Han-Bom Moon

Curriculum Vitae

Department of Mathematics, Fordham University
113 W 60th St, New York, NY 10023
hmoon8@fordham.edu
www.hanbommoon.net

Research Interests

I am broadly interested in algebraic geometry and related areas. My research interests include birational geometry of moduli spaces, geometric invariant theory, conformal blocks, skein algebras, and derived category.

Employment

Sep 2021 -	Fordham University Associate Professor with tenure	New York, NY
Aug 2018 - Aug 2021	Fordham University Assistant Professor	New York, NY
Sep 2017 - Jul 2018	Institute for Advanced Study Member	Princeton, NJ
Aug 2013 - Aug 2017	Fordham University P.M.C. Visiting Assistant Professor	Bronx, NY
Aug 2011 - Aug 2013	University of Georgia Postdoctoral Associate	Athens, GA

Visiting Positions

July 2024 - July 2024	Universitá di Genova Professori Visitatori	Genova, Italy
Sep 2021 - Jun 2022	Stanford University Visiting Assistant Professor	Stanford, CA

Education

Mar 2005 - Aug 2011	Ph.D. in Mathematics Advisor: Young-Hoon Kiem	Seoul National University
Mar 2001 - Feb 2005	B.S. in Mathematics Education Graduation with honors - Summa cum laude	Seoul National University

Publications and Preprints (reverse chronological order)

32. (with K.-S. Lee) Derived categories of symmetric products and moduli spaces of vector bundles on a curve. preprint. arXiv:2309.15412.
31. (with A. Campbell, F. Dedvukaj, D. McCormick III, and J. Morales) On algebraic space filling curves. preprint. arXiv:2310.09293.
30. (with R. Jain and P. Wu) Distribution of the number of zeros of polynomials over a finite field. to appear *Involve*. arXiv:2308.14580.
29. (with P. Gallardo, J. Martinez-Garcia, and D. Swinarski) Computation of GIT quotients of semisimple groups. preprint. arXiv:2308.08049.
28. (With A. Caminata and L. Schaffler) Determinantal varieties from point configurations on hypersurfaces. *Int. Math. Res. Not. IMRN*, DOI: https://doi.org/10.1093/imrn/rnad244.

27. Tropical geometry and phylogenetic diversity. preprint.
26. (With K.-S. Lee) Derived category and ACM bundles of moduli space of vector bundles on a curve. *Forum. Math, Sigma*, Volume 11, 2023, e81, DOI: https://doi.org/10.1017/fms.2023.75.
25. (With H. Wong) Consequences of the compatibility of cluster algebra and skein algebra and cluster algebra on surfaces. to appear *New York J. Math.*, arXiv:2201.08833.
24. (With K.-S. Lee) Positivity of the Poincare bundle on the moduli space of vector bundles and its applications, preprint. arXiv:2106.04857.
23. (With F. Azad, Z. Chen, M. Dreyer, and R. Horowitz) Presentations of the Roger-Yang generalized skein algebra. *Algebr. Geom. Topol.*, 21 (2021), no. 6, 3199–3220.
22. (With A. Caminata, N. Giansiracusa, and L. Schaffler) Point configurations, phylogenetic trees, and dissimilarity vectors. *Proc. Natl. Acad. Sci. USA*, 2021, 118 (12).
21. (with H. Wong) The Roger-Yang skein algebra and the decorated Teichmüller space. *Quantum Topol.*, Volume 12, Issue 2, 2021, pp. 265–308.
20. (With S.-B. Yoo) Finite generation of the algebra of type A conformal blocks via birational geometry II: higher genus, *Proc. Lond. Math. Soc.*, vol.120 (2020), issue 2, 242–264.
19. (With L. Schaffler) KSBA compactification of the moduli space of K3 surfaces with purely non-symplectic automorphism of order four, *Proc. Edinb. Math. Soc.*, Volume 64, Issue 1, February 2021, pp. 99–127.
18. (With A. Caminata, N. Giansiracusa, and L. Schaffler) Equations for points to lie on a rational normal curve, *Adv. Math.*, Vol. 340, (2018) no. 15, 653–683.
17. (With S.-B. Yoo) Finite generation of the algebra of type A conformal blocks via birational geometry, *Int. Math. Res. Not. IMRN*, (2021), no. 7, 4941–4974.
16. (With K. Chung) Birational geometry of the moduli space of pure sheaves on quadric surface. *C. R. Math. Acad. Sci. Paris.*, 355 (2017), no. 10, 1082–1088.
15. (With K. Chung) Mori's program for the moduli space of conics in Grassmannian. *Taiwanese J. Math., a special issue for Algebraic Geometry in East Asia 2016*, Vol. 21, (2017) No. 3, 621–652.
14. (With D. Swinarski) On the S_n-invariant F-conjecture, *J. Algebra.* Vol. 517, (2019) no. 1, 439–456.
13. (With C. Summers, J. von Albade, and R. Xie) Birational contractions of $\overline{M}_{0,n}$ and combinatorics of extremal assignments. *J. Algebraic Comb.*, Vol. 47, (2018), no. 1, 51–90.
12. (With K. Chung) Chow ring of the moduli space of stable sheaves supported on quartic curves. *Q. J. Math.*, Vol. 68, (2017), No. 3, 851–887.
11. (With K. Chung) Moduli of sheaves, Fourier-Mukai transform, and partial desingularization. *Math. Z.*, 283 (2016), no. 1-2, 275–299.
10. (With S.-B. Yoo) Birational geometry of the moduli space of rank 2 parabolic bundles on a rational curve. *Int. Math. Res. Not. IMRN* (2016), no. 3, 827–859.
9. (With D. Swinarski) Effective curves on $\overline{M}_{0,n}$ from group actions. *Manuscripta Math.*, 147 (2015), no. 1-2, 239–268.
8. Mori program for $\overline{M}_{0,7}$ with symmetric divisors. *Canad. J. Math.*, 69 (2017), no. 3, 613–649.
7. Mori program for $\overline{M}_{0,6}$ with symmetric divisors. *Math. Nachr.*, 288 (2015), no. 7, 824–836.
6. (With A. Gibney, D. Jensen and D. Swinarski) Veronese quotient models of $\overline{M}_{0,n}$ and conformal blocks. *Michigan Math. J.*, 62 (2013), no. 4, 721–751.
5. (With N. Giansiracusa and D. Jensen) GIT compactifications of $M_{0,n}$ and flips. *Adv. in Math.*, 248, (2013), 242–278.
4. A family of divisors on $\overline{M}_{g,n}$ and their log canonical models. *J. Pure Appl. Algebra*, 219 (2015), no. 10, 4642–4652.
3. Log canonical models for the moduli space of stable pointed rational curves. *Proc. Amer. Math. Soc.*, 141 (2013), no. 11, 3771–3785.

2. (With Y.-H. Kiem) Moduli spaces of weighted pointed stable rational curves via GIT. *Osaka J. of Math.*, Vol. 48, (2011) No. 4, 1115–1140.
1. (With Y.-H. Kiem) Moduli spaces of stable maps to projective space via GIT. *Internat. J. Math.*, 21 (2010), no. 5, 639–664.

Honors and Awards

2023	Collaborate@ICERM Grant on "Point configurations on projective varieties"	ICERM
2018	SQuaREs on "Computational aspects of GIT with a view toward geometry of moduli spaces"	AIM

Teaching Experience

Fordham University

Fall 2024	Calculus I, Linear Algebra I, Honors Science (Math component)
Spring 2024	Calculus II, Abstract Algebra II, Honors Science (Math component)
Fall 2023	two sections of Calculus I, Honors Science (Math component)
Spring 2023	Multivariable Calculus II, Abstract Algebra I, Honors Science (Math component)
Fall 2022	Multivariable Calculus I, Linear Algebra I, Honors Science (Math component)
Spring 2021	Numerical Analysis, Calculus II (Recitation)
Fall 2020	two sections of Calculus I
Spring 2020	Topology, Numerical Analysis
Fall 2019	two sections of Linear Algebra I
Spring 2019	Calculus II, Numerical Analysis
Fall 2018	two sections of Calculus I
Spring 2017	Calculus II, Calculus I (Recitation), Multivariable Calculus II (Recitation)
Fall 2016	Abstract Algebra I, two sections of Calculus II
Spring 2016	Mathematical Modeling, Calculus II
Fall 2015	Discrete Mathematics, two sections of Math for Business: Finite
Spring 2015	Mathematical Modeling, Finite Mathematics
Fall 2014	Abstract Algebra I, two sections of Math for Business: Precalculus
Spring 2014	Abstract Algebra I, two sections of Math for Business: Calculus
Fall 2013	Multivariable Calculus I, Math for Business: Finite

University of Georgia

Spring 2013	two sections of Calculus for Engineering and Science II
Fall 2012	two sections of Calculus for Engineering and Science II
Spring 2012	two sections of Calculus for Engineering and Science I

Seoul National University

2005 – 2011	Teaching Assistant: Calculus I, Calculus II, Honors Calculus I, Honors Calculus II
2005 – 2010	Grading Assistant: Graduate Algebra, Undergraduate Algebra, Algebraic Geometry, Linear Algebra, Differential Geometry, Engineering Mathematics, Geometric Algebra

Activities

Organization

Fall 2023 –	AG@PUI Seminar
Fall 2023 –	Fordham Algebra Seminar
Fall 2019 –	Mathematics Department Seminar

Editorial work

Jul 2023 -	Associate Editor of Notices of the American Mathematical Society

Service and Mentoring

Summer 2023	Guiding summer research of six undergraduate students Alana Campbell, Flora Dedvukaj, Ritik Jain, Donal McCormick III, Joshua Morales, and Peter Wu. Resulting in the research papers "On algebraic space filling curves" and "Distribution of the number of zeros of polynomials over a finite field."
Summer 2020	Guided summer research of four undergraduate students Farhan Azad, Zixi Chen, Matt Dreyer, and Ryan Horowitz. Resulting in the research paper "Presentations of the Roger-Yang generalized skein algebra" which appeared on *Algebr. Geom. Topol.*
Summer 2015	Guided summer research of three undergraduate students Charles Summers, James von Albade, and Ranze Xie. Resulting in the research paper "Birational contractions of $\overline{\mathrm{M}}_{0,\mathrm{n}}$ and combinatorics of extremal assignments" which appeared on *J. Algebraic Comb.*
Dec 2022	Career Panel for undergrad/grad students at Seoul National University
Fall 2018 –	Math major advisor
Fall 2018 – Spring 2021	Freshman advisor
Fall 2014 – Spring 2021	Korean Students Association at Fordham University advisor
Fall 2019 – Spring 2023	Guided the honor thesis of Sarah Grandinetti (2020), Kelvin Buck (2021), and Kreena Vora (2023).
Fall 2015 –	Guided five reading seminars/independent studies on combinatorics, topology, algebraic geometry, cryptography, and differential equations.

Journals refereed

Bulletin of the Korean Mathematical Society, Journal of Algebra, Journal of Mathematical Society of Japan, Michigan Mathematical Journal, The American Mathematical Monthly, International Mathematics Research Notices, Journal of Symbolic Computation, Advances in Mathematics, Bulletin of the London Mathematical Society, European Journal of Mathematics, Manuscripta Mathematica, Notices of the American Mathematical Society, Communications in Mathematical Physics, Communication in Algebra, Crelle, Journal of Pure and Applied Algebra, and Nagoya Journal of Mathematics.

Invited Talks (Bold face: series lectures)

2024

Point configurations, phylogenetic trees, and dissimilarity maps, A Showcase of Algebraic Geometry at Undergraduate Institutions, AMS Central Sectional Meeting, University of Texas–San Antonio	September
Derived category of moduli space of vector bundles on a curve, algebra and geometry seminar, Università di Genova	July
Derived category of moduli space of vector bundles on a curve, Automorphisms of Riemann Surfaces and Related Topics, AMS Central Sectional Meeting, University of Wisconsin–Milwaukee	April
Derived category of moduli space of vector bundles on a curve, Harvard-MIT algebraic geometry seminar	April
Presentations of the Roger-Yang generalized skein algebra, Skein Modules in Low Dimensional Topology, AMS Eastern Sectional Meeting, Howard University	April
Cluster algebras and generalized skein algebras, Quantum Topology seminar, online	March
Cluster algebras and generalized skein algebras, Knots, graphs and groups seminar, online	March
Algebra of conformal blocks, algebra seminar, Fordham University	February
On roots of complex polynomials, department seminar, Fordham University	February
Cluster algebras and generalized skein algebras, Knots, Skein Modules, and Categorification, Joint Mathematical Meeting, San Francisco	January

2023

Derived category of moduli space of vector bundles, Fordham algebra seminar	November
Derived category of moduli space of vector bundles, Commutative Algebra and Algebraic Geometry seminar, CUNY	October
Algebraic geometry over finite fields, AG@PUI seminar	October

2022

Algebra and Geometry of Conformal Blocks, BrainLink, Incheon	December
Derived category of moduli space of vector bundles, Fordham University	October
Derived category of moduli space of vector bundles, Global KMS conference	October
Derived category of moduli space of vector bundles, Workshop on Geometry of Moduli Spaces, Gangneung	August
Vector bundles and representation theory on a curve, Seoul National University	August
Compatibility of skein algebra and cluster algebra, UC Davis,	May
Point configurations, phylogenetic trees, and dissimilarity maps, KMS Spring Meeting	April
Introduction to Geometric Invariant Theory, four-hour lecture, DGIST	February
Derived category of moduli of vector bundles, three-hour lecture, Complex Geometry seminar, IBS	January

2021

Point configurations, phylogenetic trees, and dissimilarity maps, University of California Riverside	November
Conformal Blocks in Algebraic Geometry, three-hour lecture, University of Miami	October
Derived category of moduli of vector bundles, Stanford University	September
Generalized skein algebra and decorated Teichmuller space, Cluster algebras and related topics, Seoul National University	July
Point configurations, phylogenetic trees, and dissimilarity maps, AGEA seminar	July
Can we recover the history of life with mathematics?, Fordham University	April
Point configurations, phylogenetic trees, and dissimilarity maps, Special Session on Moduli of curves, Hilbert schemes, and tropical geometry, AMS Sectional Meeting	March

2020

Point configurations, phylogenetic trees, and dissimilarity maps, ZAG seminar	December
Let's count points!, seminar talk, Fordham University	November
Finite generation of the algebra of conformal blocks via birational geometry, Geometry and Topology Seminar, Virginia Commonwealth University	May

2019

Let's count points!, colloquium, Claremont Center for Mathematical Sciences	November
Phylogenetic trees, tropical geometry, and point configurations, Fordham University	October
Geometry of quotient varieties and the algebra of conformal blocks, Claremont McKenna College	April

2018

Equations for point configurations to lie on a rational normal curve, KIAS	May
Finite generation of the algebra of type A conformal blocks over a curve – Part 2, Algebraic Geometry in Gunsan, Gunsan	May
Introduction to conformal blocks, six-hour lecture, IBS-CGP	May
On zeros of complex polynomials, colloquium, Seoul National University	May

2017

Equations for point configurations to lie on a rational normal curve, Seoul National University	December
Birational geometry of moduli spaces, Fordham University	December
Birational geometry of moduli spaces of parabolic bundles, Johns Hopkins University	November
Birational geometry of moduli spaces of parabolic bundles, University of Massachusetts Amherst	November
Birational geometry of moduli spaces of parabolic bundles, Workshop on Topics in Algebraic Geometry, University of North Carolina at Chapel Hill	November
Birational geometry of moduli spaces of parabolic bundles, Rutgers University	October
Let's count points!, colloquium, Swarthmore College	September
Birational geometry of moduli spaces of parabolic bundles, KAIST	June
Birational geometry of moduli spaces of parabolic bundles, Seoul National University	June
Rationality of moduli spaces of hyperplane arrangements, One-day workshop on hyperplane arrangements and singularities, KIAS	June
Birational geometry of moduli spaces of parabolic bundles, KIAS	June
Birational geometry of moduli spaces, colloquium, University of Seoul	June
Let's count points!, colloquium, Seoul National University	June
Some facts that you may not know about right triangles, Fordham University	May
Birational geometry of moduli spaces of parabolic bundles, Courant Institute	April
Birational geometry of moduli spaces, colloquium, Claremont McKenna College	February
Birational geometry of moduli spaces, University of Arizona	February
Birational geometry of moduli spaces, colloquium, University of Kentucky	January
Classical invariant theory and birational geometry of moduli spaces of parabolic bundles, Joint Mathematics Meeting, Atlanta	January

2016

Classical invariant theory and birational geometry of moduli spaces, Workshop on Combinatorial Moduli Spaces, Fields Institute	December
Classical invariant theory and birational geometry of moduli spaces, Princeton University	November
A computational approach to the F-conjecture, KIAS	May
A computational approach to the F-conjecture, KAIST	May
Geometric invariant theory and construction of moduli spaces, colloquium, Kyoungbook National University	May
Moduli spaces and birational geometry, colloquium talk at Department of Mathematics Education, Seoul National University	May
Birational geometry of moduli spaces of parabolic bundles, Seoul National University	May
Algebraic geometry, moduli spaces, and invariant theory, Ewha Women's University	May
A computational approach to the F-conjecture, Workshop on Rational Curves and Moduli, Damyang	May

2015

Let's count points!, Fordham University	December
Birational geometry of moduli spaces of parabolic bundles, Stony Brook University	November
Classical invariant theory and birational geometry of moduli spaces, colloquium, Rutgers University-Newark	November

2014

Effective curve class computation on moduli of rational curves, KIAS	August
Alternative compactifications of the moduli space of pointed rational curves, IBS-CGP	July
Do we really need integral?, Fordham University	March
Alternative compactifications of the moduli space of pointed rational curves, KIAS	January

2013

Alternative compactifications of the moduli space of pointed rational curves, Seoul National University	December
Alternative compactifications of the moduli space of pointed rational curves, Yale University	November
Birational geometry of $\bar{M}_{0,n}$ and conformal blocks, KIAS	July
Moduli spaces and their birational geometry, Ehwa Women's university	July
Euler's product formula and its geometric interpretation, colloquium, Seoul National University	July
Birational geometry of $\bar{M}_{0,n}$ and conformal blocks, KAIST	July
Mori's program for $\bar{M}_{0,n}$, KAIST	July
GIT compactifications of $M_{0,n}$, The Asian Mathematical Conference 2013, Busan	July
Compactifications of moduli of curves, series lecture at KIAS	June
Birational geometry of $\bar{M}_{0,n}$ and conformal blocks, Princeton University	March
Moduli spaces and their birational geometry, Fordham University	February
Moduli spaces and their birational geometry, University of Georgia	February

2012

Toward a classification of projective modular compactifications of $\bar{M}_{0,n}$, University of Georgia	October
Introduction to Geometric Invariant Theory, four-hour lecture on Summer School on Algebraic Geometry, Sol Beach	June
New family of nef divisors on $\bar{M}_{0,n}$, KIAS	June
GIT compactifications of $M_{0,n}$, KIAS	June
GIT compactifications of $M_{0,n}$, Seoul National University	June

– 2011

Mori's program for moduli spaces of pointed curves and psi-classes, University of Georgia	Sep 2011
Moduli spaces and their birational geometry, Seoul National University	Aug 2011
Mori's program for moduli spaces of pointed curves and psi-classes, Workshop on Moduli and Birational Geometry, Gyeongju	Jul 2011
Mori's program for $\bar{M}_{0,n}$, Brown University	May 2011
Moduli spaces and its birational geometry, Chungnam University	Apr 2011
Mori's program for the moduli space of pointed stable rational curves, Global KMS International Conference, Postech	Oct 2010
Introduction to moduli spaces, Workshop for Young Mathematicians in Korea, KAIST	Jul 2010
Elementary construction of the moduli spaces of rational curves via GIT, Mini workshop on curves, Seoul National University	Mar 2010
On GIT constructions of Kontsevich moduli spaces of stable maps, Joint Meeting of the KMS and AMS, Ewha Women's University	Dec 2009
Cohomology of moduli spaces of stable maps to projective space, Seoul National University	Jan 2008