

Raj Gandhi

Curriculum vitae

Malott Hall, Cornell University
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Research interests

Schubert calculus, matroids, finite reflection groups, formal group laws, flag varieties, brick manifolds, generalized cohomology theories, toric degenerations.

Education

Sep. 2021 - **Ph.D. in Mathematics**, Cornell University

Aug. 2026 Thesis title: *TBA*.

Advisor: Allen Knutson.

Sep. 2019 - **M.Sc. in Mathematics**, University of Ottawa

Aug. 2021 Thesis title: *Oriented cohomology rings of the semisimple linear algebraic groups of ranks 1 and 2*. ruor.uottawa.ca/handle/10393/42566.

Advisors: Alistair Savage and Kirill Zainoulline.

2015–2019 **B.Sc. in Physics-Mathematics**, University of Ottawa

Research

Publications/Refereed Conference Proceedings

1. Deforming the motivic Segre classes of Schubert cells in the Grassmannian. *Séminaire Lotharingien de Combinatoire*. (2025). <https://www.mat.univie.ac.at/~slc/wpapers/FPSAC2025/12.pdf>
2. A degeneration of the brick variety and a mixed subdivision of the associahedron into cubes. (Joint with Gabe Udell.) *Séminaire Lotharingien de Combinatoire*. (2025). <https://www.mat.univie.ac.at/~slc/wpapers/FPSAC2025/91.pdf>
3. Diagrammatics for F_4 . (Joint with Alistair Savage and Kirill Zainoulline.) *Bulletin of the London Mathematical Society*. (2022). <https://onlinelibrary.wiley.com/doi/10.1112/blms.12733>.
4. The formal affine Demazure algebra and real finite reflection groups. *Algebras and Representation Theory*. (2022) <https://link.springer.com/article/10.1007/s10468-022-10158-x>.
5. Decomposing Frobenius Heisenberg categories, *Journal of Algebra and its Applications*. (2020). Vol. 19. No. 5. 31 pages. doi.org/10.1142/S0219498820500942.

Posters

1. The ring of twisted differential operators of reflection group $I_2(5)$. (2016). University of Ottawa library. ruor.uottawa.ca/handle/10393/36283.

Teaching Experience

Cornell University

- MATH 1920: Multivariable Calculus for Engineers. Grader and recitation instructor. (Fall 2025).

University of Ottawa

- MAT 1320X: Calculus I. Recitation instructor. (Summer 2021).
- MAT 2355: Introduction to Geometry. Grader. (Winter 2021).
- MAT 1348: Discrete Mathematics for Computing. Grader and recitation instructor. (Winter 2021).
- MAT 2141: Honours Linear Algebra. Grader. (Fall 2020).
- MAT 1341: Introduction to Linear Algebra. Grader and recitation instructor. (Fall 2020).
- MAT 1332: Calculus II for the Life Sciences. Grader and recitation instructor. (Fall 2020).
- MAT 1300X: Mathematical Methods I. Tutorial instructor. (Summer 2020)
- MAT 1320: Calculus I. Grader and recitation instructor. (Winter 2020).
- MAT 1348: Discrete Mathematics for Computing. Grader and recitation instructor. (Winter 2020).
- MAT 1362: Mathematical Reasoning and Proofs. Grader. (Winter 2020).
- MAT 1362: Mathematical Reasoning and Proofs. Grader and recitation instructor. (Fall 2019).

Outreach and service

Canada/USA Mathcamp

June-August 2023 I was a **mentor** at Canada/USA Mathcamp. I taught five one-week-long courses: Knot invariants; Representation theory of the symmetric groups; Linear algebra through knots; Quiver representations II; Introduction to Schubert calculus.

Cornell Prison Education Program

Jan.-Feb. 2025 I was an **instructor** for MATH 112, a course offered at Auburn Correctional Facility through Cayuga Community College. (This course was canceled partway through due to a New York State prison guard strike.)

Sep.-Dec. 2024 I was a **tutor** for MATH 112, a course offered at Auburn Correctional Facility through Cayuga Community College.

Ithaca high school math seminar

- Nov.-Dec. 2024 I taught a 16-lecture course at Ithaca high school. The topic was Tropical Geometry, and the problem sets for the course are here: https://drive.google.com/drive/folders/1cqaSJSWWGK_gcvJ8pGHMy0Npy520fwua?usp=sharing
- Jan.-March 2024 I taught a 16-lecture course at Ithaca high school. The topic was Partially Ordered Sets, and the notes for the course are here: <https://drive.google.com/drive/folders/1Do59gET0j4nmm8ylIAGWmUz480FXH0HH?usp=sharing>
- Jan.-March 2023 I taught a 16-lecture course at Ithaca high school. The topic was Young Tableaux, and the notes for the course are here: https://drive.google.com/file/d/1UdUD1T_izXgFtyYTwD70g6Ff7zScqt08/view?usp=sharing
- Cornell GRASSHOPR Program
- March 2025 Anna Barth and I taught a three-lesson-long mini-course on the topic of cryptography to middle school students at Lehman Alternative Community School in Ithaca, NY.
- March 2023 I taught a five-lesson-long mini-course on graph theory to middle school students at Lehman Alternative Community School in Ithaca, NY.
- March 2022 Aria Beaupré and I taught a four-lesson-long mini-course on the topic of voting theory to middle school students at Namasté Montessori school in Ithaca, NY.
- Cornell directed reading program
- Fall 2025 My undergraduate mentees and I are reading "Matroids: A Geometric Introduction" by Gary Gordan and Jennifer McNulty.
- Spring 2023 My undergraduate mentee and I read the first six chapters of "The Knot Book" by Colin C. Adams.
- Fall 2022 My undergraduate mentee and I read the first three chapters of "Arithmetic of Elliptic Curves" by Joseph H. Silverman.

Presentations

Invited/Contributed Talks

- June 26, 2025 **Algebra seminar**, *Deforming the motivic Segre classes of Schubert cells in the Grassmannian*, University of Ottawa
- May 1, 2025 **Combinatorics seminar**, *Deforming the motivic Segre classes of Schubert cells in the Grassmannian*, University of Toronto
- March 17, 2024 **Graduate Student Combinatorics Conference (GSCC)**, *Degenerating brick manifolds and subdividing the associahedron*, Carnegie Mellon University
- June 3, 2021 **Algebra and Geometry of Homogeneous Spaces**, *The formal group ring and real finite reflection groups*, University of Ottawa

Posters

- July 21, '25 **Formal power series and algebraic combinatorics (FPSAC)**, *Deforming the motivic Segre classes of Schubert cells in the Grassmannian*, Hokkaido University, Poster.
- March 22, 2025 **Mid-Atlantic Algebra, Geometry, and Combinatorics (MAAGC) Workshop**, *Deforming the motivic Segre classes of Schubert cells in the Grassmannian*, CUNY Graduate Center in New York, Poster.
- June 26, 2024 **Encuentro Colombiano de Combinatoria (ECCO)**, *Generalized cohomology rings of rank 2 root systems*, Universidad del Cauca, Poster.

Informal talks

- Feb. 20, '24 **Olivetti club**, *Linear algebra through quiver representations*, Cornell University
- May 2, '23 **Olivetti club**, *String calculus: a calculus with a twist*, Cornell University

Conferences, workshops, and seminars

Attended

- Aug. 18-22 '25 **Workshop on algebra and representation theory**, *University of Oregon*, Eugene, Oregon
- July 21-25, '25 **Formal power series and algebraic combinatorics**, *Hokkaido University*, Sapporo, Japan
- Jan. 20-24, '25 **Apprenticeship program in commutative algebra**, *Field's institute*, Toronto, Canada
- July 22-26, '24 **Formal power series and algebraic combinatorics**, *Ruhr-Universität Bochum*, Bochum, Germany.
- July 15-19, '24 **Summer school in algebraic combinatorics**, *Max Planck Institute*, Leipzig, Germany.
- June 12-22, '23 **Schubert summer school**, *University of Illinois at Urbana-Champaign*, Champaign, Illinois.
- Apr. 28-30, '23 **Algebraic geometry northeastern series**, *Stony Brook University*, Stony Brook, NY.
- Sep. 24, '22 **Route 81**, Queen's university
- June 6-10, '22 **The Los Angeles Workshop on Representations and Geometry**, University of Southern California
- May 6-8, '22 **Cornell Topology Festival**, Cornell university
- Apr. 29-May 1, '22 **Derived categories and moduli spaces**, Cornell university

Organized

- Fall 2022 **What is... seminar**, Cornell university, <https://pi.math.cornell.edu/m/event-list-p/whatis>

■ Awards/Scholarships

Awards

2015–2019 **Dean's honour list**, *University of Ottawa*

2018 **Student paper award**,
Department of mathematics and statistics, University of Ottawa
(Awarded for paper titled *Decomposing Frobenius Heisenberg categories*.)

External scholarships

2021 **Canada Graduate Scholarship - Doctoral, NSERC**
(Awarded for Sep. 2021 - Aug. 2024 session.) - Declined

2021 **Postgraduate Scholarship - Doctoral, NSERC**
(Awarded for Sep. 2021 - Aug. 2024 session.) - Accepted

2020 **Ontario graduate scholarship, Ontario government**
(Awarded for Sep. 2020 - Aug. 2021 session.) - Accepted

2019 **Canada graduate scholarship - M.Sc., NSERC**
(Awarded for Sep. 2019 - Aug. 2020 session.) - Accepted

2019 **Ontario graduate scholarship, Ontario government**
(Awarded for Sep. 2019 - Aug. 2020 session.) - Declined

2019 **Undergraduate student research award, NSERC**

2018 **Undergraduate student research award, NSERC**

2017 **Undergraduate student research award, NSERC**

Internal scholarships

2021 **Admission fellowship, Cornell University**
(Awarded in 2021. Used during Aug. 2024–May 2025 session.)

2020 **Excellence scholarship - M.Sc., University of Ottawa**
(Awarded for Sep. 2020 - Aug. 2021 session.)

2019 **Excellence scholarship - M.Sc., University of Ottawa**
(Awarded for Sep. 2019 - Aug. 2020 session.)

2016 **Undergraduate research opportunity program, University of Ottawa**

2015 **Admission scholarship - B.Sc., University of Ottawa**