

Jake Levinson

CONTACT INFORMATION	Département de mathématiques et de statistique Université de Montréal Montréal, QC Canada H3C 3J7	jake.levinson@umontreal.ca https://dms.umontreal.ca/~levinson/
RESEARCH	Algebraic geometry and combinatorics, particularly Schubert calculus, moduli of stable curves, and syzygies.	
EMPLOYMENT	Professeur adjoint, August 2023–present. Université de Montréal Assistant Professor, July 2020–present (on leave August 2023–present). Simon Fraser University Acting Assistant Professor, 2017–2018 and 2019–2020. University of Washington, Seattle Google AI Resident, July 2018–July 2019 Google Research, New York NSERC Postdoctoral Fellow, May–September 2017 LaCIM (Combinatorics Laboratory), Université du Québec à Montréal	
EDUCATION	PhD mathematics, University of Michigan, Ann Arbor, 2017 (with David Speyer) <ul style="list-style-type: none">- Dissertation: Foundations of Boij–Söderberg theory for Grassmannians BA mathematics (summa cum laude), Williams College, 2011 <ul style="list-style-type: none">- Highest honors in mathematics, Phi Beta Kappa, Sigma Xi, Rosenberg Prize (excellence in mathematics)- Budapest Semesters in Mathematics, Fall 2009 (highest honors)	
REFEREED PUBLICATIONS	<ol style="list-style-type: none">1. Sean T. Griffin, Jake Levinson, and Alexander Woo. Springer fibers and the Delta Conjecture at $t = 0$. <i>Advances in Mathematics</i>, vol. 439 (2024). doi: 10.1016/j.aim.2024.1094912. Maria Gillespie, Sean T. Griffin, and Jake Levinson. Degenerations and multiplicity-free formulas for products of ψ and ω classes on $\overline{M}_{0,n}$. <i>Mathematische Zeitschrift</i> 304:56 (2023). doi: 10.1007/s00209-023-03313-73. Maria Gillespie, Jake Levinson and Kevin Purbhoo. Schubert curves in the orthogonal Grassmannian. <i>Discrete and Computational Geometry</i> 69, (2023), doi: 10.1007/s00454-022-00440-6.4. Maria Gillespie, Sean T. Griffin, and Jake Levinson. Lazy tournaments and multidegrees of a projective embedding of $\overline{M}_{0,n}$. <i>Combinatorial Theory</i> 3(1), (2022). doi: 10.5070/C631604165. Maria Gillespie, Sean T. Griffin, and Jake Levinson. Tournaments and slide rules for products of ψ and ω classes on $\overline{M}_{0,n}$ (extended abstract). <i>Séminaire Lotharingien de Combinatoire (FPSAC 2022)</i>, 86B (2022), Art. 50, 12 pp.	

6. Jake Levinson and Brooke Ullery. A Cayley-Bacharach theorem and plane configurations. *Proceedings of the American Mathematical Society* 150 (2022), 4603–4618. doi: 10.1090/proc/15983
7. Ben Adlam, Jake Levinson and Jeffrey Pennington. A random matrix perspective on mixtures of nonlinearities in single-layer neural networks. *Proceedings of The 25th International Conference on Artificial Intelligence and Statistics* (2022), PMLR 151:3434–3457.
8. Jake Levinson, Kevin Purbhoo. Class groups of open Richardson varieties in the Grassmannian are trivial. *J. Commut. Algebra* 14(2), 267–275, (2022). doi: 10.1216/jca.2022.14.267
9. Sean T. Griffin, Jake Levinson, and Alexander Woo. Springer fibers and the Delta Conjecture at $t = 0$ (extended abstract). *Séminaire Lotharingien de Combinatoire (FPSAC 2021)*, 85B (2021), Art. 76, 12 pp.
10. Jake Levinson and Kevin Purbhoo. A topological proof of the Shapiro-Shapiro conjecture. *Inventiones Mathematicae* vol. 226 (2021), no. 2, 521–578. doi: 10.1007/s00222-021-01056-y
11. Jake Levinson, Carlos Esteves, Kefan Chen, Noah Snaveley, Angjoo Kanazawa, Afshin Rostamizadeh and Ameesh Makadia. An Analysis of SVD for Deep Rotation Estimation. *Advances in Neural Information Processing Systems 33* (NeurIPS 2020), 22554–22565.
12. Maria Gillespie and Jake Levinson. Axioms for shifted tableau crystals. *Electronic Journal of Combinatorics* vol. 26 (2019), no. 2, #P2.2, 38 pp. doi: 10.37236/8033
13. Maria Gillespie, Jake Levinson and Kevin Purbhoo. A crystal-like structure on shifted tableaux. *Algebraic Combinatorics*, vol. 3 (2020), no. 3, 693–725. doi: 10.5802/alco.110
14. Nic Ford and Jake Levinson. Foundations of Boij-Söderberg theory for Grassmannians. *Compositio Mathematica*, vol. 154 (2018), no. 10, 2205–2238. doi: 10.1112/S0010437X18007418
15. Nic Ford, Jake Levinson and Steven Sam. Towards Boij-Söderberg theory for Grassmannians: the case of square matrices. *Algebra and Number Theory*, vol. 12 (2018), no. 2, 285–303. doi: 10.2140/ant.2018.12.285
16. Maria Gillespie, Jake Levinson and Kevin Purbhoo. Shifted tableau crystals. *Séminaire Lotharingien de Combinatoire (FPSAC 2018)*, 80B (2018), Art. 71, 12 pp.
17. Maria Gillespie and Jake Levinson. Monodromy and K-theory of Schubert curves via generalized jeu de taquin. *Journal of Algebraic Combinatorics*, vol. 45 (2017), no. 1, 191–243. doi: 10.1007/s10801-016-0705-7
18. Maria Gillespie and Jake Levinson. Monodromy and K-theory of Schubert curves via generalized jeu de taquin. *28th International Conference on Formal Power Series and Algebraic Combinatorics, Discrete Mathematics and Theoretical Computer Science Proceedings* (2016), 551–562. doi: 10.46298/dmtcs.6381
19. Jake Levinson. One-dimensional Schubert problems with respect to osculating flags. *Canadian Journal of Mathematics*, vol. 69 (2017), no. 1, 143–185. doi: 10.4153/CJM-2015-061-1
20. Jake Levinson and Steven J. Miller. The n -level densities of low-lying zeros of quadratic Dirichlet L -functions. *Acta Arithmetica*, vol. 161 (2013), 145–182. doi: 10.4064/aa161-2-3

21. Nick Arnosti, Rachel Karpman, Caitlin Levenson, Jake Levinson and Susan Loepf. Semilocal formal fibers of minimal prime ideal of excellent reduced local rings. *Journal of Commutative Algebra*, vol.4 (2012) no.1, 29–56. doi: 10.1216/JCA-2012-4-1-29

PREPRINTS

Nathan Ilten and Jake Levinson. Rational curves in projective toric varieties. Submitted (2024). arXiv: 2312.16590

Maria Gillespie and Jake Levinson. Products of boundary classes on $\overline{M}_{0,n}$ via balanced weights. Submitted (2023). arXiv: 2311.09557

Jake Levinson, Brooke Ullery, and David Stapleton. Minimal degree fibrations in curves and the asymptotic degree of irrationality of divisors. Submitted (2023). arXiv: 2304.09963

M. Gillespie, S. T. Griffin, and J. Levinson. A proof of a conjecture of Monin and Rana on equations defining $\overline{M}_{0,n}$. Submitted (2022). arXiv: 2209.06688

OTHER WRITING

Jake Levinson. Review of “The BIG Jobs Guide: Business, Industry, and Government Careers for Mathematical Scientists, Statisticians, and Operations Researchers”. *Notices of the American Mathematical Society*, May 2022.

SOFTWARE AND
CODE

Peer-reviewed contributions to `mathlib` (open-source mathematics library in Lean), <https://github.com/leanprover-community/mathlib>:

- Local cohomology (basic definition). (2023). with Emily Witt, Scott Morrison and Sam van Gool. PR #19061
- Hermite polynomials. (2023). with Luke Mantle (USRA student). PRs #18739, 18837, 18896, 19044
- Young diagrams and semistandard Young tableaux. (2022). PRs #15822, 16120, 16195, 17061, 17445
- Locally surjective maps of presheaves. (2022). with Sam van Gool. PR #15398.
- Surjective ring maps induce closed embeddings of spectra (2022). with Sam van Gool. PR #15291.

AWARDS

NSERC Discovery Grant, 2021-2026 (incl. Discovery Launch Supplement)
RGPIN-2021-04169. Total CAD \$127,500.

AMS Travel Grant, International Congress of Mathematicians, 2018

AMS-Simons Travel Grant, 2017

NSERC Postdoctoral Fellowship, 2017

FRQNT Postdoctoral Fellowship, 2017 (declined due to NSERC)

Best Student Paper, FPSAC Vancouver, 2016, joint with M. Gillespie
Monodromy of Schubert curves via generalized jeu de taquin

Rackham Predoctoral Fellowship, University of Michigan, 2016-2017

FRQNT (Quebec Scientific Research Foundation) Scholarships:
Masters Research Scholarship, 2011-2013 (grant 146622)
Doctoral Research Scholarship, 2014-2016 (grant 184146)

Mort Brown Excellence in Teaching Award, 2014

Rackham International Fellowship Nominee, 2013

NSERC (Natural Sciences and Engineering Research Council of Canada)
Canada Graduate Student Fellowship, 2011 (declined due to FRQNT)

TEACHING

Université de Montréal:

- MAT6620, algèbre commutative, hiver 2024

Simon Fraser University:

- Workshop, “Introduction to Lean”, Computational Math Day, Spring 2023
- Math 819, Topics in Algebraic Geometry (Schemes), Spring 2023
- Math 251, Calculus III, Fall 2022.
- Math 240, Linear Algebra, Fall 2022.
- Math 240, Linear Algebra, Spring 2022.
- Math 340, Introduction to Abstract Algebra – Rings and Fields, Fall 2021.
- Math 894, Topics in Algebraic Geometry (Enumerative geometry), Spring 2021.
- Math 440, Galois Theory, Spring 2021.
- Math 340, Introduction to Abstract Algebra – Rings and Fields, Fall 2020.

University of Washington:

- Math 583, Topics in Algebraic Geometry (Intersection Theory), Spring 2020.
- Math 327, Real Analysis, Winter 2020.
- Math 308, Matrix Algebra, Autumn 2017, Winter 2018*, Spring 2018*, Fall 2019.
*: Designed and implemented an independent group project component for the course, including developing pedagogical materials and project evaluation rubric, culminating in a public poster session.

University of Michigan:

- Math 115, Calculus I, Fall 2011.
- Math 116, Calculus II, Winter 2012, Fall 2012, Fall 2013*, Winter 2014, Fall 2014.
- Math 216, Differential Equations, Winter 2013 (teaching assistantship only).

*: Co-coordinated Math 116 (involving 25 instructors), assisting Fernando Carreon in writing and editing exams, training new instructors, and coordinating exam grading.

Williams College:

- Teaching assistant for Abstract Algebra, Real Analysis, Complex Analysis, Commutative Algebra.

MENTORSHIP

Graduate students advised:

- Haggai Liu (PhD 2021–present)
- Carl Waller (PhD 2022–present)
- Derek Moran (MSc 2022–present)
- Chi Ki Ngai (MSc 2022–present)

Undergraduate students advised:

- Luke Mantle (2023), on computer-based theorem proving in Lean.
- Vladimir Mishel, Evguenia Sourgaeva (2021), on moduli of curves.

- Alyssa Mell, Jason Miller, Carmen Perena, Sky Qiu, Winnie Shao, Tiffany Tian, Victoria Wan, Travis Xie, Shengkun Ye, Ting Yin, expository project on mathematical modeling in epidemiology (Spring 2020, advised jointly with Jarod Alper).
- Yujin Jeong, Junchen Pan (2018), on tableau combinatorics.

ORGANIZING

Lead organizer (with V. Blankers, M. Gillespie, S. Griffin and D. Maclagan), *Combinatorics of Moduli of Curves (COMOC)*, Banff International Research Station, July 2024.

Co-organizer (with S. Brauner, A. Morales, G. Park, F. Saliola and H. Thomas), *Combinatorial Algebra meets Algebraic Combinatorics (CAAC) 2024*, Université du Québec à Montréal, January 2024.

Co-organizer (with M. Gillespie and R. Cavalieri), Special Session on Combinatorics and Geometry of Moduli Spaces, CMS Winter Meeting 2021 (online).

SERVICE

Production Editor, *Algebraic Combinatorics*, 2024–present.

Comité de l'épreuve d'algèbre, Université de Montréal, 2023–present.

Comité de l'épreuve générale en mathématiques, Université de Montréal, 2023–present.

Comité du Club mathématique du 1er cycle, Université de Montréal, 2023–present.

Co-organizer, CIRGET Algebraic Geometry Seminar, Montreal, Fall 2023–present.

Endowment Grants Committee, Canadian Mathematics Society, July 2022–present.

Co-organizer, Number Theory and Algebraic Geometry Seminar, Simon Fraser University, Fall 2021–Spring 2023.

Examiner, Pure Math Comprehensive Exams, Simon Fraser University, Summer 2021.

Tenure and Promotion Committee, Mathematics Department, Simon Fraser University, Summer 2021–Spring 2022.

BEAM (Bridge to Enter Advanced Mathematics), Manhattan, NY:

- Ran weekly after-school math club at Hamilton Grange Middle School, 2018-2019. BEAM is a non-profit organization that supports math enrichment programs at low-income schools in New York City.

Co-organizer, Algebra and Geometry Seminar, University of Washington, Fall 2019 and Winter 2020.

Graduate Admissions Committee, University of Washington, January 2020.

Assisted with ALGECOM (Algebra, Geometry and Combinatorics Day), University of Michigan, October 2015

- Responsible for day-of logistics (conference registration, food planning, speaker orientation)

Co-organizer, Student Algebraic Geometry Seminar, University of Michigan, Fall 2014 – Winter 2016.

Developed two week-long mini-courses aimed at other grad students, July 2014:

- An Introduction to Schubert Calculus.
- Translating Between Geometry and Algebra. (taught jointly with Rebecca R-G.)

Member, Students in Mathematics and Statistics Advisory Board (SMASAB), Williams College, 2008-09 and 2010-11.

INVITED TALKS

1. Symposium annuel en mathématiques pour un avenir en recherche et en industrie (SAMARI), Université de Montréal (March 2024)
2. Séminaires universitaires en mathématiques à Montréal (SUMM), Université du Québec à Montréal (January 2024)
3. Geometry Seminar, Texas A&M University (December 2023)
4. CIRGET Algebraic Geometry Seminar, UQAM (November 2023)
5. NTAG Seminar, Simon Fraser University (October 2023)
6. Colloquium, Amherst College (October 2023)
7. Jumpstart Workshop, Western Washington University (August 2023)
8. Colloquium, University of Lisbon (July 2023)
9. Schubert Calculus Summer School, Combinatorics Days in Covilhã, Universidade da Beira Interior (July 2023)
10. Joint Algebra and Combinatorics / Geometry Seminar, University of Coimbra (July 2023)
11. École d'été, Université de Montréal (May 2023)
12. Colloquium, Colorado State University (April 2023)
13. Combinatorial Algebra Meets Algebraic Combinatorics (CAAC), University of Waterloo (January 2023)
14. Colloquium, Université de Montréal (January 2023)
15. Algebraic Geometry Seminar, University of British Columbia (October 2022)
16. Algebra and Algebraic Geometry Seminar, University of Washington (April 2022)
17. Algebraic Geometry Seminar, University of California, Riverside (February 2022)
18. CMS Winter Meeting (December 2021)
19. FRAGMENT Seminar, Colorado State University (November 2021)
20. ART Seminar, University of Oklahoma, Norman (May 2021)
21. AMS Sectional Meeting (May 2021)
22. Virtual Combinatorics Day, Lisbon, Portugal (December 2020)
23. Monodromy and Galois groups in enumerative geometry, ICERM (September 2020)
24. NU-UIC-UofC Algebraic Geometry Seminar, Chicago (August 2020)
25. Number Theory and Algebraic Geometry Seminar, Simon Fraser University (April 2020)
26. FRAGMENT Seminar, Colorado State University (March 2020)
27. AlGeCom Day, University of Illinois, Urbana-Champaign (February 2020)
28. Combinatorics Seminar, University of Washington (January 2020)
29. Colloquium, Simon Fraser University (November 2019)

30. Algebraic Geometry Seminar, University of California, San Diego (November 2019)
31. Algebraic Geometry Seminar, University of Michigan (October 2019)
32. AMS Sectional Meeting, University of Wisconsin, Madison (September 2019)
33. Math Colloquium, University of Washington (September 2019)
34. Séminaire du LaCIM, UQAM (July 2019)
35. Algebraic Geometry Seminar, Harvard University (March 2019)
36. Algebra Seminar, University of Washington (December 2018)
37. Formal Power Series and Algebraic Combinatorics (FPSAC), Hanover (July 2018)
38. AMS Sectional Meeting, University of Portland (April 2018)
39. Séminaire du LaCIM, UQAM (January 2018)
40. AMS Sectional Meeting, University of California, Riverside (November 2017)
41. Combinatorics Seminar, University of Washington (October 2017)
42. Séminaire du LaCIM, UQAM (July 2017)
43. AMS Sectional Meeting, Hunter College, New York (May 2017)
44. Algebra and Discrete Math Seminar, University of California, Davis (May 2017)
45. Algebra Seminar, University of Washington (January 2017)
46. AG Seminar, Stanford University (January 2017)
47. CA&AG Seminar, University of California, Berkeley (January 2017)
48. AMS-MAA Joint Mathematics Meetings, Atlanta (January 2017)
49. Combinatorics Seminar, University of Washington (January 2017)
50. Geometry & Topology Seminar, San Francisco State University (January 2017)
51. Commutative Algebra Seminar, University of Utah (December 2016)
52. Combinatorial Algebraic Geometry Seminar, Fields Institute (November 2016)
53. CAGE Seminar, University of Pennsylvania (November 2016)
54. Bi-College Math Colloquium, Haverford College (November 2016)
55. Combinatorics Seminar, University of Minnesota (October 2016)
56. Algebraic Combinatorics Seminar, York University, Toronto (September 2016)
57. Formal Power Series and Algebraic Combinatorics (FPSAC), Vancouver (July 2016)
58. Combinatorics Seminar, University of California, Berkeley (April 2016)
59. Séminaire du LaCIM, l'Université du Québec à Montréal (April 2016)
60. Algebra and Combinatorics Seminar, Central Michigan University (March 2016)
61. FrankFest, Williams College (February 2016)
62. Combinatorics Seminar, University of Michigan, Ann Arbor (January 2016)
63. AMS-MAA Joint Mathematics Meetings, Seattle (January 2016)
64. Algebraic Geometry Seminar, University of Wisconsin, Madison (November 2015)
65. Geometric Representation Theory Seminar, University of Toronto (November 2015)
66. Algebra, Geometry and Combinatorics Seminar, University of Illinois, Urbana-Champaign (September 2015)
67. Midwest Algebraic Geometry Graduate Conference, UIC (April 2015)

68. Algebra Seminar, Michigan State University (April 2015)
69. Geometry Seminar, Texas A&M University (March 2015)
70. Combinatorics Seminar, University of California, Berkeley (February 2015)