

Curriculum Vitae

KAROLA MÉSZÁROS

Work Address: Department of Mathematics
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Employment

- 2020 – **Associate Professor of Mathematics**, Cornell University.
- 2014 – 2020 **Assistant Professor of Mathematics**, Cornell University.
- 2012 – 2014 **H.C.Wang Assistant Professor**, Department of Mathematics, Cornell University.
- 2011 – 2012 **NSF Fellow**, Department of Mathematics, University of Michigan, Ann Arbor.
- 2010 – 2011 **Lecturer**, Department of Mathematics, MIT.

Short-term Positions

- Summer 2019 **Visiting Assistant Professor**, Department of Mathematics, MIT.
- 2018 – 2019 **von Neumann Fellow**, Institute for Advanced Study.
- Winter 2016 **Invitée Paris 7**, Invited Scholar at Université Paris 7 Diderot.

Education

- 2005 – 2010 **Ph. D. in Mathematics**, Massachusetts Institute of Technology.
Thesis: *Root polytopes, triangulations, and subdivision algebras*,
advised by Richard P. Stanley
- 2001 – 2005 **B.S. in Mathematics**, Massachusetts Institute of Technology.

Scientific/Academic Honors

- 2019 – 2024 CAREER National Science Foundation Grant, [DMS-1847284](#)
- 2018 – 2019 von Neumann Fellowship at the Institute for Advanced Study
- 2015 – 2019 National Science Foundation Grant [DMS-1501059](#)
- 2011 – 2014 National Science Foundation Postdoctoral Research Fellowship
- 2009 – 2010 MIT Department of Mathematics Graduate Student Appreciation Fellowship
- 2005 – 2006 AKAMAI Fellowship
- 2005 AMITA (Association of MIT Alumnae) Senior Academic Award
- 2005 MIT Jon A. Bucsela Prize in Mathematics

Research Interests

Algebraic combinatorics, discrete geometry.

Publications and Preprints

- preprints
1. Elena Hafner, Karola Mészáros, Linus Setiabrata and Avery St. Dizier, *Bubbling for the M -convexity of Grothendieck polynomials*, in preparation.
 2. Matt Dreyer, Karola Mészáros, and Avery St. Dizier, *On the degree of Grothendieck polynomials*, [arXiv:2209.00687](#)
 3. Karola Mészáros, Linus Setiabrata and Avery St. Dizier, *On the support of Grothendieck polynomials*, [arXiv:2201.09452](#)

- 2022 4. Karola Mészáros, Linus Setiabrata and Avery St. Dizier, *An orthodontia formula for Grothendieck polynomials*, Trans. Amer. Math. Soc., 375 (2022), 1281–1303.
5. Ricky I. Liu, Karola Mészáros and Avery St. Dizier, *Schubert polynomials as projections of Minkowski sums of Gelfand-Tsetlin polytopes*. Combin. Theory, accepted.
- 2021 6. June Huh, Jacob Matherne, Karola Mészáros and Avery St. Dizier, *Logarithmic concavity of Schur and related polynomials*, Trans. Amer. Math. Soc. 375 (2022), no. 6, 4411–4427.
- Karola Mészáros, Avery St. Dizier and Arthur Tanjaya, *Principal specialization of dual characters of flagged Weyl modules*, Electron. J. Combin. 28 (4) (2021), #P4.17
7. Karola Mészáros and Arthur Tanjaya, *Inclusion-exclusion on Schubert polynomials*, Algebr. Comb., accepted.
8. Karola Mészáros and Linus Setiabrata, *Lorentzian polynomials from polytope projections*, Algebr. Comb., Volume 4 (2021) no. 4, pp. 723–739.
9. Samuel C. Gutekunst, Karola Mészáros and T. Kyle Petersen, *Root cones and the resonance arrangement*. Electron. J. Combin. 28 (1) (2021), #P1.12.
10. Kabir Kapoor, Karola Mészáros and Linus Setiabrata, *Counting integer points of flow polytopes*, Discrete Comput. Geom., accepted.
11. Sylvie Corteel, Jang Soo Kim and Karola Mészáros, *Volumes of generalized Chan-Robbins-Yuen polytopes*. Discrete Comput. Geom. 65 (2021), no. 2, 510–530.
- 2020 12. Alex Fink, Karola Mészáros and Avery St. Dizier, *Zero-one Schubert polynomials*. Math. Z. 297 (2021), no. 3–4, 1023–1042.
13. Karola Mészáros and Avery St. Dizier, *From generalized permutahedra to Grothendieck polynomials via flow polytopes*. Algebr. Comb. 3 (2020), no. 5, 1197–1230.
- 2019 14. Ricky I. Liu, Karola Mészáros and Avery St. Dizier, *Gelfand-Tsetlin polytopes: a story of flow and order polytopes*. SIAM J. Disc. Math. 33 (2019), no. 4, 2394–2415.
15. Karola Mészáros and Alejandro H. Morales, *Volumes and Ehrhart polynomials of flow polytopes*. Math. Z. 293 (2019), no. 3–4, 1369–1401.
16. Karola Mészáros, Alejandro H. Morales and Jessica Striker, *On flow polytopes, order polytopes, and a certain face of the alternating sign matrix polytope*. Discrete Comput. Geom. 62 (2019), no. 1, 128–163.
17. Ricky I. Liu, Karola Mészáros and Alejandro H. Morales, *Flow polytopes and the space of diagonal harmonics*. Canad. J. Math., 71 (2019), no. 6, 1495–1521.
18. Karola Mészáros, Connor Simpson and Zoe Wellner, *Flow polytopes of partitions*. Electron. J. Combin. 26 (2019), no. 1, Paper 1.47, 12 pp.
- 2018 19. Alex Fink, Karola Mészáros and Avery St. Dizier, *Schubert polynomials as integer point transforms of generalized permutahedra*. Adv. Math. 332 (2018), 465–475.
20. Laura Escobar and Karola Mészáros, *Subword complexes via triangulations of root polytopes*. Algebr. Comb. 1 (2018), no. 3, 395–414.
- 2017 21. Sylvie Corteel, Jang Soo Kim and Karola Mészáros, *Flow polytopes with Catalan volumes*. C. R. Math. Acad. Sci. Paris 355 (2017), no. 3, 248–259.
22. Patricia Hersh and Karola Mészáros, *SB-labelings and posets with each interval homotopy equivalent to a sphere or a ball*. J. Combin. Theory Ser. A, (2017), 152, 104–120.
23. Karola Mészáros, Alejandro H. Morales and Brendon Rhoades, *The polytope of Tesler matrices*. Selecta Math. (N.S.), 23 (2017), no. 1, 425–454.

24. Karola Mészáros, *Calculating Greene's function via root polytopes and subdivision algebras*. Pacific J. Math., 286 (2017), no. 2, 385–400.
- 2016 25. Laura Escobar and Karola Mészáros, *Toric matrix Schubert varieties and their polytopes*. Proc. Amer. Math. Soc., 144 (2016), no. 12, 5081–5096.
26. Karola Mészáros, *Pipe dream complexes and triangulations of root polytopes belong together*. SIAM J. Disc. Math., 30 (2016), no. 1, 100–111.
27. Karola Mészáros, *h -Polynomials of Reduction Trees*. SIAM J. Disc. Math., 30 (2016), no. 2, 736–762.
28. Jonah Blasiak, Ricky I. Liu and Karola Mészáros, *Subalgebras of the Fomin-Kirillov algebra*, J. Algebraic Combin., 44 (2016), no. 3, 785–829.
- 2015 29. Karola Mészáros and Alejandro H. Morales, *Flow polytopes of signed graphs and the Kostant partition function*. Int. Math. Res. Notices (2015) no. 3: 830–871.
30. Louis J. Billera, Lionel Levine and Karola Mészáros, *How to decompose a permutation into a pair of labeled Dyck paths by playing a game*. Proc. Amer. Math. Soc. 143 (2015), no. 5, 1865–1873.
31. Karola Mészáros, *Product formulas for volumes of flow polytopes*. Proc. Amer. Math. Soc. 143 (2015), no. 3, 937–954.
32. Karola Mészáros, *h -Polynomials via Reduced Forms*. Electron. J. Combin. 21. 22(4) (2015), #P4.18
- 2014 33. Karola Mészáros, Greta Panova and Alexander Postnikov, *Schur times Schubert via the Fomin-Kirillov algebra*. Electron. J. Combin. 21 (2014), no. 1, Paper 1.39, 22 pp.
34. Jang Soo Kim, Karola Mészáros, Greta Panova and David B. Wilson, *Dyck tilings, increasing trees, descents, and inversions*. J. Combin. Theory Ser. A 122 (2014), 9–27.
- 2013 35. Karola Mészáros and Alexander Postnikov, *Branched polymers and hyperplane arrangements*. Discrete Comput. Geom. 50, Issue 1 (2013), Page 22-38.
36. Karola Mészáros, *Labeling the regions of the type C_n Shi arrangement*, Electron. J. Combin. 20, Issue 2 (2013), P31.
- 2012 37. Karola Mészáros, *Demystifying a divisibility property of the Kostant partition function*. Pacific J. Math. 260-1 (2012) 215-225.
- 2011 38. Karola Mészáros, *Root polytopes, triangulations, and the subdivision algebra, II*. Trans. Amer. Math. Soc. **363**: # 11, 6111–6141, 2011.
39. Karola Mészáros, *Root polytopes, triangulations, and the subdivision algebra, I*. Trans. Amer. Math. Soc. **363**: # 8, 4359–4382, 2011.
- 2008 40. Alexander Holroyd, Lionel Levine, Karola Mészáros, Yuval Peres, James Propp, and David Wilson, *Chip-firing and rotor-routing on finite digraphs*. In and out of Equilibrium II, “Progress in Probability,” Birkhäuser (2008), 331-364.
41. Karola Mészáros, *On low degree k -ordered graphs*. Discrete Math. 308, Issue 12 (2008), 2418-2426.
42. Karola Mészáros, *On 3-regular 4-ordered graphs*. Discrete Math. 308, Issue 11 (2008), 2149-2155.
43. Karola Mészáros, *Latin squares and their defining sets*. Discrete Math. 308, Issue 12 (2008), 2366-2378.
- 2007 44. Karola Mészáros, *On the number of genus one labeled circle trees*, Electron. J. Combin. 14 (2007), #R68.

Invited and Seminar talks

- 2022 April MSU Combinatorics and Graph theory seminar
 March Brandeis Combinatorics seminar
 January Plenary Speaker, FPSAC (Formal Power Series and Algebraic Combinatorics), Ramat-Gan, Israel
- 2021 June Algebra and Discrete Mathematics Seminar, UC Davis, CA
 May CANADAM, Session on Flow polytopes on graphs.
 May Combinatorics Seminar, UW, Seattle, WA
 May Workshop on Degeneracy Loci, Columbus, OH
 Apr. Algebra, Geometry, and Combinatorics Online Seminar
 Apr. Invited Speaker, Workshop on Algebraic Geometry and Polyhedra, ICERM, Providence, RI
 Apr. Invited Speaker, (Polytop)ics: Recent advances on polytopes, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany
- 2020 July (postponed) Plenary Speaker, FPSAC (Formal Power Series and Algebraic Combinatorics), Ramat-Gan, Israel
 July (postponed) Invited Speaker, Algebraic Combinatorics in Cetraro, Cetraro, Italy
 Apr. (postponed) Invited Speaker, Geometric Combinatorics meets Nonlinear Algebra Workshop, NYC, NY.
 Apr. (postponed) Geometry, Combinatorics, and Integrable Systems Seminar, The Ohio State University, Columbus, OH
 Mar. (postponed) Colloquium, Washington University, St. Louis, MO
- 2019 Nov Research Seminar in Combinatorics, Freie Universität, Berlin, Germany
 May Invited Speaker, Mid-Atlantic Algebra, Geometry & Combinatorics Workshop, Drexel University, Philadelphia, PA
 Apr. Colloquium, UIUC, Urbana-Champaign, IL
 Apr. MIT Combinatorics Seminar, Cambridge, MA
 Apr. Computer Science/Discrete Mathematics Seminar, Institute for Advanced Study, Princeton, NJ
 Mar. University of Szeged Combinatorics Seminar, Szeged, Hungary
 Mar. LaCIM Combinatorics Seminar, Montréal, Canada
- 2018 Dec. IAS Members' Seminar, Institute for Advanced Study, Princeton, NJ
 Nov. Invited Speaker, Subtraction-Free combinatorics, a conference in honor of Sergey Fomin's 60th birthday, Ann Arbor, MI
 Nov. Colloquium, Haverford College, Haverford, PA
 Apr. Invited Speaker, Graduate Student Combinatorics Conference, University of Texas, Dallas, TX
 Mar. Invited Speaker, Triangle Lectures in Combinatorics, NCSU, Raleigh, NC
- 2017 Oct Colloquium, George Mason University, Fairfax, VA
 Sept. AMS Sectional Meeting, Polynomials in enumerative, algebraic and geometric combinatorics, University at Buffalo, SUNY, Buffalo, NY
 Jun. Invited speaker, Algebraic and Geometric Combinatorics of Reflection Groups, CRM/LaCIM, Montréal, Canada
 Apr. Combinatorics Seminar, Georgia Tech, Atlanta, GA
 Feb. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY
 Jan. Colloquium, Technische Universität, Berlin, Germany
- 2016 Nov. UC Berkeley Combinatorics Seminar, Berkeley, CA
 Nov. Invited Speaker, AIM Workshop on Polyhedral geometry and partition theory, San Jose, CA
 Nov. Combinatorics Seminar, University of Washington, Seattle, WA

- Jan. LIAFA: Enumerative and analytic combinatorics seminar, Université Paris 7, Paris, France
- 2015 Nov. Combinatorics Seminar, University of California, San Diego, CA
 Nov. Combinatorics Seminar, University of Washington, Seattle, WA
 Oct. Enumerative, algebraic and geometric combinatorics, AMS Sectional Meeting at Loyola University, Chicago, IL
 May University of Szeged Combinatorics Seminar, Szeged, Hungary
 Apr. MIT Combinatorics Seminar, Cambridge, MA
 Mar. Kempner Colloquium, University of Colorado, Boulder, CO
 Mar. Applied Algebra Seminar, York University, Toronto, CA
 Feb. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY
 Feb. Invited speaker, Perspectives in Lie Theory, Pisa, Italy
- 2014 June Invited speaker, Stanley's 70th birthday conference, Cambridge, MA
 June Discrete Geometry Seminar, Freie Universität, Berlin, Germany
 May Plenary speaker, ALGECOM, Urbana-Champaign, IL
 Apr. University of Szeged Combinatorics Seminar, Szeged, Hungary
 Feb. NCSU Algebra and Combinatorics seminar, Raleigh, NC
 Jan. Invited speaker, AMS joint meetings, Session on Geometric applications of Algebraic Combinatorics, Baltimore, MD
- 2013 Oct. LACIM Combinatorics Seminar, Montreal, Canada
 Oct. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY
 Sep. UMN Combinatorics Seminar, Minneapolis, MN
 Sep. Invited speaker, COMETA, Cortona, Italy
- 2012 Nov. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY
 Apr. UM Combinatorics Seminar, Ann Arbor, MI
- 2011 Aug. Invited speaker, Cluster Algebras and Statistical Physics, ICERM, Providence, RI
 Feb. UBC Mathematics Colloquium, Vancouver, Canada
 Feb. UBC Combinatorics Seminar, Vancouver, Canada
 Jan. UMN Combinatorics Seminar, Minneapolis, MN
- 2010 Sep. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY
 May. Plenary speaker, Discrete Math Day, Worcester, MA.
- 2009 Dec. UM Combinatorics Seminar, Ann Arbor, MI
 Nov. Dartmouth Combinatorics Seminar, Hanover, NH
 Oct. UW Combinatorics Seminar, Seattle, WA
 Oct. Brown University Discrete Mathematics Seminar, Providence, RI
 May SFSU Algebra-Geometry-Combinatorics Seminar, San Francisco, CA
 Apr. UC Berkeley Discrete Mathematics Seminar, Berkeley, CA
 Apr. AMS Special Session on Matroids in algebra and geometry, San Francisco, CA
 Apr. UC Davis Algebra and Discrete Mathematics Seminar, Davis, CA
 Feb. MIT Combinatorics Seminar, Cambridge, MA
- 2008 Dec. ELTE Egerváry Seminar, Budapest, Hungary
 Dec. University of Szeged Combinatorics Seminar, Szeged, Hungary
 Nov. Dartmouth Combinatorics Seminar, Hanover, NH

Teaching

- 2022 Fall MATH 4410: Introduction to Combinatorics I, Cornell undergraduate course
 2022 Spring MATH 3360: Applicable Algebra, Cornell undergraduate course
 2021 Fall MATH 4410: Introduction to Combinatorics I, Cornell undergraduate course
 2020 Fall MATH 4410: Introduction to Combinatorics I, Cornell undergraduate course

- 2020 Spring MATH 6410: Enumerative Combinatorics, Cornell graduate course
 2020 Spring MATH 3340: Abstract Algebra, Cornell undergraduate course
 2019 Fall MATH 4370: Computational Algebra, Cornell undergraduate course
 2018 Spring MATH 6410: Enumerative Combinatorics, Cornell graduate course
 2017 Spring MATH 2310: Linear Algebra with Applications, Cornell undergraduate course
 2016 Spring MATH 6410: Enumerative Combinatorics, Cornell graduate course
 2015 Fall MATH 4410: Introduction to Combinatorics I, Cornell undergraduate course
 2015 Spring MATH 4550: Applicable Geometry, Cornell undergraduate course
 2014 Fall MATH 4410: Introduction to Combinatorics I, Cornell undergraduate course
 2014 Spring MATH 6410: Enumerative Combinatorics, Cornell graduate course
 2013 Spring MATH 4550: Applicable Geometry, Cornell undergraduate course

Supervised Reading and Research

- 2021 Fall MATH 4900: Supervised Research, Cornell undergraduates
 2021 Spring MATH 4900: Supervised Research, Cornell undergraduates
 2020 Spring MATH 4900: Supervised Research, Cornell undergraduates
 2019 Fall MATH 4900: Supervised Research, Cornell undergraduates
 2019 Fall MATH 7900: Supervised Reading & Research, Cornell graduates
 2019 Spring MATH 4900: Supervised Research, Cornell undergraduates
 2019 Spring MATH 7900: Supervised Reading & Research, Cornell graduates
 2018 Fall MATH 4900: Supervised Research, Cornell undergraduates
 2018 Fall MATH 7900: Supervised Reading & Research, Cornell graduates
 2018 Spring MATH 4900: Supervised Research, Cornell undergraduates
 2017 Fall MATH 4900: Supervised Research, Cornell undergraduates
 2017 Fall MATH 7900: Supervised Reading & Research, Cornell graduates
 2017 Spring MATH 4900: Supervised Research, Cornell undergraduates
 2017 Spring MATH 7900: Supervised Reading & Research, Cornell graduates
 2016 Fall MATH 4900: Supervised Research, Cornell undergraduates
 2013 Fall MATH 4901: Supervised Reading, Cornell undergraduates

Thesis Committees

- 2022 Spring Fiona Young, Cornell Department of Mathematics A-exam committee member
 2021 Spring Prairie Wentworth-Nice, Cornell Department of Mathematics A-exam committee member
 2020 Summer Joseph Fluegemann, Cornell Department of Mathematics A-exam committee member
 2020 Spring Sam Gutekunst, Cornell ORIE Department B-exam committee member
 2020 Spring Avery St. Dizier, Cornell Department of Mathematics B-exam committee chair
 2019 Spring Swee Hong Chan, Cornell Department of Mathematics B-exam committee member
 2019 Spring Sagar Jha, Cornell Department of Computer Science A-exam committee member
 2018 Spring Connor Simpson, Cornell Mathematics Undergraduate Honors Thesis Advisor
 2018 Spring Avery St. Dizier, Cornell Department of Mathematics A-exam committee chair
 2018 Spring Sam Gutekunst, Cornell ORIE Department A-exam committee member
 2017 Spring Matvey Soloviev, Cornell Department of Computer Science A-exam committee member
 2016 Spring Swee Hong Chan, Cornell Department of Mathematics A-exam committee member

Mentoring and Outreach

- 2022 AWM Panel on academia and industry

- 2022- MIT PRIMES faculty mentor for CMU graduate student Zoe Wellner and Boston area high school student Advay Goel
- 2021- mentoring undergraduate student Alejandro Maris Natera on a research project
- 2021- designed and involved with Discrete Mathematics and Explorations program for high school students
- 2020- supervising the research of mathematics graduate student Elena Hafner
- 2020-2021 mentored undergraduate student Matt Dreyer on a research project
- 2020-2021 mentored undergraduate student Arthur Tanjaya on a research project
- 2018-2020 mentored undergraduate student Linus Setiabrata on a research project
- 2018 mentored undergraduate student Kabir Kapoor on a research project
- 2017 mentored Amherst College undergraduate student Sylvia Frank on a reading and research project
- 2017-2020 mentored ORIE graduate student Samuel Gutekunst on a research project
- 2016-2018 mentored undergraduate students Connor Simpson and Zoe Wellner on a research project
- 2016-2020 supervised the research of mathematics graduate student Avery St. Dizier
- 2014-2016 Involved graduate students Kai Fong Ernest Chong and Laura Escobar and undergraduates Ethan Koenig and Aravind Gollakota in research
- 2016 Presented on *Combinatorial Enumeration* to interested non-math majors in the Totally Awesome Math Course at Cornell (MATH 1600)
- 2016 Presented on *Ehrhart polynomials of integer polytopes* in the Cornell Undergraduate Math Club
- 2016 Presented on *Catalan numbers* to an audience of Central NY high school teachers (MATH 5080)
- 2014 Presented on *Fibonacci numbers* to an audience of Central NY high school teachers (MATH 5080)
- 2014 Presented on *Enumerative Combinatorics* to interested non-math majors in the Totally Awesome Math Course at Cornell (MATH 1600)
- 2013 Designed a reading course on *Combinatorics and Polytopes* for Cornell undergraduate Bradford Aymes
- 2013 Presented on *Polytopes and Magic Squares* in the Cornell Undergraduate Math Club

Postdocs Mentored

- 2022- Christian Gaetz, Klarman Fellow.

Service at the Cornell Department of Mathematics

- 2015-2016, 2017-2018, 2019-2020, 2022 Graduate Admissions Committee
- 2012-2016, 2019-2022 Math Club Committee
- 2014-2015, 2016-2018 Computer Committee

Professional Activities

- 2021 NSF Grant Panelist
- 2017 – 2018 Program Committee member for FPSAC 2018 (Formal Power Series and Algebraic Combinatorics)

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- 2017 Organized lecture series by Luca Moci at Cornell “A survey on vector partition functions: quasi-polynomiality and beyond”
- 2014 – 2018 Co-organizer of the Cornell Discrete Geometry and Combinatorics seminar since Fall 2014
- 2006 – Reviewer for mathematics journals (International Mathematical Research Notices; Compositio Mathematica; Mathematische Zeitschrift; Comptes Rendus Mathématique Acad. Sci. Paris; Transformation Groups; Proceedings of the American Mathematical Society; Transactions of the American Mathematical Society; Symmetry, Integrability and Geometry: Methods and Applications; Discrete & Computational Geometry; Journal of Combinatorial Theory Series A; Journal of Algebraic Combinatorics; Combinatorics, Probability and Computing; SIAM Journal of Discrete Mathematics; European Journal of Combinatorics; Discrete Mathematics; Electronic Journal of Combinatorics) and for conferences FPSAC (Formal Power Series and Algebraic Combinatorics) and SODA (Symposium on Discrete Algorithms)