungary (both in 2006); and PIMS-MITACS Summer School in Probability, University of British Columbia, Vancouver, Canada (2005).

## Conferences Attended

Since 2002, I have participated in more than 50 conferences. In addition to the above conferences, I have attended every edition of the Erdős Lecture Series from 2002 to 2019, held at The University of Memphis, USA. Other conferences that I have attended include the following.

- 200 Years of Trinity Combinatorics, on the occasion of the 80th birthday of Béla Bollobás, and 60th birthdays of Timothy Gowers and Imre Leader, University of Cambridge, Cambridge, UK (2023).
- Combinatorics in Cambridge, on the occasion of the 70th birthday of Béla Bollobás, University of Cambridge, Cambridge, UK (2013).
- Random Graphs and Large-Scale Real-World Networks, National University of Singapore, Singapore (2006).
- 1011th Meeting of the AMS, University of Nebraska-Lincoln, Lincoln, USA (2005).
- Models of Real-World Random Networks, Mathematical Sciences Research Institute, Berkeley, USA (2005).
- Phase Transitions in Computation and Reconstruction, Mathematical Sciences Research Institute, Berkeley, USA (2005).
- Mathematics in Zürich, on the occasion of the 40th anniversary of FIM, ETH, Zürich, Switzerland (2004).
- Workshop de Combinatória, Probabilidade e Computação, IMPA, Rio de Janeiro, Brazil (2004).
- Combinatorics in Cambridge, on the occasion of the 60th birthday of Béla Bollobás, University of Cambridge, Cambridge, UK (2003).
- Workshop on Extremal Graph Theory, on the occasion of the 60th birthday of Miklós Simonovits, Alfréd Rényi Institute of Mathematics, Budapest and Csopak, Hungary (2003).
- Expansion Methods in Combinatorics (a series of lectures given by Christian Borgs, Microsoft Research, as part of 2003 NSF-CBMS Regional Research Conferences), The University of Memphis, Memphis, USA (2003).
- Combinatorics, Graph Theory and Applications, Hong Kong University of Science and Technology, Hong Kong (Satellite conference of ICM 2002) (2002).
- Random Graphs and Structures, workshop at Isaac Newton Institute, Cambridge, UK (2002).

## Selected Seminar Talks and Presentations

- At Beijing Normal University (Zhuhai), I gave the talk *Recent developments in bootstrap percolation*.
- At Beijing Normal-Hong Kong Baptist University, I gave the talk *Some applications of combinatorics*.
- At Sun Yat-sen University, I gave the talk *Degree powers in graphs with a forbidden forest*.
- At Northwestern Polytechnical University, I gave the talk *Rainbow connection of digraphs*.
- At Korea Advanced Institute of Science and Technology, University of Cambridge, and Nankai University, I gave the talk *Highly connected subgraphs in sparse graphs*.
- At Sun Yat-sen University, Ajou University, Simon Fraser University, and Central South University, I gave the talk *Connected subgraphs in edge-coloured graphs*.
- At Universitat Politècnica de Catalunya, Universidade de Lisboa, Universidade de Coimbra and Universidade Nova de Lisboa, I gave the talk *Rainbow connection in graphs*.
- At Universidade Nova de Lisboa, I gave the talk *Union-free families*.
- At The University of Memphis and Universidade Nova de Lisboa, I gave the talk *The balanced decomposition number of a graph*.
- At Universidade de Lisboa, I gave a short course (five lectures) on *Discrete isoperimetric inequalities*.
- At Tokyo University of Science, I gave the talk *Highly connected coloured subgraphs and the regularity lemma*.
- At The University of Memphis, University of Nebraska-Lincoln, Universitat Politècnica de Catalunya, Universidad de Alcalá, University College London, Universidade Nova de Lisboa, and Universidade de Coimbra, I gave the talk *Highly connected subgraphs in multicoloured graphs*.
- At The University of Memphis, I presented many research papers in the graduate courses that I attended. The topics covered include percolation theory, combinatorial phase transitions, extremal graph theory, hypergraphs, probability, and  $p$ -adic analysis.

## Organisation of Conferences and Seminars

- The 23rd Thailand-Japan Conference on Discrete and Computational Geometry, Graphs, and Games (TJCDCG<sup>3</sup> 2020+1), Chiang Mai University, Chiang Mai, Thailand. An online international conference where I was an organising committee member, 2021.
- Guangzhou Discrete Mathematics Seminar, Sun Yat-sen University, Guangzhou, China. A seminar series co-organised with Ping Hu, Chao Yang and Zhanbo Zhang, 2017 to 2024.
- Combinatorics Conference in Lisboa, Universidade Nova de Lisboa, Lisbon, Portugal. An international conference co-organised with Oleg Pikhurko, Manuel Silva and Teresa Sousa, 2011.

## Professional Activities

- Referee for submitted papers for the following journals: *Journal of Combinatorial Theory, Series B*; *Combinatorics, Probability and Computing*; *European Journal of Combinatorics*; *SIAM Journal on Discrete Mathematics*; *The Electronic Journal of Combinatorics*; *Journal of Combinatorial Optimization*; *Discrete Applied Mathematics*, *Discrete Mathematics*; *Graphs and Combinatorics*; *The Australasian Journal of Combinatorics*; *Networks and Heterogeneous Media*; *Information Processing Letters*; *Acta Mathematica Sinica (English Series)*; and *Discussiones Mathematicae Graph Theory*.

## Other Activities

- 2003 to present      Mentor for the United Kingdom Mathematics Trust. I have been mentoring talented high school students for Mathematical Olympiad competitions, many of whom went on to compete at the International Mathematical Olympiad for the UK.
- 2002                      Marker at the 43rd International Mathematical Olympiad, 2002, held in Glasgow, UK.
- 1997, 1999, 2000      Participant at the International Mathematics Competition for University Students, held in Plovdiv (Bulgaria), Keszthely (Hungary) and London (UK), respectively.
- 1993 to 1996          Participant of the British Mathematical Olympiad.

## Programming Languages

C, C++, Python, MATLAB, HTML, Mathematica.

## Languages

English (native), Cantonese (native), Chinese (competent), French (intermediate).