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 thoeries, toric degenerations.

Education

Sep. 2021 - Aug. 2026	**Ph.D. in Mathematics**, *Cornell University* Thesis title: *TBA*. Advisor: Allen Knutson.
Sep. 2019 - Aug. 2021	**M.Sc. in Mathematics**, *University of Ottawa* 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://londmathsoc.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_ gcvJ8pGHMyONpy520fwua?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/1Do59gETOj4nmm8ylIAGWmUz48OFXHOHH? 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/1UdUDlT_ 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*