COLLEEN ROBICHAUX

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RESEARCH INTERESTS

Algebraic combinatorics, Schubert calculus

EMPLOYMENT

NSF Mathematical Sciences Postdoctoral Research Fellow, University of California, UCLA, 2023–2026
  Sponsoring Scientist: Igor Pak

Chancellor's Postdoctoral Fellow, University of California, UCLA, 2023–2024
  Supervisor: Igor Pak

Hedrick Assistant Adjunct Professor, University of California, UCLA, 2022–2026
  Mentors: Igor Pak and Pavel Galashin

EDUCATION

Ph.D. Mathematics, University of Illinois at Urbana-Champaign, June 2022
  Advisor: Alexander Yong

M.S. Mathematics, University of Illinois at Urbana-Champaign, May 2018

B.S. Mathematics, Secondary Education concentration, Louisiana State University, May 2016

HONORS

NSF Mathematical Sciences Postdoctoral Research Fellow, (2023–2026)

Chancellor's Postdoctoral Fellow at University of California, UCLA, (2023–2024)

NSF Graduate Research Fellowship, (2018–2022)

Irving Reiner Memorial Award, UIUC Ph.D. student(s) with outstanding achievement in algebra (2020)

GAANN Fellow, U.S. Department of Education's Graduate Assistance in Areas of National Need program (2016–2017)

University Medalist, LSU undergraduates graduating with GPA ≥ 4.0 (2016)

Astronaut Scholar, Astronaut Scholarship, the two LSU candidates are selected among high-achieving LSU STEM undergraduates (2015–2016)

PUBLICATIONS AND PREPRINTS

1. A counterexample to the Ross–Yong conjecture for Grothendieck polynomials, preprint, arXiv: 2403.14538, (2024), 12pp.

2. Castelnuovo–Mumford regularity for 321-avoiding Kazhdan–Lusztig varieties, preprint, arXiv: 2308.14208, (2023), 23pp.

3. (with Jenna Rajchgot, Anna Weigandt) Castelnuovo–Mumford regularity of ladder determinantal varieties and patches of Grassmannian Schubert varieties, *Journal of Algebra*, Vol. 617 (2023), 160–191.

4. (with Harshit Yadav, Alexander Yong) Equivariant cohomology, Schubert calculus, and edge labeled tableaux, in *Facets of Algebraic Geometry: A Volume in Honour of William Fulton's 80th Birthday*, Vol. 2, Cambridge University Press, London Mathematical Society Lecture Note Series, (2022) 284–335.

5. (with Anshul Adve, Alexander Yong) An efficient algorithm for deciding vanishing of Schubert polynomial coefficients, *Advances in Mathematics*, Vol. 383 (2021).

6. (with Jenna Rajchgot, Yi Ren, Avery St. Dizier, Anna Weigandt) Degrees of symmetric Grothendieck polynomials and Castelnuovo–Mumford regularity, *Proceedings of the American Mathematical Society*, 149 (2021) no. 4, 1405–1416.

7. Shifted edge labeled tableaux and localizations, preprint, arXiv:2111.02971, (2021), 10pp.

8. (with Harshit Yadav, Alexander Yong) The A·B·C·Ds of Schubert calculus, *Séminaire Lotharingien de Combinatoire* B85a (2020), 12 pp.

9. (with Anshul Adve, Alexander Yong) Vanishing of Littlewood-Richardson polynomials is in P, *Computational Complexity*, Vol. 28(2) (2019), 241–257.

10. (with Christian Gaetz, Michelle Mastrianni, Rebecca Patrias, Hailee Peck, David Schwein, Ka Yu Tam) K-Knuth Equivalence for Increasing Tableaux, *Electronic Journal of Combinatorics*, Vol. 23(1) (2016), P1.40.

CONFERENCE PROCEEDINGS

1. Castelnuovo-Mumford regularity for 321-avoiding Kazhdan–Lusztig varieties, The 35th International Conference on Formal Power Series and Algebraic Combinatorics, Davis, United States (FPSAC 2023), *Séminaire Lotharingien de Combinatoire* 89B (2023), Article #45, 12pp.

2. (with Anshul Adve, Alexander Yong) Complexity, Combinatorial Positivity, and Newton Polytopes, The 31st International Conference on Formal Power Series and Algebraic Combinatorics, Ljubljana, Slovenia (FPSAC 2019), *Séminaire Lotharingien de Combinatoire* 82B (2019), Article #52, 12pp.

SEMINAR AND CONFERENCE TALKS

- Castelnuovo–Mumford regularity and excited Young diagrams. Combinatorics and Graph Theory Seminar, Michigan State University, Zoom. (January 31, 2024)

- Castelnuovo–Mumford regularity and excited Young diagrams. Combinatorics Seminar, University of California, Berkeley, Berkeley, CA. (November 14, 2023)

- Degrees of Grothendieck Polynomials and CM Regularity. Southern California Discrete Mathematics Symposium 2023, California State University, Los Angeles, Los Angeles, CA. (November 5, 2023)

- Castelnuovo–Mumford regularity and Kazhdan–Lusztig varieties. 2023 Schubert Summer School at UIUC, University of Illinois at Urbana-Champaign, Urbana, IL. (June 20, 2023)

- Degrees of Grothendieck Polynomials and CM Regularity. Spring Western Sectional Meeting, Special Session on Combinatorics and Representation Theory, California State University, Fresno, Fresno, CA. (May 6, 2023)

- Degrees of Grothendieck Polynomials and CM Regularity. Spring Western Sectional Meeting, Special Session on Combinatorics and Representation Theory, California State University, Fresno, Fresno, CA. (May 6, 2023)

- Degrees of Grothendieck Polynomials and CM Regularity. Women in Algebra and Combinatorics Conference, University at Albany, Albany, NY. (April 28, 2023)

- Degrees of Grothendieck polynomials and Castelnuovo–Mumford regularity. Combinatorics Seminar, Brandeis University, Zoom. (March 14, 2023)

- Degrees of Grothendieck polynomials and Castelnuovo–Mumford regularity. The Séminaire du LaCIM, Université du Québec à Montréal, Montréal. (November 11, 2022)

- Degrees of Grothendieck polynomials and Castelnuovo–Mumford regularity. UCLA Combinatorics Forum, University of California, Los Angeles, Los Angeles, CA. (October 27, 2022)

- CM regularity and Kazhdan–Lusztig varieties. Schubert Seminar, Zoom. (October 10, 2022)

- Castelnuovo–Mumford regularity of ladder determinantal ideals via Grothendieck polynomials. Fall Eastern Sectional Meeting, The Combinatorics and Geometry of Jordan type and Commuting Varieties, University of Massachusetts Amherst, Amherst, MA. (October 2, 2022)

- Equivariant Cohomology, Schubert Calculus, and Edge Labeled Tableaux. Fall Eastern Sectional Meeting, Young Voices in Combinatorics, University of Massachusetts Amherst, Amherst, MA. (October 1, 2022)

- CM regularity and Kazhdan–Lusztig varieties. Algebraic Geometry Seminar, University of Illinois at Chicago, Zoom. (September 26, 2022)

- Degrees of Grothendieck polynomials and Castelnuovo–Mumford regularity. Combinatorics Seminar, University of Southern California, Los Angeles, CA. (September 14, 2022)

- K-orbit determinantal ideals. Women in Commutative Algebra and Algebraic Geometry Workshop, Fields Institute, Zoom. (February 5, 2022)

- Castelnuovo–Mumford regularity of ladder determinantal ideals via Grothendieck polynomials. CAAC, Fields Institute, Zoom. (January 21, 2022)

- Castelnuovo–Mumford regularity of ladder determinantal ideals via Grothendieck polynomials. Algebra Seminar, Syracuse University, Zoom. (December 10, 2021)

- Castelnuovo–Mumford regularity of ladder determinantal ideals via Grothendieck polynomials. Combinatorics and Geometry of Moduli Spaces session, CMS Winter Meeting 2021, Zoom. (December 6, 2021)

- Castelnuovo–Mumford regularity of ladder determinantal ideals via Grothendieck polynomials. Discrete Geometry and Combinatorics Seminar, Cornell University, Ithaca NY. (November 8, 2021)

- CM regularity and Kazhdan–Lusztig varieties. Algebra and Discrete Math Seminar, University of California, Davis, Davis CA. (September 27, 2021)

- Degrees of Grothendieck Polynomials and CM Regularity. Graduate Online Combinatorics Colloquium, Zoom. (September 15, 2021)

- The A·B·C·Ds of Schubert calculus. IMPANGA 20 Contributed talk, Banach Center, Zoom. (July 15, 2021)

- CM regularity and Kazhdan–Lusztig varieties. Recent Developments in Gröbner Geometry session, CMS Summer Meeting 2021, Zoom. (June 9, 2021)

- An Efficient Algorithm for Deciding the Vanishing of Schubert Polynomial Coefficients. Combinatorics and Geometry Seminar and Pre-Seminar, University of Washington, Zoom. (April 28, 2021)

- CM regularity and Kazhdan–Lusztig varieties. Algebraic Geometry/Commutative Algebra Seminar, University of Notre Dame, Zoom. (April 8, 2021)

- An Efficient Algorithm for Deciding the Vanishing of Schubert Polynomial Coefficients. Algebraic (and enumerative) combinatorics seminar, University of Waterloo, Zoom. (March 25, 2021)

- Equivariant cohomology, Schubert calculus, and Edge labeled tableaux. Spring Eastern Sectional Meeting, Recent Advances in Schubert Calculus and Related Topics, III, Brown University, Zoom. (March 20, 2021)

- An Efficient Algorithm for Deciding the Vanishing of Schubert Polynomial Coefficients. Discrete Mathematics Seminar, University of British Columbia, Zoom. (March 9, 2021)

- Littlewood-Richardson coefficients and the Hermitian Eigenvalue Problem. AWM Graduate Student Colloquium, University of Illinois at Urbana-Champaign, Zoom. (February 24, 2021)

- Matrix Schubert varieties and CM regularity. Introductory Workshop: Combinatorial Algebraic Geometry Lightning Talks, ICERM, Zoom. (February 17, 2021)

- Computing degrees of Grothendieck polynomials. UBC-UIUC Combinatorics Meeting, Zoom. (January 19, 2021)

- An Efficient Algorithm for Deciding the Vanishing of Schubert Polynomial Coefficients. Enumerative Combinatorics session, CMS Winter Meeting 2020, Zoom. (December 5, 2020)

- An Efficient Algorithm for Deciding the Vanishing of Schubert Polynomial Coefficients. Combinatorics Seminar, University of Florida, Zoom. (November 10, 2020)

- Schubert Polynomials and Computational Complexity. Theory of Computation Seminar, University of Illinois at Urbana-Champaign, Zoom. (October 28, 2020)

- The A·B·C·Ds of Schubert calculus. Western Sectional Meeting, Combinatorics of Reduced Decompositions of Elements of Coxeter Groups and Related Topics, California State University, Fresno, Fresno CA. (May 2, 2020 – cancelled)

- Equivariant cohomology, Schubert calculus, and Edge labeled tableaux. Spring Eastern Sectional Meeting, Recent Advances in Schubert Calculus and Related Topics, II, Tufts University, Medford, MA. (March 21, 2020 – cancelled)

- The A·B·C·Ds of Schubert calculus. AMS Spring Southeastern Sectional Meeting, Combinatorics Related to Geometry and Representation Theory, IV, University of Virginia, Charlottesville, VA. (March 15, 2020 – cancelled)

- Degree of Grothendieck polynomials and Castelnuovo–Mumford regularity. AWM Mini Symposium, University of Illinois at Urbana-Champaign, Urbana, IL. (February 8, 2020)

- Degree of Grothendieck polynomials and Castelnuovo–Mumford regularity. Combinatorial Algebraic Geometry session, CMS Winter Meeting 2019, Toronto, ON. (December 8, 2019)

- Degree of Grothendieck polynomials and Castelnuovo–Mumford regularity. Algebra, Geometry, and Combinatorics Seminar, University of Illinois at Urbana-Champaign, Urbana, IL. (November 21, 2019)

- Schubert Polynomials and Computational Complexity. Undergraduate Seminar, University of Illinois at Urbana-Champaign, Urbana, IL. (October 25, 2019)

- Schubert Polynomials and Computational Complexity. New Facets of Algebraic Geometry Contributed talk, University of Michigan, Ann Arbor, MI. (October 18, 2019)

- A conversation about Algebraic Combinatorics and Computational Complexity. GROW 2019 Plenary Talk, University of Illinois at Urbana-Champaign, Urbana, IL. (October 6, 2019) (joint with Alexander Yong)

- Complexity, Combinatorial Positivity, and Newton Polytopes. Combinatorics Seminar, Washington University in St. Louis, St. Louis, MO. (April 12, 2019)

- Complexity, Combinatorial Positivity, and Newton Polytopes. Graduate Student Combinatorics Conference, University of Pennsylvania, Philadelphia, PA. (April 6, 2019)

- Complexity and Combinatorial Positivity. AWM Mini Symposium, University of Illinois at Urbana-Champaign, Urbana, IL. (February 9, 2019)

- Complexity, Combinatorial Positivity, and Newton Polytopes. Algebra, Geometry, and Combinatorics Seminar, University of Illinois at Urbana-Champaign, Urbana, IL. (March 28, 2019)

- Vanishing of Littlewood-Richardson polynomials is in P. Workshop on Representation Theory, Combinatorics, and Geometry Contributed Talk, University of Virginia, Charlottesville, VA.(October 20, 2018)

- Vanishing of Littlewood-Richardson polynomials is in P. Algebra, Geometry, and Combinatorics Seminar, University of Illinois at Urbana-Champaign, Urbana, IL. (November 15, 2017)

POSTER PRESENTATIONS

- CM regularity for 321-avoiding Kazhdan–Lusztig varieties. FPSAC 2023, Davis, California. (July 18, 2023)

- CM regularity and Kazhdan–Lusztig varieties. NCN Combinatorics Klatch, Gather. (August 3, 2021)

- Computational Complexity, Newton Polytopes, and Schubert Polynomials. Algebraic Geometry and Polyhedra, ICERM, Gather. (April 14, 2021)

- CM regularity and Kazhdan–Lusztig varieties. CAAC 2021, Université du Québec à Montréal, Zoom. (January 23, 2021)

- CM regularity and Kazhdan–Lusztig varieties. AlCoVE 2020, Zoom. (June 16, 2020)

- CM regularity and Kazhdan–Lusztig varieties. MAAGC 2020,University of Virginia, Charlottesville, VA. (March 13, 2020 – cancelled)

- CM regularity and Kazhdan–Lusztig varieties. ALGECOM XIX, University of Illinois at Urbana-Champaign, Urbana, IL. (March 7, 2020)

- The A·B·C·Ds of Schubert calculus. ALGECOM XVIII, Washington University in St. Louis, St. Louis, MO. (September 21, 2019)

- Complexity, Combinatorial Positivity, and Newton Polytopes. FPSAC 2019, Ljubljana, Slovenia. (July 1, 2019)

- Complexity, Combinatorial Positivity, and Newton Polytopes. ALGECOM XVII, Loyola University Chicago, Chicago, IL. (May 25, 2019)

- Vanishing of Littlewood-Richardson polynomials is in P. ALGECOM XVI, University of Michigan, Ann Arbor, MI. (March 24, 2018)

TEACHING

- University of California, Los Angeles, Instructor of Record
  - Enumerative Combinatorics (Spring 2023)
  - Graph Theory (Winter 2023)
  - Discrete Structures (Fall 2022, Spring 2023)
    * Large lecture course
- ICERM, Teaching Assistant
  - Intro Workshop: Combinatorial Algebraic Geometry (Spring 2021)
- University of Illinois at Urbana-Champaign (UIUC), Teaching Assistant
  - Calculus II, Merit Program (Spring 2018)
    * Active Learning, rated "Outstanding" (in the top 10% for the rating of Instructor's Overall Teaching Effectiveness among UIUC instructors).
  - Calculus I, Merit Program (Fall 2017)
    * Active Learning, rated "Outstanding" (in the top 10% for the rating of Instructor's Overall Teaching Effectiveness among UIUC instructors).
- East Ascension High School, Student Teacher
  - Geometry, Algebra II (Spring 2016)
    * Inquiry-based Learning

PROFESSIONAL ACTIVITIES AND SERVICE

- UCLA Combinatorics Forum co-organizer (Fall 2023–)
- UCLA Department of Mathematics Diversity Committee, Member (Fall 2023–)
- UCLA Women in Math Mentorship Program, Mentor (Fall 2022–)
- IPAM Long Program: Geometry, Statistical Mechanics, and Integrability, Core participant. (Spring 2024).
- Southern California Discrete Mathematics (SoCalDM) Symposium 2024 co-organizer (Spring 2024)
- Women in Commutative Algebra and Algebraic Geometry Workshop, Participant (Spring 2022)
- Association of American Universities PhD Initiative Mathematics, Committee Member (2020-2022)
- Illinois Geometry Lab (IGL), Outreach Manager and Leadership Team Member (2017-2022)
- Illinois Geometry Lab (IGL), Undergraduate Outreach Founder and Graduate Mentor (2018-2022)
- University of Illinois Algebra-Geometry-Combinatorics Seminar co-organizer (Fall 2019-2022)
- Referee for Annals of Combinatorics, Electronic Journal of Combinatorics, Algebraic Combinatorics, Combinatorial Theory, Advances in Applied Mathematics, FPSAC 2022, FPSAC 2023
- ICERM Workshop: Combinatorial Algebraic Geometry, Virtual participant. (Spring 2021).
- ICERM Combinatorial Algebraic Geometry Graduate/Postoc Seminar co-organizer (Spring 2021)
- ALGECOM XIX co-organizer (Spring 2020)

- Graduate Research Opportunities for Women (GROW), Plenary Speaker and Graduate Student Panelist (October 2019)

- Nebraska Conference for Undergraduate Women in Mathematics (NCUWM), Invited Graduate Student Panelist (January 2019)

- Sloan University Center of Exemplary Mentoring, Graduate Student Mentor (August 2018-May 2019)

- Illinois Combinatorics Lab for Undergraduate Experiences (ICLUE), Graduate Student Mentor (2017-2018)

OUTREACH

- UCLA Curtis Center, Faculty Contact (2022–)

- UCLA Math Circle, Logistical Aid (Fall 2023)

- UCLA Undergraduate Mathematics Students Association: Guest Speaker (November 2022)

- Illinois Geometry Lab (IGL)

  - UIUC Undergraduates: Training of UIUC undergraduate volunteers for IGL Outreach activities (Fall 2018–Spring 2022)

  - Urbana Neighborhood Connections: Co-Organizer, activity for K-5 grade children (November 2021)

  - Garden Hills Academy: Instructor, Co-Organizer, activity for 2-3 grade children (March 2021)

  - International Prep Academy: Co-Organizer, activity for 2-3 grade children (March 2020)

  - SACNAS and Friends: Instructor and Co-Organizer, activity for Champaign-Urbana 1-8 grade children (February 2020)

  - Julia Robinson Day: Instructor, activity for Champaign-Urbana K-6 grade children (February 2020)

  - Central High School: Co-Organizer, activity for 9-12 grade children (November 2018, February 2020)

  - First Lego League Robotics Competition: Instructor and Co-Organizer, activity for Illinois K-5 grade children (January 2017 (volunteer), 2018 (volunteer), 2019, 2020)

  - Science at the Market: Instructor and Organizer, activity for Champaign-Urbana K-3 grade children (Fall 2016 (volunteer), 2017 (volunteer), 2018, 2019, 2021)

  - Franklin STEAM Academy: Instructor and Co-Organizer, activity for 6-8 grade children (April, August 2019, September 2021)

  - Illini Fest: Instructor, activity for Chicago K-5 grade children (July 2019)

  - Illinois Council of Teachers of Mathematics Math Contest: Instructor and Organizer, activity for Illinois 8-12 grade children (May 2019)

  - Tri-Point High School: Instructor and Organizer, STEM day activity for rural Southern Illinois 10-12 grade children (April 2019)

  - Rantoul High School: Instructor and Organizer, activity for 10-11 grade children (March 2018 (volunteer), March 2019)

  - Southern Illinois High School: Instructor and Co-Organizer, activity for 9-10 grade children (March 2019)

- – Four Color Fest: Instructor, activity for K-6 grade children (November 2017)

- Summer Illinois Mathematics Camp: Guest Speaker (2019, 2021), Volunteer (2020)

- Sonia Math Day: Instructor and Co-Organizer, activity for Champaign-Urbana 9-12 grade children (November 2017, April 2018)

- Girls Engaged in Math and Science (GEMS): Instructor and Co-Organizer, activity for Champaign-Urbana 5-8 grade children (March 2018)

- iSTEM: Instructor, activity for Champaign-Urbana 9-12 grade children (August 2017)