

# CURRICULUM VITAE

MOHAMMAD FARROKHI DERAKHSHANDEH GHOUCHAN

Address: Department of Mathematics,  
Institute for Advanced Studies in Basic Sciences (IASBS),  
Zanjan 45137-66731, Iran

Emails: m.farrokhi.d.g@gmail.com  
farrokhi@iasbs.ac.ir

Homepages: <https://mfarrokhidg.github.io/>

## ACADEMIC EDUCATION:

---

- Ph.D. in Mathematics in 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 in 2007 with honor, Ferdowsi University of Mashhad, Iran.  
**Thesis:** *Partitions of Groups*
- B. Sc. in Mathematics in 2005 with honor, Ferdowsi University of Mashhad, Iran.  
**Project:** *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 and etc.),
- Algebraic graph theory,
- Elementary number theory,

- Recreational mathematics.

## HONORS:

---

- 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.

## PUBLICATIONS:

---

1. With S. Faridi, 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, 28 pp.
2. With D. Yaqubi and H. Ghasemian Zoeram, Lattice paths inside a table, *Math. Commun.* **28** (2023), 181–201.
3. With Y. Sadegh, and A. Yazdan Pour, Green-Lazarsfeld index of square-free monomial ideals and their powers, *J. Algebra* **622** (2023), 676–693.
4. With A. A. Yazdan Pour, New methods for constructing shellable simplicial complexes (Persian), *Math. Res.* **8**(4) (2023), 164–179.
5. With S. Gharakhloo and A. A. Yazdan Pour, Positive matching decompositions of graphs, *Discrete Appl. Math.* **320** (2022), 311–323.
6. Finite groups with five relative commutativity degrees, *Results Math.* **77**(2) (2022), Article 56, 16 pp.
7. With E. Ghorbani, H. R. Maimani, and F. Rahimi Mahid, Some algebraic properties of Sierpiński graphs, *Ars Math. Contemp.* **20**(2) (2021), 171–186.
8. With A. Azimi, Factorization graph of finite groups, *Publ. Math. Debrecen* **98**(1-2) (2021), 183–199.
9. With A. Azimi and R. B. Bapat, Resistance distance of blowups of trees, *Discrete Math.* **344**(7) (2021), 112387, 11 pp.
10. With 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), 2050073, 27 pp.
11. With A. Erfanian and M. Rajabian, Relative Cayley graphs of finite groups, *Asian-Eur. J. Math.* **12**(7) (2019), 2050003, 14 pp.
12. With H. Safa and M. R. R. Moghaddam, Some properties of 2-auto-Engel groups, *Houston J. Math.* **44**(1) (2018), 31–48.
13. With S. H. Jafari, On the probability of being a deficient square group on 2-element subsets, *Comm. Algebra* **46**(3) (2018), 1259–1266.

14. With F. Saeedi, Finite groups with a given number of relative centralizers, *Comm. Algebra*. **46**(1) (2018), 378–385.
15. With A. Azimi, A. Erfanian, and H. Ghayour,  $n$ -Array Jacobson graphs, *Bull. Iranian Math. Soc.* **43**(7) (2017), 2137–2152.
16. With A. Doostabadi, Embeddings of (proper) power graphs of finite groups, *Algebra Discrete Math.* **24**(2) (2017), 221–234.
17. With A. Erfanian and S. Shalchi, On  $\theta$ -commutators and the corresponding non-commuting graph, *Open Math.* **15**(1) (2017), 1530–1538.
18. With H. Safa, Subgroups with large relative subgroup commutativity degree, *Quaest. Math.* **40**(7) (2017), 973–979.
19. With A. Abdollahi, D. Bounabi, and Y. Guerboussa, Groups of prime generalized exponent, *Internat. J. Algebra Comput.* **27**(7) (2017), 849–862.
20. With A. Azimi, Cycles and paths in Jacobson graphs, *Ars Combin.* **134** (2017), 61–74.
21. With M. Afkhami and K. Khashyarmanesh, Planar, outerplanar and ring graph cozero-divisor graphs, *Ars Combin.* **131** (2017), 397–406.
22. With A. Azimi, Self 2-distance graphs, *Canad. Math. Bull.* **60**(1) (2017), 26–42.
23. With M. Hoseiniravesh and M. R. R. Moghaddam, Lie algebras with few centralizers, *Comm. Algebra*. **45**(7) (2017), 2867–2874.
24. With A. Mohammadian, A. Erfanian, and B. Wilkens, Triangle-free commuting conjugacy classes graphs, *J. Group Theory* **19** (2016), 1049–1061.
25. With M. R. R. Moghaddam, On groups satisfying a symmetric Engel word, *Ric. Mat.* **65**(1) (2016), 15–20.
26. With A. Azimi, A. Erfanian, and N. Hoseini, On cycles in intersection graph of rings, *Bull. Iranian Math. Soc.* **42**(2) (2016), 461–470.
27. With R. Barzegar and A. Erfanian, Probability of mutually commuting two finite subsets of a finite group, *Ars Combin.* **124** (2016), 165–176.
28. With M. R. R. Moghaddam, On the centre of the automorphism group of a group, *Bull. Austral. Math. Soc.* **92** (2015), 390–396.
29. With A. Erfanian, Finite groups with four relative commutativity degrees, *Algebra Colloq.* **22**(3) (2015), 449–458.
30. With A. Doostabadi, On the connectivity of proper power graphs of finite groups, *Comm. Algebra* **43**(10) (2015), 4305–4319.
31. With M. Afkhami and K. Khashyarmanesh, Planar, toroidal and projective commuting and non-commuting graphs, *Comm. Algebra* **43**(7) (2015), 2964–2970.
32. With M. Chaboksavar and F. Saeedi, Abelian groups as autocommutator subgroups, *Rend. Circ. Mat. Palermo* **63** (2014), 319–327.
33. With A. Azimi, Simple graphs whose 2-distance graphs are path or cycle, *Matematiche (Catania)* **69**(2) (2014), 183–191.
34. With A. Erfanian and M. Rajabian, Planar infinite groups, *J. Group Theory* **17** (2014), 897–909.
35. With M. Chaboksavar and F. Saeedi, Finite groups with a given absolute central factor group, *Arch. Math. (Basel)* **102** (2014), 401–409.

36. With A. Azimi and A. Erfanian, Isomorphisms between Jacobson graphs, *Rend. Circ. Mat. Palermo* **63** (2014), 277–286.
37. With A. Doostabadi and A. Erfanian, On power graphs of finite groups with forbidden induced subgraphs, *Indag. Math.* **25**(3) (2014), 525–533.
38. With H. Darabi and F. Saeedi, The number of fuzzy subgroups of some non-abelian groups, *Iranian J. Fuzzy Systems* **10**(6) (2013), 101–107.
39. With F. Saeedi, Subgroup permutability degree of  $PSL(2, p^n)$ , *Glasgow Math. J.* **55**(3) (2013), 581–590.
40. With R. Barzegar and A. Erfanian, Finite groups with three relative commutativity degrees, *Bull. Iranian Math. Soc.* **32**(2) (2013), 271–280.
41. With A. Erfanian, On the probability of being a 2-Engel group, *Int. J. Group Theory* **2**(4) (2013), 31–38.
42. With A. Erfanian and B. Tolve, Non-normal graph of finite groups, *J. Algebra Appl.* **12**(4) (2013), 9 pp.
43. With A. Azimi and A. Erfanian, The Jacobson graph of commutative rings, *J. Algebra Appl.* **12**(3) (2013), 18 pp.
44. Factorization numbers of finite Abelian groups, *Int. J. Group Theory* **2**(2) (2013), 1–8.
45. With F. Saeedi, Subgroup normality degrees of finite groups II, *J. Algebra Appl.* **11**(4) (2012), 8 pp.
46. With F. Saeedi, Factorization numbers of some finite groups, *Glasgow Math. J.* **54**(2) (2012), 345–354.
47. With M. Naghshineh and M. R. R. Moghaddam, Autocommutator subgroups with cyclic outer automorphism group, *Note Mat.* **31**(2) (2011), 9–16.
48. Some results on the partitions of groups, *Rend. Sem. Math. Univ. Padova* **125** (2011), 119–146.
49. With F. Saeedi and S. H. Jafari, Subgroup normality degrees of finite groups I, *Arch. Math. (Basel)* **96**(3) (2011), 215–224.
50. Generalization of an identity involving the generalized Fibonacci numbers and its applications, *Integers* **9** (2009), Article 39, 497–513.
51. With A. Erfanian, On some classes of tidy groups, *Algebras Groups Geom.* **25**(1) (2008), 109–113.
52. An identity generator: Basic commutators, *Electron. J. Combin.* **15**(1) (2008), Note 15, 6 pp.
53. Some remarks on the equation  $F_n = kF_m$  in Fibonacci numbers, *J. Integer Seq.* **10**(5) (2007), Article 7, 9 pp.

#### SUBMITTED:

1. With A. Yazdan Pour, Gröbner basis and Krull dimension of Lovász-Saks-Sherijver ideal associated to a tree.
2. With A. Shamsian, and A. Yazdan Pour, Extending simplicial complexes: topological and combinatorial properties.

3. With A. Azimi, Moore-Penrose inverse of incidence matrices.
4. With A. Azimi, Explicit formulas for matrices associated to ladder, circular ladder, and Möbius ladder graphs.
5. Lattice paths inside a table: Rows and columns linear combinations.
6. With D. Yaqubi, Lattice paths inside a table II.
7. With A. Mohammadian, Groups whose all (minimal) Cayley graphs have a given forbidden structure.
8. With A. Azimi and H. Ghayour, On vertex decomposability of generalized Jacobson graphs.
9. With F. Saeedi, The classification of 2-solvable Leibniz algebras of low dimensions.
10. With A. Erfanian and A. Mohammadian, A characterization of Tutte-Coxeter graph.
11. Finite groups with two subgroup normality degrees.

#### UNPUBLISHED:

---

1. 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 and organizing committees** of the Second IASBS Mathematics School, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran, February 19–21, 2020.
2. **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.

## TEACHING:

---

1. Algebra 1
2. Advanced Algebra
3. Algebraic Graph Theory: Graphs and Matrices
4. Algebraic Graph Theory: Symmetric Graphs
5. Discrete Mathematics
6. Fundamentals of Algebra
7. Finite Groups
8. Galois Theory
9. Geometric Group Theory
10. Permutation Groups and Their Applications: Permutation Puzzles
11. Representations of Groups

## SKILLS:

---

1. Python + NumPy, SymPy, SciPy, OpenCV, Pillow, etc.
2. GAP: Group Algebra Programming
3. Latex

**LANGUAGES:**

---

1. English: Advanced.
2. Japanese: Intermediate.