

# Rashid Zaare-Nahandi

## Professor of Mathematic

Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran

Birth: 1964, Tabriz, Iran

## Education

Ph.D.: University of Tehran (Tehran, Iran), 1999.

M. Sc.: University of Teachers Education (Tehran, Iran), 1993.

Bachelor: Sharif University of Technology (Tehran, Iran), 1990.

## Area of Research

Algebraic Geometry, Commutative Algebra, Algebraic Combinatorics

## Specific Topics of Interests

Computational methods in Algebraic Geometry and Commutative Algebra, Free resolution of ideals of polynomial rings, Grobner bases.

## Publications

1. (with Reza Jafarpour-Golzari), Unmixed  $d$ -uniform  $r$ -partite hypergraphs, *Ars Combinatoria*, 155, (2021) 135-143.
2. (with Reza Abdolmaleki, Jurgen Herzog), On the initial behavior of the number of generators of powers of monomial ideals, *Bulletin Mathematique de la Societe des Sciences Mathematiques de Roumanie*, 63 (2), (2020) 119-129.
3. (with Mina Bigdeli, Ali Akbar Yazdan Pour), Decomposable clutters and a generalization of Simon's conjecture, *Journal of Algebra* 531, (2019) 102-124.
4. (with Abbas Nasrollah Nejad, Ashkan Nikseresht, Ali Akbar Yazdan Pour), On the blowup of affine spaces along monomial ideals: Tameness, *Journal of Symbolic Computation* 93, (2019) 85-99.
5. (with Mina Bigdeli, Jurgen Herzog), On the index of powers of edge ideals, *Communications in Algebra* 46 (3), (2018) 1080-1095.
6. (with Abbas Nasrollah Nejad, Zahra Shahidi), Torsion-free Aluffi algebras, *Journal of Algebra* 513, (2018) 190-207.
7. (with Ashkan Nikseresht), On generalization of cycles and chordality to clutters from an algebraic viewpoint, *Algebra colloquium* 24 (04), (2017) 611-624.

8. (with Mina Bigdeli, Ali Akbar Yazdan Pour), Stability of Betti numbers under reduction processes: Towards chordality of clutters, *Journal of Combinatorial Theory, Series A* 145, (2017) 129-149.
9. (with Mina Bigdeli, Jurgen Herzog, Ali Akbar Yazdan Pour), Simplicial orders and chordality, *Journal of Algebraic Combinatorics* 45 (4), (2017) 1021-1039.
10. (with Reza Jafarpour-Golzari) Unmixed  $r$ -partite graphs, *Bulletin of the Iranian Mathematical Society* 43 (3), (2017) 781-787.
11. (with Abbas Nasrollah Nejad, Aron Simis) The Aluffi algebra of the Jacobian of points in projective space: torsion-freeness, *Journal of Algebra* 467, (2016) 268-283.
12. (with Marcel Morales, Ali Akbar Yazdan Pour), Regularity and free resolution of ideals which are minimal to  $d$ -linearity, *Mathematica Scandinavica* 118 (2), (2016) 161-182.
13. Pure simplicial complexes and well-covered graphs, to appear in *Rocky Mountain Journal of Mathematics* 45 (2), (2015) 695-702.
14. Cohen-Macaulayness of bipartite graphs, revisited, *Bulletin of the Malaysian Mathematical Sciences Society* 38 (4), (2015) 1601-1607.
15. (with Asghar Madadi), Perfect Matching of 3-uniform Hypergraphs, *Electronic Notes in Discrete Mathematics* 45 (2014) 63-66.
16. (with Marcel Morales, Ali Akbar Yazdan Pour), Castelnuovo-Mumford regularity under reduction processes on Graphs and Hypergraphs, *Electronic Notes in Discrete Mathematics* 45 (2014) 57-62.
17. (with Marcel Morales, Abbas Nasrollah Nejad, Ali Akbar Yazdan Pour), Monomial ideals with 3-linear resolution, *Annals de Mathematiques de Toulouse, Series 6*, 23 (4), (2014) 877-891.
18. (with Asghar Madadi) Cohen-Macaulay  $r$ -partite graphs with minimal clique cover, *Bulletin of the Iranian Mathematical Society* 40 (3) (2014) 609-617.
19. Universally Koszul algebras defined by graphs, *Journal of Discrete Mathematical Sciences and Cryptography* 15 (6) (2012) 349-352.
20. Invariance of the barycentric subdivision of a simplicial complex, *Bull. Iranian Math. Soc.* 38 (2) (2012) 423-432.
21. (with Marcel Morales and Ali Akbar Yazdan Pour) The regularity of edge ideals of graphs, *Journal of Pure and Applied Algebra* 216 (2012) 2714-2719.
22. (with Abbas Nasrollah Nejad) Aluffi torsion-free ideals, *Journal of Algebra* 346 (2011) 284-298.
23. (with L. Sharifan) Minimal free resolution of associated graded ring of monomial curves of generalized arithmetic sequences, *Journal of Pure and Applied Algebra* 213 (2009) 360-369.
24. On isomorphism of simplicial complexes and their related algebras, *Bull. Iranian Math. Soc.* 35 (1) (2009) 41-48.
25. Some infinite classes of Fullerene graphs, *International Mathematical Forum* 1 (40) (2006) 1997-2002.
26. Perfect matchings in graphs, an approach via Grobner basis, *Southeast Asian Bulletin of Mathematics* 30 (2006) 341-345.
27. (with Rahim Zaare-Nahandi) The minimal free resolution of a class of square-free monomial ideals, *Journal of Pure and Applied Algebra* 189 (2004) 264-278.

28. (with Hamid Usefi) A note on minors of a generalized Hankel matrix, *International Mathematical Journal*, 3 (11) (2003) 1197-1201.
29. (with Rahim Zaare-Nahandi) Grobner basis and free resolution of the ideal of 2-minors of a  $2 \times n$  matrix of linear forms, *Communications in Algebra*, 28 (9) (2000) 4433-4453.

## Publications in Persian

1. History of Iranian mathematics competitions for university students, a chapter in the book "Iranian Mathematics Competitions for University Students", by B. Yahaghi, Iranian Math. Soc. and Iran University Press, Tehran, 2009. (English version is published by Hindustan Publishing Co. 2009).
2. Buchberger and Grobner bases (an expository and review article on history of Grobner bases and role of Buchberger in improving the theory), *Farhang va Andishe Riazi*, 44 (2010) 55-80.
3. Monitoring Science, Technology and Innovation of Mathematics in Iran, Published by Vice Presidency for Science and Technology, Iran, 2015.
4. Determinantal ideals, *Mathematical Researches*, 2023.

## Talks in International Conferences

1. Free resolution of the ideal of 2-minors of a  $(2 \times n)$  matrix of linear forms, 11<sup>th</sup> Seminar on Algebra, Isfahan Univ. of Tech., Isfahan, Iran, 27-29 October 1999.
2. Generalized Hankel matrices and their applications in algebraic geometry, 3<sup>rd</sup> Joint Seminar on Applied Math, Baku State University, Baku, Azerbaijan, 6-8 September 2002,
3. (with Rahim Zaare-Nahandi) Minimal free resolution of some monomial ideals, a survey, 15<sup>th</sup> Seminar on Algebra, Guilan University, Rasht, Iran, 19-20 July 2003. (Main Invited Speaker)
4. Domination ideal of a graph, 2<sup>nd</sup> Seminar on Commutative Algebra, IPM, Tehranm Iran, 16-17 November 2005. (Invited Speaker)
5. On isomorphism of simplicial complexes and their related rings, 3<sup>rd</sup> Seminar on Commutative Algebra, IPM, Tehran, Iran, 10-11 January 2007. (Invited Speaker)
6. Minimal free resolution of the associated graded ring of monomial affine curves, International Conference on Commutative Algebra, IIT Mumbai, Mumbai, India, 8-12 January 2008. (Invited Speaker)
7. Some infinite classes of Fullerene graphs, The first Conference and Workshop on Mathematical Chemistry, Tarbiat Modares University, Tehran, Iran, 29-31 January 2008.
8. Betti numbers of the associated graded ring of certain monomial curves, 5<sup>th</sup> International Fez Conference on Commutative Algebra and Applications, King Mohammad II University, Fez, Morocco, 23-28 June 2008,. (Invited Speaker)
9. (with Abbas Nasrollah Nejad) Hilbert Series of monomial algebras, 39<sup>th</sup> Annual Iranian Mathematics Conference, University of Kerman, Kerman, Iran, 24-27 August 2008.

10. Homomorphism of simplicial complexes, 4<sup>th</sup> Seminar on Commutative Algebra, 5<sup>th</sup> Seminar on Commutative Algebra, Isfahan University of Technology, Isfahan, Iran, 10-11 December 2008. (Invited Speaker)
11. Minimal free resolution of associated graded rings, 40<sup>th</sup> Annual Iranian Mathematics Conference, Sharif University of Technology, Tehran, Iran, 16-19 August 2009. (Invited Speaker)
12. Universally Koszul graphs, 21<sup>th</sup> Seminar on Algebra, University of Tabriz, Tabriz, Iran, 10-11 November 2010.
13. Barycentric subdivision of simplicial complexes, 7<sup>th</sup> Seminar on Commutative Algebra, IPM, Tehran, Iran, 1-2 December 2010. (Main Speaker)
14. Pure simplicial complexes and well-covered graphs, 3<sup>rd</sup> Algebraic Combinatorics Conference of Iran, University of Isfahan, Isfahan, Iran, 24-25 February 2011.
15. Aluffi torsion-free ideals, 42<sup>nd</sup> Annual Iranian Mathematics Conference, Valiasr University of Rafsanjan, Rafsanjan, Iran, 5-8 September 2011. (Invited Speaker)
16. A new method for checking Cohen-Macaulayness of bipartite graphs, 8<sup>th</sup> Seminar on Commutative Algebra, IPM, Tehran, Iran, 30 November - 1 December 2011.
17. A classification of monomial ideals with 3-linear minimal free resolution, 22<sup>nd</sup> Iranian Algebra Seminar, Hakim Sabzevari University, Sabzevar, Iran, 31 Jan - 2 Feb 2012. (Keynote speaker)
18. (with L. Sharifan) A class of monomial curves of homogeneous type, 22<sup>nd</sup> Iranian Algebra Seminar, Hakim Sabzevari University, Sabzevar, Iran, 31 Jan - 2 Feb 2012.
19. Regularity of monomial ideals generated in degree 2 and 3, 2<sup>nd</sup> Seminar on Combinatorial Commutative Algebra, IPM, Tehran, Iran, February 2012.
20. (with M. Morales, A. Yazdan Pour) Resolution of Ideals which are Minimal to d-linearity, The 43<sup>rd</sup> Annual Iranian Mathematics Conference, University of Tabriz, Tabriz, Iran, 27-30 August 2012.
21. (with S. Faghfour, J. Hossein Pour) Hilbert series of zero-dimensional ideals with 2 and 3 variables, The 43<sup>rd</sup> Annual Iranian Mathematics Conference, University of Tabriz, Tabriz, Iran, 27-30 August 2012.
22. (with M. Morales , A. Yazdan Pour) Castelnuovo-Mumford regularity under reduction processes on graphs and hypergraphs, 5<sup>th</sup> Conference on Algebraic Combinatorics and Graph Theory, University of Kashan, Kashan, Iran, July 2012.
23. (with A. Madadi) Perfect matching of 3-uniform hypergraphs, 5<sup>th</sup> Conference on Algebraic Combinatorics and Graph Theory, University of Kashan, Kashan, Iran, July 2012.
24. Constructive algebra: a method for teaching higher algebra, Challenges of Mathematical Education, University of California, Irvine, USA, 27-29 January 2014. (Invited Speaker)
25. Steps on classification of monomial ideals with linear resolution, Workshop on Computational Differential Algebra, IPM, Tehran, Iran, 21-25 June 2014. (Invited Lecturer)
26. (with A. Nikseresht) On generalizations of cycles and chordal graphs to clutters of higher dimensions, The 7-th SEAMS-UGM, 2015 International Conference on Mathematics and Its Applications, Indonesia, August 18-21, 2015.
27. (with A. Nikseresht) Linear resolution, chordality and ascent of clutters, 12<sup>th</sup> Seminar on Commutative Algebra, IPM, Tehran, Iran, 11-12 November 2015.

28. Linearity of resolution of monomial ideals and the role of characteristic of the base field, Frontiers in Mathematics, IPM, Tehran, Iran, February 2016 (Invited Speaker).
29. Linearity of resolution of monomials and the role of characteristic of the base field, Conference on Combinatorial Structures in Geometry, Osnabrueck University, Osnabrueck, Germany, 8-12 August 2016.
30. Computing in Algebraic Geometry, International Workshop on Mathematics and Physics, Salahaddin University, Erbil, Iraq, 25- 26 April 2017. (Invited Speaker)
31. Extendable shellability and Simon's conjecture, CIMPA School on Combinatorial Commutative Algebra, COMSETS, Lahore, Pakistan, 5 -14 March 2018. (Invited Lecturer)
32. Shellable Simplicial Complexes, Second International Conference of Mathematics, Salahaddin University, Erbil, Iraq, 3-5 February 2019. (Main Speaker)
33. Determinantal Ideals, Third International Conference of Mathematics, Salahaddin University, Erbil, Iraq, 28-30 August 2022. (Key Note Speaker)
34. An introduction to Computational Commutative Algebra, CIMPA-WAMS School on Commutative Algebra, Sulaimani University, Iraq, 1-7 September 2022. (Invited Lecturer)

## Positions

1. Vice President for Administration, Finance, Education and Research, IASBS, 2018-present.
2. Director of International Relations, IASBS, 2016-2018.
3. Vice President on Administration and Finance, IASBS, 2013.
4. Director of Research Affairs, IASBS, 2010-2012.
5. Chairman of Department of Mathematics, IASBS, 2002-2004 and 2006-2009.
6. Member of editorial board, Bulletin of the Iranian Mathematical Society, 2019-2021.
7. Editor-in-chief, Newsletter of the Iranian Mathematical Society, 1998-2000 and 2004-2006.
8. Member of editorial board of Farhang va Andishe Riazhi, 2010-2016.
9. Chairman of Scientific Committee of the Iranian Mathematics Competitions for University Students, 2003-2006.
10. Inspector of the Iranian Mathematical Society, 2012-2014.
11. Member of Executive Committee of the Iranian Mathematical Society, 1998-2000, 2003-2006, 2006-2009, 2020-2023.
12. Member of the National and State Councils of the World Mathematical Year 2000.
13. Chair of Scientific Committee of the Mathematics House of Zanjan, 2002-2017.
14. Head of Secretariat, Iranian Mathematical Society, 1987-1999.
15. Chairman of the Board of Trustee, Sobouti-Khajehpour Prize, 2012-2017.
16. Organizer of CIMPA-UNESCO-IRAN School on Groebner Bases and Applications, 19-30 July 2005, IASBS, Iran.
17. Organizer of Workshop on Computational Commutative Algebra, 2-7 July 2011, IPM, Iran (joint with Hossein Sabzrou).
18. Organizer of Workshop on Mathematical Writing, 3-5 November 2003, IASBS.

19. Organizer of Workshop on Computational Differential Algebras, 21-25 June 2014, IPM, (joint with Amir Hashemi).
20. Organizer of First Festival on Mind Toys, 27-30 June 2011, Mathematics House of Zanjan.
21. Organizer of Second Festival on Mind Toys, 1-4 September 2015, Mathematics House of Zanjan.
22. Organizer of Mathematical Summer Schools for Undergraduate University Students (two weeks each), IASBS, 2016, 2017, 2018, 2019, 2020.
23. Organizer of CIMPA-WAMS Summer Research School on Topics in Analytic and Transcendental Number Theory, IASBS, 2017.
24. Organizer of CIMPA-WAMS Summer Research Schools on Algebraic Geometry and Commutative Algebra (two weeks each), IASBS, 2017, 2018, 2019, (joint with Abbas Nasrollah Nejad and Ali Akbar Yazdan Pour).

## Scientific Fellowships

Research fellowship of ICTP, Abdus-Salam ICTP, Trieste, Italy, 2000-2006.

Research fellowship of Austrian Academy of Science, Research Institute for Symbolic Computation, University of Johan Kepler, Linz, Austria, March, July-August 2006.

Sabbatical Leave, University of Genova, Genova, Italy, September 2009-June 2010.

Mathematics Education Program, World Learning & USA Academy of Sciences, 10 January – 2 February 2014, USA.

## Courses Taught

Calculus (undergraduate); Algebra I & II (undergraduate); Projective Geometry (undergraduate); Introduction to Algebraic Geometry (undergraduate); Complex Variables (undergraduate); Linear Algebra (undergraduate); Commutative Algebra I & II (graduate); Algebraic Geometry I & II (graduate); Computational Methods in Commutative Algebra and Algebraic Geometry I & II (graduate); Advanced Algebra I & II (graduate); Algebraic Graph Theory (graduate); Algebraic Topology (graduate); Combinatorial Commutative Algebra (graduate).

**Student's evaluation of teaching: 19.70 (out of 20), during 2016-2022.**

## Graduated Ph. D. Students

Leila Sharifan (Joint with F. Rahmati) 2009, Ali Akbar Yazdan Pour (Joint with M. Morales) 2012, Abolfazl Tarizadeh 2013, Asghar Madadi (Joint with M. Ariannejad) 2014, Mina Bigdeli (Joint with Jurgen Herzog) 2015, Reza Jafarpour Golzari 2018, Zahra Shahidi (Joint with Abbas Nasrollah Nejad) 2019, Amirbehzad Farrahi (Joit with Abbas Nasrollah Nejad) 2021, Reza

Abdolmaleki (Joint with Jurgen Herzog) 2020, Somayeh Vosoughian (Joint with R. Naghipour) 2021, Shekoufeh Gherekhlou (Joint with Aliakbar Yazdanpour, Volkmar Welker) 2022.

## **Current Ph. D. Students**

Roghieh Ghorbani (Joint with Sara Faridi), Belal Sefatpanah (Joint with Giorgio Ottaviani).

## **Graduated M. Sc. Students**

Ali Moharrami (2000), Rasoul Moghaddam (2002), Hamid Usefi (2002), Firouz Alipour (2002), Mojtaba Zamani (2003), Vajiheh Tarviji (2003), Seyyed Mohammad Ajdani (2004), Abbas Nasrollah Nejad (2006), Pouya Nikoo (2006), Saeed Alirezazadeh (2007), Abolghasem Dashtban (2007), Aliakbar Yazdanpour (2007), Saeed Shaabani (2007), Mohammad Pirhayati (2007), Ehsan Hesamifard (2008), Zeinab Kodaee (joint with M. Zaker) (2008), Leila Tajdoust (joint with A. Rahnama) (2008), Neda Mohammadzadeh (2009), Masoud Mohammadpour (2009), Asghar Madadi (2009), Zabihollah Fallah (2009), Farzad Elmi (joint with S. Salehi) (2010), Hossein Kheyri (2011), Zahra Shahidi (2011), Sahar Faghfori (2012), Jamal Hossein Pour (2012), Javad Tavakoli (2012), Mohammad Bagher Safari (2012), Mohsen Shekari (joint with Aliakbar Yazdanpour) (2013), Masoumeh Danesfahani (2013), Kobra Khanahmadlou (Joint with Abbas NasrollahNejad) (2014), Iman Bahmani (2014), Marjan Amirian (2014), Narges Akbarisafa (joint with Ali Akbar Yazdan Pour) (2014), Sepehr Jafari (2015), Maryam Zamani (2015), Fatemeh Yarmohammadi (2015), Mahmoud Ejazi (2017), Yousef Ashegh Bonabi (2017), Alireza Shamsian (joint with Ali Akbar Yazdan Pour) (2018), Maryam Mouvivand (joint with Abbas Nasrollah Nejad) (2018), Roghieh Dameshghi (2019), Jafar Madadi (2021), Mina Hashemi (2021), Nasrin Sadeghi (2022).

## **Visited Countries**

Armenia, Austria, Azerbaijan, Belorussia, France, Georgia, Germany, Greece, India, Iraq, Italy, Morocco, Pakistan, Qatar, Russia, Turkey, Ukraine, United Arab Emirates, United States of America.

## **Contact me**

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