

# Mahsa Shirazi

## Curriculum Vitae

📍 452 Machray Hall, Department of Mathematics  
University of Manitoba, Winnipeg, MB, Canada  
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### Employment

- 2022–present **PIMS postdoctoral fellow**, Department of mathematics, University of Manitoba, Canada
- Spring 2022 **Teaching fellow**, Department of mathematics and Statistics, University of Regina, Canada
- 2018–2022 **Teaching assistant**, Department of mathematics and Statistics, University of Regina, Canada

### Education

- 2018–2022 **Ph.D. Mathematics**, University of Regina, Canada
- Thesis title *Extensions of the Erdős-Ko-Rado theorem to perfect matchings*
- Supervisors Dr. Shaun Fallat and Dr. Karen Meagher
- Degree Feb. 2022
- GPA 95/100
- 2013–2015 **M.Sc Applied Mathematics** (Numerical Analysis), Shiraz University of Technology, Iran
- Thesis title *Algorithms for solving the generalized Sylvester matrix equation over Boolean algebra*
- Supervisor Dr. Behnam Hashemi
- Degree Mar. 2015
- 2008-2013 **B.Sc. Pure Mathematics**, Shiraz University, Iran

### Research Interests

Algebraic Graph Theory, Matrix Theory, Combinatorics, Linear Algebra

### Publications

Published

- [1] (with S. M. Fallat, N. Joshi, R. Maleki, K. Meagher, S. A. Mojallal, Sh. Nasserassr, A. S. Razafimahatratra & B. Stevens), The  $q$ -analogue of zero forcing for certain families of graphs, *Discrete Applied Mathematics*, Volume 348, pp. 91-104 (**2024**), available at <https://doi.org/10.1016/j.dam.2024.01.014>

- [2] An extension of the Erdős-Ko-Rado theorem to set-wise 2-intersecting families of perfect matchings, *Discrete Mathematics*, Volume 346, Issue 8, 113444, (2023), available at <https://doi.org/10.1016/j.disc.2023.113444>
- [3] (with K. Meagher & B. Stevens), An extension of the Erdős-Ko-Rado theorem to uniform set partitions, *Ars Mathematica Contemporanea*, Vol. 23 No. 4, (2023), available at <https://doi.org/10.26493/1855-3974.2698.6fe>
- [4] *Extensions of the Erdős-Ko-Rado Theorem to Perfect Matchings*, Doctoral dissertation, Faculty of Graduate Studies and Research, University of Regina, (2022), available at <http://hdl.handle.net/10294/14948>
- [5] (with S.M. Fallat & K. Meagher), The Erdős-Ko-Rado theorem for  $t$ -intersecting families of perfect matchings, *Algebraic Combinatorics*, Volume 4, no. 4, pp. 575-598,(2021), available at <https://doi.org/10.5802/alco.169>
- [6] (with M. Adm, K. Almuhtaseb, S.M. Fallat, K. Meagher, Sh. Nasserassr, & AS Razafimahatratra) Weakly Hadamard Diagonalizable Graphs. *Linear Algebra and its Applications*, (2021), available at <https://doi.org/10.1016/j.laa.2020.09.038>
- [7] (with B. Hashemi & H. Tavakolipour), Explicit formulae for the greatest least-squares and minimum norm g-inverses and the unique group inverse of matrices over commutative residuated dioids, *Semigroup Forum* 92,pp. 541-550, (2016), available at <https://doi.org/10.1007/s00233-015-9771-8>
- [8] (with B. Hashemi & H. Tavakolipour), Three methods for solving generalized Sylvester matrix equations over Boolean algebra, *Journal of Multiple-Valued Logic and Soft Computing* 25,pp. 427-445, (2015),
- [9] (with B. Hashemi & H. Tavakolipour), Comparison of the quasi-inverses of the Kronecker sum and product of matrices over complete commutative dioids with applications, *Linear Algebra and its Applications* 448, pp. 22-36, (2014), available at <https://doi.org/10.1016/j.laa.2014.01.028>

Under Review

- [1] (with K. Gunderson, K. Meagher, J. Morris and V. R. T. Pantangi), Robustness of Erdős-Ko-Rado theorems on permutations and perfect matchings. available at <https://doi.org/10.48550/arXiv.2406.15739>

Ready to submit

- [1] (with K. Gunderson), On Graphs and Hypergraphs with  $r$ -friendship property

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## Talks & Presentations

- Jun. 2024 A review on the Erdős-Ko-Rado theorem for uniform set partitions and perfect matchings

- Canadian Mathematical Society, Winter Meeting, Saskatoon, (invited)
- Jun. 2024 Weakly Hadamard Diagonalizable Graphs  
Canadian Mathematical Society, Winter Meeting, Saskatoon, (invited)
- Dec. 2023 Uniform hypergraphs and balanced incomplete block designs with  $r$ -friendship property  
Canadian Mathematical Society, Winter Meeting, Montreal, (invited)
- Oct. 2023 Weakly Hadamard diagonalizable graphs  
National Sun Yat-Sen University
- Jun. 2023 Extensions of the friendship theorem, and their connection to designs  
CanaDAM, Winnipeg, (invited)
- Feb. 2023 On weakly Hadamard diagonalizable graphs  
05C50 Online, (invited)
- Feb. 2023 Extensions of the friendship theorem  
Virtual Emergent Research: The PIMS Postdoctoral Fellow Colloquium Series
- Dec. 2022 Graphs with  $r$ -friendship properties  
PRIMA congress, Vancouver, (invited)
- Dec. 2022 Graphs with  $r$ -friendship properties  
Canadian Mathematical Society, Winter Meeting, Toronto, (invited)
- Oct. 2022 On weakly Hadamard diagonalizable graphs  
Combinatorics Seminar, University of Manitoba
- Jun. 2022 On weakly Hadamard diagonalizable graphs  
BIRS, Cross-community collaborations in combinatorics, (invited)
- Apr. 2022 On the eigenvalues of the perfect matching derangement graph  
Virtual Algebraic Graph Theory Seminar, (invited)
- Aug. 2021 The ratio bound for the Erdős-Ko-Rado theorem on set-wise  $t$ -intersecting perfect matchings  
Virtual Carleton Combinatorics Meeting (invited, with K. Meagher and A. S. Razafimahatratra)
- Jul. 2021 On weakly Hadamard diagonalizable graphs  
28th British Combinatorial Conference
- Jun. 2021 On a generalization of set-wise intersection of perfect matchings  
Canadian Mathematical Society, Summer Meeting, (invited)
- Jun. 2021 On a generalization of the Erdős-Ko-Rado theorem to intersecting and set-wise intersecting perfect matchings  
CanaDAM
- Sep. 2020 Extensions of the Erdős-Ko-Rado theorem to 2-intersecting perfect matchings and 2-intersecting permutations  
Virtual Algebraic Graph Theory Seminar (invited, with A. S. Razafimahatratra)

- Jun. 2019 Erdős-Ko-Rado theorem for  $t$ -intersecting families of perfect matchings  
Canadian Mathematical Society Summer Meeting, University of Regina
- May 2019 Erdős-Ko-Rado theorem for  $t$ -intersecting families of perfect matchings  
Invited Talk at Shiraz University of Technology, Women in Mathematics Day
- Jul. 2018 Review of some nonexistence results for strong external difference families  
Prairie Discrete Mathematics Workshop, Brandon University

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## Meetings & Workshops Attended

- Aug.3–27, 2021 Math to Power Industry Workshop, hosted online by Pacific Institute for the Mathematical Sciences (PIMS)
- May 29–30, 2021 Western Canada Linear Algebra Meeting (WCLAM), Brandon University

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## Organization Experiences

- 2022-present Co-organizer, Combinatorics Seminar, University of Manitoba  
Organizers:A. Arman, M. Ferrari, K. Gunderson and M. Shirazi
- Nov. 2023 Co-organizer, Association for Women in Mathematics (AWM) Symposium, University of Manitoba
- Jun. 2023 Co-organizer, Contributed Mini-symposium "Movement and Symmetry in Graphs", Canadian Discrete and Algorithmic Mathematics (CanaDAM)  
Organizers: VRT Pantangi and M. Shirazi
- Jun. 2023 Co-organizer, Students/Postdocs networking night with panel discussion on academic job hunting , Canadian Discrete and Algorithmic Mathematics (CanaDAM)  
Organizers: A. Arman and M. Shirazi
- August 13-14, 2021 Member of the Organizing committee of a watching party for the Prairie Discrete Mathematics Workshop in Regina, University of Lethbridge

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## Honors, Awards, & Scholarships

- Winter 2022 Winner of the 2022 PIMS Postdoctoral Fellowship Competition
- Fall 2021 Faculty of Graduate Studies and Research Doctoral Graduate Teaching Assistant, (\$2,515)
- Winter 2021 UR Graduate Scholarship, University of Regina (\$11,000)
- Winter 2020 Faculty of Graduate Studies and Research Doctoral Graduate Teaching Assistant, (\$2,472)
- Winter 2020 Faculty of Graduate Studies and Research Thesis Only Scholarship, University of Regina, (\$2,833)
- Winter 2020 UR Graduate Scholarship, University of Regina, (\$1000)
- Fall 2019 UR Graduate Scholarship, University of Regina, (\$4,750)

- Winter 2019 Faculty of Graduate Studies and Research Doctoral Graduate Teaching Assistant, (\$2,436)
- Winter 2019 UR Graduate Scholarship, University of Regina, (\$9500)
- Fall 2018 Saskatchewan Innovation and Excellence Graduate Scholarship, (\$5,000)
- Winter 2018 UR Graduate Scholarship, University of Regina, (\$5,000)

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## Teaching Experiences

**Instructor:** Complete responsibility for teaching, including preparing the syllabus, notes, assessments, answering students questions and designing/supervising lab sessions.

University of Manitoba

- Winter 2024 Math 1300, Vector Geometry and Linear Algebra, 330 students in 2 sections
- Spring 2023 Math 2720, Multivariable Calculus, 33 students
- Fall 2022 Math 2030, Combinatorics 1, 63 students

University of Regina

- Spring 2022 Math 122, Linear Algebra I, 45 students
- Fall 2020 Math 223, Introduction to Abstract Algebra, 25 students

### Teaching Assistant

University of Regina, from 18 to 120 students

- Fall 2021 Math 103 Applied Calculus I, and MATH 110 Calculus I
- Winter 2021 Math 103, Applied Calculus I
- Spring 2020 Math 110, Calculus I
- Winter 2020 Math 111, Calculus II
- Fall 2019 Math 110, Calculus I
- Spring 2019 Math 111, Calculus II
- Winter 2019 Math 103, Applied Calculus I
- Fall 2018 Math 261, Methods of Numerical Analysis, and Math 110, Calculus I
- Spring 2018 Math 110, Calculus I
- Winter 2018 Math 122, Linear Algebra I
- 2019-2022 Mathematics Tutor, Global Learning Centre, University of Regina
- 2019-2022 Mathematics Tutor, Student Success Centre, University of Regina
- 2018–2019 ARP Teaching Assistant, Student Affairs, Student Success Centre, University of Regina

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## Student Supervision

- Winter 2024 Atishaya Maharjan (University of Manitoba), On Stars in Trees and Strongly Regular Graphs, The Manitoba eXperimental Mathematics Laboratory(MXML)
- Summer 2023 Marshall Kaatz (University of Manitoba), An Acyclic Spin on the Classical Ramsey Numbers, Faculty of Science Undergraduate Student Summer Research, USRA (co-supervision with K. Gunderson)  
2<sup>nd</sup> place in Computational Sciences, Undergraduate Research Poster Competition, University of Manitoba
- Nov. 2022-Apr. 2023 Anu Singh (University of Saskatchewan) and Jaskaran Singh (University of Manitoba), Chip firing games: applications of the Smith Normal Forms of Combinatorial matrices, PIMS Virtual Experimental Mathematics Lab (VXML) (co-supervision with R. Tej Pantangi)

## Referee Experiences

- 2024 *Discrete Mathematics*
- 2023 *SIAM Journal on Matrix Analysis and Applications (SIMAX)*
- 2022 *Operators and Matrices*
- 2021 *Journal of Combinatorial Theory, Series A*
- 2020 *Discrete Applied Mathematics*

## Outreach

- Sep.24, 2022 Volunteer at Science Outreach, University of Manitoba, University of Manitoba
- Winter 2020 Instructor for Grade 7-10, Math Circle, Faculty of Science, Department of Mathematics and Statistics, University of Regina
- Fall 2018 Volunteer, Math Circle, Faculty of Science, Department of Mathematics and Statistics, University of Regina
- Sep.15, 2019 Volunteer, Educational Activities at the Treaty 4 gathering, Faculty of Science, University of Regina

## University Activities

- 2022-present Member of the Movement and Symmetry in Graphs Collaborative Research Group
- Winter 2018-2022 Member of the Discrete Math Research Group, Department of Mathematics and Statistics, University of Regina
- Apr. 2008 Member of the Student Scientific Society, Department of Mathematics, Shiraz University
- Aug. 2009 Member of procurement staff during the “Break Time in University” (Shiraz University program for high school students)
- 2009–2010 Secretary of Student Scientific Society, Department of Mathematics, Shiraz University
- 2009–2011 Managing Editor of “Noghte Atf” (Inflection point), collegiate magazine, Shiraz University

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## Programming Skills & Technical Software

Expert MATLAB, L<sup>A</sup>T<sub>E</sub>X

Intermediate Maple, GAP, Sage, Python

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## Extracurricular Activities

Painting and Running

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## Languages

Persian (native), English (Fluent)

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## References

### **Shaun Fallat**

Professor, Department of Mathematics and Statistics

University of Regina, Regina, SK, Canada

✉ [shaun.fallat@uregina.ca](mailto:shaun.fallat@uregina.ca)

### **Karen Gunderson**

Assistant Professor, Department of Mathematics

University of Manitoba, Winnipeg, MB, Canada

✉ [karen.gunderson@umanitoba.ca](mailto:karen.gunderson@umanitoba.ca)

### **Nicholas Harland** (addressing teaching)

Instructor II, Associate Head Undergraduate, Department of Mathematics

University of Manitoba, Winnipeg, MB, Canada

✉ [Nicholas.Harland@umanitoba.ca](mailto:Nicholas.Harland@umanitoba.ca)

### **Karen Meagher**

Professor, Department of Mathematics and Statistics

University of Regina, Regina, SK, Canada

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Last updated July 10, 2024