

Curriculum Vitæ

Maksym Fedorchuk

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Employment

- 2016 – present Associate Professor, Boston College
- 2012 – 2016 Assistant Professor, Boston College
- 2008 – 2012 Ritt Assistant Professor, Columbia University

Education

- 2004 – 2008 Ph.D. in Mathematics – Harvard University
Thesis title: *Geometry of Severi varieties and the moduli space of curves*
Advisor: Joe Harris
- 2001 – 2004 S.B. in Mathematics – Massachusetts Institute of Technology

Grants and Awards

- Simons Collaboration Grant for Mathematicians #582030, \$42,000, 2018 – 2023.
- NSA Young Investigator Grant H98230-16-1-0061, \$40,000, 2016 – 2018.
- Sloan Research Fellowship, \$50,000, 2014 – 2016.
- NSF Grant DMS-1259226, PI: *Geometry of Moduli Spaces, Geometric Invariant Theory, and Deformations of Singularities*, \$117,999, 2012 – 2016.
- NSF Conference Grant DMS-1651082, PI for the lead node: *Collaborative Research: AGNES: Algebraic Geometry NorthEastern Series*, 2017 – 2020. Funding for the Fall 2019 AGNES meeting at Boston College.
- NSF Conference Grant DMS-1360598, PI: *Collaborative Research: AGNES: Algebraic Geometry NorthEastern Series*, 2014 – 2017. Funding for the Spring 2015 AGNES meeting at Boston College.
- Boston College Undergraduate Research Fellowship Grant (\$8,625 to support 2 undergraduate students), Summer 2017.

- Boston College Faculty Fellowship, Fall 2015.
- Boston College Undergraduate Research Fellowship Grant (\$10,000 to support 3 undergraduate students), Summer 2015.
- Boston College Undergraduate Research Fellowship Grant (\$2,000 to support 2 undergraduate students), Spring 2015.

Publications and preprints

1. Standard models of low degree del Pezzo fibrations, with Hamid Ahmadinezhad and Igor Krylov, *in preparation*.
2. GIT for canonical curves, with Fabio Felici and Filippo Viviani, *in preparation*.
3. Associated form morphism, with Alexander Isaev, preprint on [arXiv:1807.02082](https://arxiv.org/abs/1807.02082), submitted (November 2018), 18pp.
4. VGIT presentation of the second flip of $\overline{M}_{2,1}$, with Matthew Grimes, [arXiv:1805.08581](https://arxiv.org/abs/1805.08581), accepted (January 2019) at *Michigan Mathematical Journal*, 26pp.
5. Geometric Invariant Theory of syzygies, with applications to moduli spaces, In *Geometry of Moduli*, volume 14 of *Abel Symposia*, Springer International Publishing, 2018, 28 pages.
6. Direct sum decomposability of polynomials and factorization of associated forms, preprint on [arXiv:1705.03452](https://arxiv.org/abs/1705.03452), submitted (November 2018), 26pp.
7. Stability of associated forms, with Alexander Isaev, to appear in *Journal of Algebraic Geometry*, available at [arXiv:1703.00438](https://arxiv.org/abs/1703.00438), 20pp.
8. GIT semistability of Hilbert points of Milnor algebras, *Math. Ann.* **367** (2017), no. 1-2, 441–460.
9. Second flip in the Hassett-Keel program: A local description, with Jarod Alper, David I. Smyth, and Fred van der Wyck, *Compositio Mathematica* **153** (2017), no. 8, 1547–1583.
10. Second flip in the Hassett-Keel program: Existence of good moduli spaces, with Jarod Alper and David I. Smyth, *Compositio Mathematica* **153** (2017), no. 8, 1584–1609.
11. Second flip in the Hassett-Keel program: Projectivity, with Jarod Alper and David I. Smyth, *International Mathematics Research Notices* **2017** (2017), no. 24, 7375–7419.
12. A semiample criterion for divisors on $\overline{M}_{0,n}$, preprint available at [arXiv:1407.7839](https://arxiv.org/abs/1407.7839). The results of “New nef divisors on $\overline{M}_{0,n}$ ” ([arXiv:1308.5993](https://arxiv.org/abs/1308.5993)) are subsumed into this paper.
13. Toward GIT stability of syzygies of canonical curves, with Anand Deopurkar and David Swinarski, *Algebraic Geometry* **3** (2016), no. 1, 1–22.

14. Groebner techniques and ribbons, with Anand Deopurkar and David Swinarski, *Albanian Journal of Mathematics* **8** (2014), no. 2, 55–70.
15. Singularities with \mathbb{G}_m -action and the log minimal model program for \overline{M}_g , with Jarod Alper and David I. Smyth, *Journal für die reine und angewandte Mathematik* **2016** (2016), no. 721, 1–41.
16. GIT of genus five canonical curves, with David I. Smyth, in *A Celebration of Algebraic Geometry*, 281–310, Clay Mathematics Proceedings, vol. 18, CMI/AMS, 2013.
17. Moduli spaces of hyperelliptic curves with A and D singularities, *Mathematische Zeitschrift* **276** (2013), no. 1–2, 299–328.
18. Finite Hilbert stability of (bi)canonical curves, with Jarod Alper and David I. Smyth, *Inventiones mathematicae* **191** (2013), no. 3, 671–718.
19. Alternate Compactifications of Moduli Spaces of Curves, with David I. Smyth, in *Handbook of Moduli: Volume I*, 331–414, editors Gavril Farkas and Ian Morrison, Adv. Lect. Math. (ALM), 24, Int. Press, Somerville, MA, 2013.
20. Stability of 2nd Hilbert points of canonical curves, with David Jensen, *International Mathematics Research Notices* **2013** (2013), no. 22, 5270–5287.
21. The final log canonical model of the moduli space of stable curves of genus four, *International Mathematics Research Notices* **2012** (2012), no. 24, 5650–5672.
22. Cyclic covering morphisms on $\overline{M}_{0,n}$ (with an appendix by Anand Deopurkar), *preprint*. Available at [arXiv:1105.0655](https://arxiv.org/abs/1105.0655).
23. Moduli of weighted stable curves and log canonical models of $\overline{M}_{g,n}$, *Mathematical Research Letters* **18** (2011), no. 4, 1–13.
24. Ample divisors on moduli spaces of pointed rational curves, with David I. Smyth, *Journal of Algebraic Geometry*, **20** (2011), no. 4, 599–629.
25. Severi Varieties and the Moduli Space of Curves, Ph.D. thesis, Harvard University, 2008.
26. Rigidity and polynomial invariants of convex polytopes, with Igor Pak, *Duke Mathematical Journal* **129** (2005), no. 2, 371–404.

Meetings and Conferences Organized

- Fall 2017 Boston College–Northeastern U Algebraic Geometry Mini-Conference (with Ana-Maria Castravet, Dawei Chen, Brian Lehmann, Emanuele Macri, Alina Marian), November 4, 2017.

- Spring 2017 Boston College–Northeastern U Algebraic Geometry Mini-Conference (with Ana-Maria Castravet, Dawei Chen, Brian Lehmann, Emanuele Macri, Alina Marian), March 18, 2017.
- *Stability and moduli spaces* workshop at the American Institute of Mathematics (with Anand Deopurkar, Ian Morrison, Xiaowei Wang), San Jose, CA, January 2017.
- Fall 2016 BC–Northeastern Algebraic Geometry Mini-Conference (with Ana-Maria Castravet, Dawei Chen, Brian Lehmann, Emanuele Macri, Alina Marian), October 15, 2016.
- *Cycles on Moduli Spaces, Geometric Invariant Theory, and Dynamics* workshop at the ICERM (with Ana-Maria Castravet, Dawei Chen, and Anton Zorich), Providence, RI, August 1–5, 2016.
- Spring 2016 BC–Northeastern Algebraic Geometry Mini-Conference (with Ana-Maria Castravet, Dawei Chen, Brian Lehmann, Emanuele Macri, Alina Marian), April 30, 2016.
- Fall 2015 BC–Northeastern Algebraic Geometry Mini-Conference (with Ana-Maria Castravet, Dawei Chen, Brian Lehmann, Emanuele Macri, Alina Marian), September 12, 2015.
- Spring 2015 BC–Northeastern Algebraic Geometry Mini-Conference (with Ana-Maria Castravet, Dawei Chen, Brian Lehmann, Emanuele Macri, Alina Marian), April 25, 2015.
- Spring 2015 AGNES at Boston College (with Dawei Chen and Brian Lehmann), March 20–22, 2015.
- Graduate mini-school during the Spring 2015 AGNES at Boston College (with Dawei Chen, Brian Lehmann, and Jason Starr), March 20, 2015.
- Fall 2013 AGNES at Boston College (with Alina Marian and Dawei Chen), October 25–27, 2013.
- Special Session on *Moduli Spaces in Algebraic Geometry* at Boston College (with Dawei Chen, Joe Harris, and Yu-Jong Tzeng), April 6–7, 2013.
- *Log minimal model program for moduli spaces* workshop at the American Institute of Mathematics (with Jarod Alper, Brendan Hassett, and David Smyth), Palo Alto, CA, December 10–14, 2012.

Mentorship

- Research mentor for Matthew Grimes (Visiting Assistant Professor at BC), September 2016 – June 2018.
- Advising a Ph.D. student (Ross Goluboff), September 2016 – present:
 - J. Ross Goluboff, *Genus six curves, K3 surfaces, and stable pairs*, preprint on [arXiv.1812.10211](https://arxiv.org/abs/1812.10211).

- Boston College Mathematical Society faculty liaison, Fall 2017 – present.
- Supervised a summer research project for 2 undergraduate students (Zihao Fang and Justin Kim, supported by a grant from BC), Summer 2017.
- Supervised a reading course on representation theory of finite groups for three undergraduate students, Spring 2017.
- Organized Undergraduate Research Mini-symposia at Boston College, featuring talks by undergraduate math majors reporting on their work in REU programs, January 2017 and September 2015.
- Honors Thesis advisor for Andrew Ferdowsian, Boston College, Fall 2015 – Spring 2016.
- Supervised a summer research project for 3 undergraduate students (Andrew Ferdowsian, Christopher Ratigan, Jian Zhou, supported by a grant from BC), Summer 2015.
- Supervised 2 undergraduate students (Andrew Ferdowsian, Christopher Ratigan) working on a project about curve singularities (supported by a grant from BC), Spring 2015.
- Supervised a reading course on plane algebraic curves (following G. Fischer's *Plane Algebraic Curves*) for 2 undergraduate students (Champ Davis, Emma West), Boston College, Spring 2015.
- Honors Thesis advisor for Katherine Pilewski, Boston College, Fall 2014 – Spring 2015.
- Supervised reading courses on Algebraic Geometry and Toric Varieties for undergraduate students (Atanas Atanasov, Rankeya Datta, Giwan Kim, John Yu) at Columbia University, Fall 2008, Spring 2009, and Fall 2011.

Service and Outreach

- Led four sessions (March 2016, November 2016, November 2017, and November 2018) at the Boston Math Teachers' Circle.
- Visited, observed, and provided feedback on mathematics classes at several Boston-area high and middle schools during a semester-long Lynch School of Education program, Fall 2012.
- Served on Tenure-Track Hiring (2013, 2014), Postdoc Hiring (2012, 2016), Putnam Competition (2012–present), Graduate Admission (2014, 2015), Boston College Math Society Liaison (2015–present), and Distinguished Lecturer (2013) Committees of the Mathematics Department, Boston College.
- Co-organized (with William Keane) weekly Putnam preparation sessions at Boston College, Fall 2012 – present.

- Read and scored 150 online applications to the 2015 Young Mathematicians Conference (at Ohio State University) for undergraduate research, July 2015.
- Co-organized Harvard/MIT Algebraic Geometry Seminar, Fall 2013 – Fall 2016.
- Co-organize Boston College NT & AG Seminar, Fall 2012 – present.
- Referee for numerous journals.
- Reviewer for the NSA-AMS Young Investigator Grant Program (2010–2013, 2016).
- Co-organized (with Dawei Chen, Boston College) a poster session during the Algebraic Geometry Northeastern Series (AGNES) Conference at Brown University, Fall 2012.
- Organized graduate student seminar on *GIT, moduli spaces, and deformation theory*, Columbia University, Fall 2011.
- Senior postdoc, MRC 2010 Workshop on Birational Geometry and Moduli Spaces.
- Served on PhD thesis defense committees of Atanas Atanasov (Harvard, 2015), Fabio Felici (Roma Tre, 2014), Alice Rizzardo (Columbia University, 2012), Mingmin Shen (Columbia University, 2010), Matt Deland (Columbia University, 2009).
- Co-organized (with Johan de Jong) graduate student seminar on *Higher-dimensional algebraic geometry*, Columbia University, Spring 2009.
- Putnam preparation lectures at Columbia University, Fall 2008, Fall 2010.

Long-term Research Visits

- Academic Visitor, Australian National University, August 2016.
- Campus Visitor, Australian National University, November 2015.
- Visiting Researcher, Max Planck Institute for Mathematics in Bonn, October 2015.
- Visiting Researcher, Max Planck Institute for Mathematics in Bonn, June 2014.
- Mathematical Sciences Research Visitor, Australian National University, June 2013.

Invited Lecture Series

- “Winter school on Algebraic Curves, Riemann surfaces and moduli spaces:” Lecture series at the Morningside Center of Mathematics, Beijing, *expected*: March 4–8, 2019.
- Graduate Workshop on Moduli of Curves: 5 lectures on *GIT constructions of the moduli space of curves and its variants*, Simons Center for Geometry and Physics, Stony Brook, July 2014.

- 2013 KAIST Winter School on Algebraic Geometry: Mini-course (3 lectures) on *Log minimal model program of \overline{M}_g via GIT and stacks*, January 2013.
- Pohang University of Science and Technology: Mini-course (3 lectures) on *Deformations of curve singularities and the moduli space of curves*, January 2011.

Conference Talks

- COW algebraic geometry workshop, University of Cambridge, UK, February 2019.
- Banff workshop “Moduli Spaces: Birational Geometry and Wall Crossings:” *Standard models of low degree del Pezzo fibrations and GIT for syzygy points*, Banff, Canada, October 2018.
- Master Lectures – the Legacy of Carl Friedrich Gauss workshop: *Invariant-theoretic Mather-Yau theorem, and applications*, TSIMF, China, December 2017.
- Abel Symposium 2017 “Geometry of moduli:” *Stability of Milnor algebras*, Norway, August 2017.
- Stacks Project Workshop 2017: *Associated forms and applications*, University of Michigan Ann Arbor, August 2017.
- Conference On Moduli and Birational geometry: *Invariant theory of Artinian Gorenstein algebras*, Jeju, Korea, December 2016.
- Combinatorial Moduli Spaces Workshop, Fields Institute: *Invariant theory of Artinian Gorenstein algebras*, Toronto, December 2016.
- BATMOBYLE (Algebraic and Tropical Meeting of Brown and Yale): *GIT semistability of Hilbert points of Milnor algebras*, New Haven, December 2015.
- SIAM Algebraic Geometry Mini Symposium: Computational Approaches to GIT and Moduli Theory: *GIT semistability of the gradient of a homogeneous form*, Daejeon, August 2015.
- Conference on Moduli and Birational Geometry, Pohang University of Science and Technology: *Projectivity of the 2nd flip of \overline{M}_g* , August 2013.
- Algebraic geometry and related fields, Australian National University: *GIT stability of Hilbert and Syzygy points of canonical curves*, May 2013.
- Geometry and Topology of Moduli Conference, Humboldt University, Berlin: *Log canonical models of moduli spaces via GIT*, October 2012.
- Algebraic Geometry Northeastern Series (AGNES) Conference, UMass Amherst: *Finite Hilbert stability of (bi)canonical curves*, April 2012.
- Algebraic Cycles and the Geometry of Group Orbits, Australian National University: *Moduli spaces of singular curves via GIT for canonical curves*, September 2011.

- Workshop on Moduli and Birational Geometry, Pohang University of Science and Technology: *GIT and the modularity principle for the log MMP for \overline{M}_g* , July 2011.
- Moduli spaces and moduli stacks, Columbia University, New York: *Cyclic covering morphisms on moduli spaces of stable pointed rational curves*, May 2011.
- Workshop on Moduli and Birational Geometry, Pohang University of Science and Technology: *Quasi-admissible hyperelliptic covers with A and D singularities*, August 2010.

Invited Seminar Talks

- Humboldt University of Berlin Algebraic Geometry Seminar: *Standard models of low degree del Pezzo fibrations and GIT for syzygy points*, July 2018.
- University of Georgia algebraic geometry seminar: *Invariant-theoretic Mather-Yau theorem, and applications*, November 2017.
- University of Michigan algebraic geometry seminar: *GIT for syzygies, with applications*, November 2017.
- University of Loughborough GMPLboro seminar: *Associated forms and applications*, May 2017.
- University of Edinburgh EDGE seminar: *Invariant theory of Artinian Gorenstein algebras*, November 2016.
- Roma Tre University Algebraic Geometry seminar: *GIT semistability of Hilbert points of Milnor algebras*, November 2015.
- Università di Firenze Algebraic Geometry seminar: *GIT semistability of Hilbert points of Milnor algebras*, November 2015.
- University of Bonn Algebraic Geometry Seminar: *GIT semistability of Hilbert points of Milnor algebras*, October 2015.
- Humboldt University of Berlin Algebraic Geometry Seminar: *GIT semistability of Hilbert points of Milnor algebras*, October 2015.
- Oberseminar at the Max Planck Institute for Mathematics: *Moduli of curves: new compactifications and flips*, October 2015.
- Geometry-Algebra-Singularities-Combinatorics Seminar, Northeastern University: *GIT semistability of the gradient of a homogeneous form*, September 2015.
- Stony Brook Algebraic Geometry seminar: *GIT semistability of the gradient of a homogeneous form*, September 2015.
- ANU algebra seminar: *A base point freeness criterion for divisors on $\overline{M}_{0,n}$* , March 2015.
- Valley Geometry Seminar (UMass Amherst): *Toward GIT stability of syzygies of canonical curves*, November 2014.

- Ohio State University Algebraic Geometry seminar: *A Semi-Ampleness Criterion for Divisors on the Moduli Space of Stable Pointed Rational Curves*, September 2014.
- Roma Tre University Algebraic Geometry seminar: *Toward GIT stability of syzygies of canonical curves*, June 2014.
- University of Colorado Algebraic Geometry seminar: *Toward GIT stability of syzygies of canonical curves*, March 2014.
- Oberseminar Algebraische und Arithmetische Geometrie, Hannover: *GIT stability of Hilbert and Syzygy points of canonical curves*, July 2013.
- Humboldt Algebraic Geometry Seminar, Berlin: *GIT stability of Hilbert and Syzygy points of canonical curves*, July 2013.
- KAIST Colloquium, Daejeon, Korea: *An introduction to the log minimal model program for the moduli space of curves*, January 2013.
- Tufts Algebraic Geometry seminar: *Finite Hilbert stability of (bi)canonical curves*, January 2013.
- Geometry-Algebra-Singularities-Combinatorics Seminar, Northeastern University: *Log canonical models of moduli spaces via GIT*, 2012.
- CUNY Representation Theory Seminar: *Hilbert stability of (bi)canonical curves*, 2012.
- Universidad de los Andes Algebra Seminar: *Moduli spaces of singular curves via GIT for canonical curves*, 2012.
- Oklahoma State University Colloquium: *Geometry of moduli spaces and Geometric Invariant Theory*, 2012.
- Cornell University Colloquium: *Geometry of moduli spaces and Geometric Invariant Theory*, 2012.
- University of Colorado Boulder Kempner Colloquium: *Geometry of moduli spaces and Geometric Invariant Theory*, 2012.
- Boston College Colloquium: *Geometry of moduli spaces and Geometric Invariant Theory*, 2012.
- Michigan State University Colloquium: *Geometry of moduli spaces and Geometric Invariant Theory*, 2012.
- Columbia University Algebraic Geometry Seminar: *Moduli spaces of singular curves via GIT for canonical curves*, 2011.
- SUNY Stony Brook Algebra, Geometry and Physics Seminar: *Modularity of log canonical models of the moduli space of stable curves*, 2011.
- Front Range Algebra, Geometry and Number Theory Seminar (University of Colorado at Boulder): *Modularity of log canonical models of the moduli space of stable curves*, 2011.

- University of Illinois at Chicago Algebraic Geometry Seminar: *Modularity of log canonical models of the moduli space of stable curves*, 2011.
- Korea Institute for Advanced Study (KIAS): *Towards the log minimal model program for \overline{M}_g* , 2011.
- Harvard-MIT Algebraic Geometry Seminar: *Spaces of hyperelliptic curves with AD singularities*, 2010.
- Princeton University Algebraic Geometry Seminar: *Spaces of hyperelliptic curves with simple singularities*, 2010.
- Columbia University Algebraic Geometry Seminar: *Spaces of hyperelliptic curves with simple singularities*, 2009.
- Rice University Algebraic Geometry Seminar: *Spaces of hyperelliptic curves with simple singularities*, 2009.
- The Valley Geometry Seminar (UMass Amherst): *Spaces of hyperelliptic curves with simple singularities*, 2009.
- American Mathematical Society Eastern Section Meeting, Special Session on Algebraic Geometry: *Moduli and enumerative geometry of curves on rational ruled surfaces*, 2008.
- UC Riverside Algebraic Geometry Seminar: *Linear sections of the Severi variety and applications*, 2008.
- Harvard-MIT Algebraic Geometry Seminar: *Linear sections of the Severi variety and applications*, 2007.
- Columbia University Algebraic Geometry Seminar: *Linear sections of the Severi variety and applications*, 2007.
- SUNY Stony Brook Algebra, Geometry and Physics Seminar: *Geometry of one-parameter families of plane curves*, 2007.

Teaching

- Fall 2005: Introduction to Calculus, Harvard University
- Fall 2006: Linear Algebra with Differential Equations, Harvard University
- Fall 2006: Course assistant, Algebraic curves and abelian varieties, Harvard University
- Spring 2008: Linear Algebra with Differential Equations, Harvard University
- Fall 2008: Calculus I, Columbia University
- Spring 2009: Calculus I, Columbia University
- Fall 2010: Commutative Algebra, Columbia University

- Spring 2010: Algebraic Geometry (Schemes), Calculus III, Columbia University
- Fall 2010: Calculus I, Columbia University
- Spring 2011: Modern Algebra I, Honors Linear Algebra, Columbia University
- Fall 2011: Algebraic Number Theory, Columbia University
- Spring 2012: Calculus III, Columbia University
- Fall 2012: Multivariable Calculus (MT 202) and Algebra I (MT 806), Boston College
- Spring 2013: Introduction to Number Theory (MT 430), Boston College
- Fall 2013: Calculus II-AP (MT 105), Boston College
- Spring 2014: Introduction to Number Theory (MT 430) and Algebra II (MT 807), Boston College
- Fall 2014: Algebra I (MT 311), Topics in Algebra and Number Theory (MT 845), and Honors Thesis (MT 496), Boston College
- Spring 2015: Algebra II (MT 312), Readings and Research (MT 490), and Honors Thesis (MT 496), Boston College
- Spring 2015: Algebra II (MT 807, graduate)
- Fall 2015: Faculty Fellowship leave
- Fall 2016: Algebra I (MT 311)
- Spring 2017: Algebra II (MT 312), Algebra II (MT 807, graduate)
- Fall 2017: Algebra I (MATH 311), Algebra I (MATH 806, graduate), and Honors Thesis (MATH 496)
- Spring 2017: Algebra II (MATH 312)
- Fall 2018: Introduction to Abstract Mathematics (MATH 2216, 2 sections)