Curriculum Vitae

Mohammad Farrokhi Derakhshandeh Ghouchan

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GitHub: https://github.com/mfarrokhidg/

Academic Education:

- **Ph.D. in Mathematics** (September 23, 2010 - November 21, 2013) with honor, Ferdowsi University of Mashhad, Iran
  Thesis: *Relative Commutativity and Normality Degrees of Subgroups in Finite Groups and Related Graphs*
- **M.Sc. in Mathematics** (September 23, 2005 - February 19, 2007) with honor, Ferdowsi University of Mashhad, Iran
  Thesis: *Partitions of Groups*
- **B.Sc. in Mathematics** (September 23, 2001 - June 21, 2005) with honor, Ferdowsi University of Mashhad, Iran
  Thesis: *Venn Diagrams*

Affiliation:

- Assistant Professor (August 22, 2016 – Current), Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran.
- Research Post-doctoral Fellow (October 3, 2014 – March 31, 2016), Muroran Institute of Technology, Hokkaido, Japan.

Research Interests:

- Probabilistic Group Theory
- Geometric Group Theory
- Automorphisms of Groups
- Factorizations of Groups

- Covers and Partitions of Groups
- Combinatorics (Additive Theory, Venn Diagrams, Fibonacci Numbers, etc.)
- Algebraic Graph Theory
- Combinatorial Commutative Algebra
- Elementary Number Theory
- Recreational Mathematics

Honors:

- **2024 Riazi Kermani Prize** for the best research paper presented at the 54th Annual Iranian Mathematical Society Conference in 2023 (jointly with Ali Akbar Yazdan Pour).
- **Gold Medal** at 10th International Scientific Olympiad on Mathematics in 2005, Tehran, Iran.
- **Silver Medal** at 29th Mathematical Competition of Iranian students in 2005, Tehran, Iran.
- **Third Prize** at 11th International Mathematical Competition of world students in 2004, Skopje, Macedonia.
- **Silver Medal** at 28th Mathematical Competition of Iranian students in 2004, Tehran, Iran.

Grants:

- M. Farrokhi D. G. and A. Yazdan Pour, Gröbner basis and Hilbert series of Lovsz-Saks-Schrijver ideal associated to trees, INSF, Grant no. 4000017, 2021.

Publications:

1. M. Farrokhi D. G. and A. A. Yazdan Pour, Gröbner basis and Krull dimension of Lovász-Saks-Sherijver ideal associated to a tree, *J. Algebra* **678** (2025), 224–252.
2. M. Farrokhi D. G., A. Shamsian, and A. A. Yazdan Pour, Extending simplicial complexes: topological and combinatorial properties, *Discrete Math.* **348**(3) (2025), Article 114335, pp. 15.
3. S. Faridi, M. Farrokhi D. G., R. Ghorbani, and A. A. Yazdan Pour, Cellular resolutions of monomial ideals and their Artinian reductions, *J. Pure Appl. Algebra* **228**(6) (2024), Article 107608, pp. 28.
4. M. Farrokhi D. G., H. Ghasemian Zoeram, and D. Yaqubi, Lattice paths inside a table, *Math. Commun.* **28** (2023), 181–201.
5. M. Farrokhi D. G., Y. Sadegh, and A. A. Yazdan Pour, Green-Lazarsfeld index of square-free monomial ideals and their powers, *J. Algebra* **622** (2023), 676–693.
6. M. Farrokhi D. G. and A. A. Yazdan Pour, New methods for constructing shellable simplicial complexes (Persian), *Math. Res.* **8**(4) (2023), 164–179.

7. M. Farrokhi D. G., S. Gharakhloo, and A. A. Yazdan Pour, Positive matching decompositions of graphs, *Discrete Appl. Math.* **320** (2022), 311–323.
8. M. Farrokhi D. G., Finite groups with five relative commutativity degrees, *Results Math.* **77**(2) (2022), Article 56, pp. 16.
9. M. Farrokhi D. G., E. Ghorbani, H. R. Maimani, and F. Rahimi Mahid, Some algebraic properties of Sierpiński graphs, *Ars Math. Contemp.* **20**(2) (2021), 171–186.
10. A. Azimi and M. Farrokhi D. G., Factorization graph of finite groups, *Publ. Math. Debrecen* **98**(1-2) (2021), 183–199.
11. A. Azimi, R. B. Bapat, and M. Farrokhi D. G., Resistance distance of blowups of trees, *Discrete Math.* **344**(7) (2021), Article 112387, pp. 11.
12. M. Farrokhi D. G. and Y. Takegahara, A formula of subgroup normality degrees with applications to the finite p-groups with cyclic subgroups of index p^2, *J. Algebra Appl.* **19**(4) (2020), Article 2050073, pp. 27.
13. A. Erfanian, M. Farrokhi D. G., and M. Rajabian, Relative Cayley graphs of finite groups, *Asian-Eur. J. Math.* **12**(7) (2019), Article 2050003, pp. 14.
14. M. Farrokhi D. G., M. R. R. Moghaddam, and H. Safa, Some properties of 2-auto-Engel groups, *Houston J. Math.* **44**(1) (2018), 31–48.
15. M. Farrokhi D. G. and S. H. Jafari, On the probability of being a deficient square group on 2-element subsets, *Comm. Algebra* **46**(3) (2018), 1259–1266.
16. M. Farrokhi D. G. and F. Saeedi, Finite groups with a given number of relative centralizers, *Comm. Algebra* **46**(1) (2018), 378–385.
17. A. Azimi, A. Erfanian, M. Farrokhi D. G., and H. Ghayour, n-Array Jacobson graphs, *Bull. Iranian Math. Soc.* **43**(7) (2017), 2137–2152.
18. A. Doostabadi and M. Farrokhi D. G., Embeddings of (proper) power graphs of finite groups, *Algebra Discrete Math.* **24**(2) (2017), 221–234.
19. A. Erfanian, M. Farrokhi D. G., and S. Shalchi, On θ-commutators and the corresponding non-commuting graph, *Open Math.* **15**(1) (2017), 1530–1538.
20. M. Farrokhi D. G. and H. Safa, Subgroups with large relative subgroup commutativity degree, *Quaest. Math.* **40**(7) (2017), 973–979.
21. A. Abdollahi, D. Bounabi, M. Farrokhi D. G., and Y. Guerboussa, Groups of prime generalized exponent, *Internat. J. Algebra Comput.* **27**(7) (2017), 849–862.
22. A. Azimi and M. Farrokhi D. G., Cycles and paths in Jacobson graphs, *Ars Combin.* **134** (2017), 61–74.
23. M. Afkhami, M. Farrokhi D. G., and K. Khashyarmanesh, Planar, outerplanar and ring graph cozero-divisor graphs, *Ars Combin.* **131** (2017), 397–406.
24. A. Azimi and M. Farrokhi D. G., Self 2-distance graphs, *Canad. Math. Bull.* **60**(1) (2017), 26–42.
25. M. Farrokhi D. G., M. Hoseiniravesh, and M. R. R. Moghaddam, Lie algebras with few centralizers, *Comm. Algebra.* **45**(7) (2017), 2867–2874.
26. A. Erfanian, M. Farrokhi D. G., A. Mohammadian, and B. Wilkens, Triangle-free commuting conjugacy classes graphs, *J. Group Theory* **19** (2016), 1049–1061.
27. M. Farrokhi D. G. and M. R. R. Moghaddam, On groups satisfying a symmetric Engel word, *Ric. Mat.* **65**(1) (2016), 15–20.

28. A. Azimi, A. Erfanian, M. Farrokhi D. G., and N. Hoseini, On cycles in intersection graph of rings, *Bull. Iranian Math. Soc.* **42**(2) (2016), 461–470.
29. R. Barzegar, A. Erfanian, and M. Farrokhi D. G., Probability of mutually commuting two finite subsets of a finite group, *Ars Combin.* **124** (2016), 165–176.
30. M. Farrokhi D. G. and M. R. R. Moghaddam, On the centre of the automorphism group of a group, *Bull. Austral. Math. Soc.* **92** (2015), 390–396.
31. A. Erfanian and M. Farrokhi D. G., Finite groups with four relative commutativity degrees, *Algebra Colloq.* **22**(3) (2015), 449–458.
32. A. Doostabadi and M. Farrokhi D. G., On the connectivity of proper power graphs of finite groups, *Comm. Algebra* **43**(10) (2015), 4305–4319.
33. M. Afkhami, M. Farrokhi D. G., and K. Khashyarmanesh, Planar, toroidal and projective commuting and non-commuting graphs, *Comm. Algebra* **43**(7) (2015), 2964–2970.
34. M. Chaboksavar, M. Farrokhi D. G., and F. Saeedi, Abelian groups as autocommutator subgroups, *Rend. Circ. Mat. Palermo* **63** (2014), 319–327.
35. A. Azimi and M. Farrokhi D. G., Simple graphs whose 2-distance graphs are path or cycle, *Matematiche (Catania)* **69**(2) (2014), 183–191.
36. A. Erfanian, M. Farrokhi D. G., and M. Rajabian, Planar infinite groups, *J. Group Theory* **17** (2017), 897–909.
37. M. Chaboksavar, M. Farrokhi D. G., and F. Saeedi, Finite groups with a given absolute central factor group, *Arch. Math. (Basel)* **102** (2014), 401–409.
38. A. Azimi, A. Erfanian, and M. Farrokhi D. G., Isomorphisms between Jacobson graphs, *Rend. Circ. Mat. Palermo* **63** (2014), 277–286.
39. A. Doostabadi, A. Erfanian, and M. Farrokhi D. G., On power graphs of finite groups with forbidden induced subgraphs, *Indag. Math.* **25**(3) (2014), 525–533.
40. H. Darabi, M. Farrokhi D. G., and F. Saeedi, The number of fuzzy subgroups of some non-abelian groups, *Iranian J. Fuzzy Systems* **10**(6) (2013), 101–107.
41. M. Farrokhi D. G. and F. Saeedi, Subgroup permutability degree of $PSL(2, p^n)$, *Glasgow Math. J.* **55**(3) (2013), 581–590.
42. R. Barzegar, A. Erfanian, and M. Farrokhi D. G., Finite groups with three relative commutativity degrees, *Bull. Iranian Math. Soc.* **32**(2) (2013), 271–280.
43. A. Erfanian and M. Farrokhi D. G., On the probability of being a 2-Engel group, *Int. J. Group Theory* **2**(4) (2013), 31–38.
44. A. Erfanian, M. Farrokhi D. G., and B. Tolue, Non-normal graphs of finite groups, *J. Algebra Appl.* **12**(4) (2013), Article 1250193, pp. 9.
45. A. Azimi, A. Erfanian, and M. Farrokhi D. G., The Jacobson graph of commutative rings, *J. Algebra Appl.* **12**(3) (2013), Article 1250179, pp. 18.
46. M. Farrokhi D. G., Factorization numbers of finite Abelian groups, *Int. J. Group Theory* **2**(2) (2013), 1–8.
47. M. Farrokhi D. G. and F. Saeedi, Subgroup normality degrees of finite groups II, *J. Algebra Appl.* **11**(4) (2012), Article 1250081, pp. 8.
48. M. Farrokhi D. G. and F. Saeedi, Factorization numbers of some finite groups, *Glasgow Math. J.* **54**(2) (2012), 345–354.

49. M. Farrokhi D. G., M. R. R. Moghaddam, and M. Naghshineh, Autocommutator subgroups with cyclic outer automorphism group, *Note Mat.* **31**(2) (2011), 9–16.
50. M. Farrokhi D. G., Some results on the partitions of groups, *Rend. Sem. Math. Univ. Padova* **125** (2011), 119–146.
51. M. Farrokhi D. G., S. H. Jafari, and F. Saeedi, Subgroup normality degrees of finite groups I, *Arch. Math. (Basel)* **96**(3) (2011), 215–224.
52. M. Farrokhi D. G., Generalization of an identity involving the generalized Fibonacci numbers and its applications, *Integers* **9** (2009), 497–513, Article 39.
53. A. Erfanian and M. Farrokhi D. G., On some classes of tidy groups, *Algebras Groups Geom.* **25**(1) (2008), 109–113.
54. M. Farrokhi D. G., An identity generator: Basic commutators, *Electron. J. Combin.* **15**(1) (2008), Note 15, pp. 6.
55. M. Farrokhi D. G., Some remarks on the equation $F_n = kF_m$ in Fibonacci numbers, *J. Integer Seq.* **10**(5) (2007), Article 7, pp. 9.

Conference Papers:

1. M. Farrokhi D. G. and A. Mohammadian, Groups whose all (minimal) Cayley graphs have a given forbidden structure, *Research on Finite Groups and Their Representations, Vertex Operator Algebras, and Algebraic Combinatorics*, Research Institute for Mathematical Sciences Kyoto University (RIMS), January 5–8, 2016, 119–127.
2. M. Farrokhi D. G., On the probability that a group satisfies a law; a survey, *Research on Finite Groups and Their Representations, Vertex Operator Algebras, and Algebraic Combinatorics*, Research Institute for Mathematical Sciences Kyoto University (RIMS), December 16–19, 2015, 158–179.

Submitted:

1. M. Farrokhi D. G. and A. A. Yazdan Pour, Gröbner basis and Krull dimension of Lovász-Saks-Sherijver ideal associated to a tree.
2. A. Azimi and M. Farrokhi D. G., Moore-Penrose inverse of incidence matrices.
3. A. Azimi and M. Farrokhi D. G., Explicit formulas for matrices associated to ladder, circular ladder, and Möbius ladder graphs.
4. M. Farrokhi D. G., Lattice paths inside a table: Rows and columns linear combinations.
5. M. Farrokhi D. G. and D. Yaqubi, Lattice paths inside a table II.
6. M. Farrokhi D. G. and A. Mohammadian, Groups whose all (minimal) Cayley graphs have a given forbidden structure.
7. A. Azimi, M. Farrokhi D. G., and H. Ghayour, On vertex decomposability of generalized Jacobson graphs.
8. M. Farrokhi D. G. and F. Saeedi, The classification of 2-solvable Leibniz algebras of low dimensions.

9. A. Erfanian, M. Farrokhi D. G., and A. Mohammadian, A characterization of Tutte-Coxeter graph.
10. M. Farrokhi D. G., Finite groups with two subgroup normality degrees.

Unpublished:

1. M. Farrokhi D. G., Fully reducible simple Venn diagrams.

American Mathematical Monthly Problems:

1. Problem 11574, May 2011.
2. Problem 11395, November 2008.
3. Problem 11388, October 2008.
4. Problem 11315, October 2007.
5. Problem 11303, Jun-July 2007.

Conferences:

1. Combinatorial and Additive Number Theory (CANT 2022), New York Number Theory Seminar, Lehman College, CUNY, New York, USA, May 24–27, 2022 (Online).
2. International Workshop on Extremal Combinatorics, IPM-Isfahan, Isfahan, Iran, May 18–19, 2022 (Online).
3. **Speaker** The 64th Annual Congress of the South African Mathematical Society, University of Free State, Bloemfontein, South Africa, November 29 - December 1, 2021 (Online).
4. Combinatorial and Additive Number Theory (CANT 2021), New York Number Theory Seminar, Lehman College, CUNY, New York, USA, May 24–28, 2021 (Online).
5. Combinatorial and Additive Number Theory (CANT 2020), New York Number Theory Seminar, Lehman College, CUNY, New York, USA, June 1–6, 2020 (Online).
6. **Speaker** The Third IPM Biennial Combinatorics and Computing Conference 2019 (IPMCCC 2019), IPM, Tehran, Iran, April 16–18, 2019.
7. **Speaker** IPM Combinatorics and Computing Conference 2017 (IPMCCC 2017), IPM, Tehran, Iran, May 16–18, 2017.
8. **Speaker** Research on Finite Groups and Their Representations, Vertex Operator Algebras, and Algebraic Combinatorics, RIMS Conference at Kyoto University, Kyoto, Japan, January 5–8, 2016.
9. **Speaker** 32nd Symposium on Algebraic Combinatorics, Kanazawa University, Kanazawa, Japan, June 22–24, 2015.
10. **Speaker** Research on Finite Groups and Their Representations, Vertex Operator Algebras, and Algebraic Combinatorics, RIMS Conference at Kyoto University, Kyoto, Japan, December 16–19, 2014.

11. **Speaker** 6th Group Theory Conference of Iran, Golestan University, Gorgan, Iran, March 12–13, 2014.
12. The 44th Annual Iranian Mathematics Conference, Ferdowsi University of Mashhad, Mashhad, Iran, August 27–30, 2013.
13. **Speaker** Fifth International Group Theory Conference, Ferdowsi University of Mashhad, Mashhad, Iran, March 13–15, 2013.
14. **Speaker** 2nd Biennial International Group Theory Conference, Doğuş University, Istanbul, Turkey, February 4–8, 2013.
15. **Speaker** The Fourth Group Theory Conference of Iran, Payam-e Noor University of Isfahan, Isfahan, Iran, March 7–9, 2012.
16. **Speaker** 22nd Iranian Algebra Seminar, Hakim Sabzevari University, Sabzevar, Iran, January 31 – February 2, 2012.
17. **Speaker** Third Conference and Workshop on Group Theory, University of Tehran, Tehran, Iran, March 9–10, 2011.
18. **Speaker** Biennial International Group Theory Conference, Universiti Teknologi Malaysia, Johor Bahru, Johor, Malaysia, February 14–18, 2011.
19. **Speaker** Group Theory Conference, Ferdowsi University of Mashhad, Mashhad, Iran, March 10–12, 2010.

Schools:

1. Third Research School on Commutative Algebra and Algebraic Geometry, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran, August 17–29, 2019.
2. The 2nd International Workshop on Leavitt Path Algebras and Graph C^*-Algebras, Kharazmi University, Tehran, Iran, June 8–10, 2019.
3. Second Research School on Commutative Algebra and Algebraic Geometry, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran, September 1–12, 2018.
4. Winter School on Graph Theory, Ferdowsi University of Mashhad, Mashhad, Iran, March 14–15, 2018.
5. Topics in Analytic and Transcendental Number Theory, WAMS research school, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran, July 1–13, 2017.

Workshops:

1. **Speaker** GAP: Group, Algebra, Programming, 6th Group Theory Conference of Iran, Golestan University, Gorgan, Iran, March 12-13, 2014 (4 Hours).
2. Algebraic Structures, Ferdowsi University of Mashhad, Mashhad, Iran, September 7-8, 2006.

Visits:

1. Institute for Research in Fundamental Sciences, Isfahan Branch (IPM-Isfahan), November 22, 2019 - December 19, 2019.

Executive Posts:

1. **Member of Scientific Committee** of the Iranian University Student Mathematical Competitions in 2023–2024.
2. **Member of Scientific and Organizing Committees** of the Second IASBS Mathematics School, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran, February 19–21, 2020.
3. **Member of Scientific and Organizing Committees** of the Second Research School on Commutative Algebra and Algebraic Geometry, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran, September 1–12, 2018.
4. **Organizer** of the Mathematical Day (in honor of Omar Khayyam's Birthday), Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran, May 18, 2018.

Teaching:

- Algebra 1
- Advanced Algebra
- Algebraic Graph Theory: Graphs and Matrices
- Algebraic Graph Theory: Symmetric Graphs
- Discrete Mathematics
- Fundamentals of Algebra
- Finite Groups
- Galois Theory
- Geometric Group Theory
- Permutation Groups and Their Applications: Permutation Puzzles
- Representations of Groups

Supervised PhD Theses:

1. Alireza Shamsiam: Combinatorial Methods for Generating Cohen-Macaulay Simplicial Complexes, 2024 (jointly with Ali Akbar Yazdan Pour).

Supervised Master Theses:

1. Rasoul Rahmani Amoli: Counting Unknot Diagrams, 2024.
2. Marzieh Ganjkhanloo: The Clar Covering Polynomial of Hexagonal Systems, 2022.
3. Zohre Gholami: Zig-Zag Products of Graphs, 2022.

Skills:

- Python + (NumPy, SymPy, SciPy, OpenCV, Pillow, etc.), Rust, JavaScript
- GAP: Group Algebra Programming
- SQL
- Latex
- HTML, CSS

Other Qualifications:

- Fundamentals of Data Science, Artificial Intelligence
- Fundamentals of Statistics, Optimization (LP), Numerical Linear Algebra
- Fundamentals of Coding, Cryptography
- Fundamentals of Quantum Computing
- Fundamentals of Compilers

Languages:

- English: Advanced
- French: Elementary
- Japanese: Intermediate