Curriculum vitae: David Donghoon Hyeon

Department of Mathematical Sciences
Seoul National University
Gwanak-gu Gwanak-ro 1
Seoul 08826, R.O.Korea

Phone: +82-2-880-2666
Fax: +82-2-887-4694
Email: dhyeon@snu.ac.kr

Education

Ph.D. Mathematics, University of Illinois at Urbana-Champaign, 2001.

B.S. Physics & Mathematics, KAIST, 1996.

Advisors

Steven Bradlow, Ph. D. thesis advisor, University of Illinois at Urbana-Champaign

William Haboush, Ph. D. thesis advisor, University of Illinois at Urbana-Champaign

Brendan Hassett, postdoctoral advisor, Rice University (currently at Brown University and ICERM)

Employment

CEO, H Machines Inc., 2020.02.19 – present

Visiting Scholar, Harvard University, 2018.3.1 – 2019.2.28

Professor, Seoul National University, 2018 – present

Associate Professor, Seoul National University, 2015–2017.

Associate Professor, POSTECH, 2013–2015.

Assistant Professor, POSTECH, 2009–2013.

Associate Professor, Marshall University, 2008–2010.

Assistant Professor, Northern Illinois University, 2004–2008.

G. C. Evans Instructor, Rice University, 2001–2004.

Honors & Awards

Member, Y-KAST, The Korean Academy of Science and Technology, 2017 – 2020.

Young Scientist Award, The Korean Academy of Science and Technology, 2014.

Excellent Paper Award, The Korean Mathematical Society, 2014.

7th biennial Kuo-Tsai Chen Prize in Mathematics, University of Illinois at Urbana-Champaign, 2001.

14th annual Irving Reiner Memorial Award in Algebra, University of Illinois at Urbana-Champaign, 2001.

Grants and Fellowships

Seoul National University 10-10 Project (Group Leader): Private AI (2021–2027)

National Research Foundation of Korea grants: RS-2025-00520280 (2025–2030), 2020R1A2B5B02099312 (2020–2023), 2017R1A5A1015626 (2017–2021), 2017R1E1A1A03071042 (2017–2020)

Samsung Science and Technology grant SSTF-BA1601-05, 2016–2021 (extended through 2022)

National Research Foundation of Korea grants: 2013R1A1A2010649 (2013–2016), 2011-0030044 (2011–2017), 2010-0010031 (2010–2013), KRF-2005-042-C00005 (2005–2007)

University Fellowship, University of Illinois at Urbana - Champaign, 1999–2000.

Waldemar J. Trjitzinsky Graduate Fellowship in Mathematics, University of Illinois at Urbana-Champaign, 1999.

Publications

Journal Articles

Conjugacy classes of commuting nilpotents (with William Haboush), *Transactions of the American Mathematical Soceity* 372 (2019), no. 6, 4293–4311.

Note on the decomposition of states (with Jaekwang Kim), *Bulletin of the Korean Mathematical Society* 55 (2018), no. 4, 1221–1230.

Grothendieck-Plücker images of Hilbert schemes are degenerate (with Hyoungju Park), *Proceedings of the Edinburgh Mathematical Society* (2) 62 (2019), no. 1, 47–60.

Castelnuovo-Mumford regularity and Bridgeland stability for points in the projective plane (with Izzet Coskun and Junyoung Park), *Proceedings of the American Mathematical Society*, 145 (2017), no. 11, 4573-4583.

An outline of the log minimal model program for the moduli space of curves, *Experimental Mathematics* 26 (2017), no.1, 114-124.

Generic semistability for reductive group actions (with Dao Phuong Bac), *Proceedings of the American Mathematical Society* (2016), 144, no.10, 4115-4124.

State polytope decomposition formula (with Jaekwang Kim), *Proceedings of the Edinburgh Mathematical Society* (2016), no. 59, 759-776.

Birational contraction of genus two tails in the moduli space of genus four curves I (with Yongnam Lee), *International Mathematical Research Notices* (2014), no.13, 3735-3757.

Log minimal model program for the moduli space of curves: The first flip (with Brendan Hassett), *Annals of Mathematics* 177 (2013), no.3, 911-968.

Log minimal model program for the moduli space of stable curves of genus three (with Yongnam Lee), *Mathematical Research Letters* 17 (2010), no.4, 625-636.

Stability of tails and 4-canonical models (with Ian Morrison), *Mathematical Research Letters* 17 (2010), no.4, 721-729.

A new look at the moduli space of hyperelliptic curves (with Yongnam Lee), *Mathematische Zeitschrift* 264 (2010), no.2, 317-326.

Stability computation via Gröbner basis (with Brendan Hassett and Yongnam Lee), *Journal of Korean Mathematical Society* 47 (2010), 41-62.

Stability of bicanonical curves of genus three (with Yongnam Lee), *Journal of Pure and Applied Algebra* 213 (2009), no.10, 1991-2000.

A log canonical model for the moduli space of curves: The first divisorial contraction (with Brendan Hassett), *Transactions of the American Mathematical Society* 361 (2009), 4471-4489.

Stability of tri-canonical curves of genus two (with Yongnam Lee), *Mathematische Annalen* (2007), no. 2, 337:479–488.

Note on the stability of principal bundles (with D. Murphy), *Proceedings of the American Mathematical Society* 132 (2004), no. 8, 2205–2213.

Principal bundles over a projective scheme, *Transactions of the American Mathematical Society* 354 (2002), no. 5, 1899–1908.

Higgs bundles, spectral curves and étale covering, *International Journal of Mathematics* 12 (2001), no. 4, 393–402.

Direct images of stable triples, *International Journal of Mathematics* 11 (2000), no. 9, 1231–124.

Proceedings

GIT construction of log canonical models of $\overline{M}_g$ (with Jarod Alper), Compact moduli spaces and vector bundles, 87–106, Contemp. Math., 564, Amer. Math. Soc., Providence, RI, 2012.

Thesis

Moduli questions for augmented bundles, University of Illinois Thesis (2001), 131 pages.

Preprints

Generic states and stability (with Cheolgyu Lee and Junyoung Park), submitted for publications, arXiv:1703.02697 [math.AG].

Computing stability of projective varieties with Macaulay 2, 12 pages, lecture note based on a series of lectures given at The Winter School on Algebraic geometry – Algebraic curves and Related areas (National Institute of Mathematical Sciences, Korea, January 2007)

Editorial

Editor for *The Bulletin of the Korean Mathematical Society*, 2016–Present

Meetings & Conferences Organized

~~Nonlinear Algebra in Daejeon, Daejeon, Korea, August 4–13, 2020~~ (cancelled due to Covid-19 pandemic)

Korean-American Kavli Frontiers of Science Symposium, Incheon, Korea, June 17–21, 2019

Conference in Geometry and Representations, Jeju, Korea, January 7–11, 2019

Special session "Algebraic geometry and computer vision", Joint Meeting of the Korean Mathematical Society and the German Mathematical Society, October 3–6, 2018

Summer School on Cryptography, Seoul National University, July 3–6, 2017.

Workshop on Moduli theory & Derived category, June 12–13, 2017.

Seoul Seminar on Algebraic Geometry III, Seoul National University, March 10, 2017.

Conference on moduli and birational geometry V, Jeju, Korea, December 12-16, 2016.

Seoul Seminar on Algebraic Geometry III, Yonsei University, September 30–October 1, 2016.

Seoul National University Algebra Camp, Jeongseon, Korea, February 14–18, 2016.

Summer school on algebraic geometry, Anmyon Island, Korea, August 17–20, 2015.

SIAM Conference on applied algebraic geometry, NIMS, Korea, August 3–7, 2015.

School on applied algebraic geometry, NIMS, Korea, April 23–24, 2015.

Conference on moduli and birational geometry IV, POSTECH, Korea, August 12–16, 2013.

The 1st GAIA-IF joint conference on geometry, POSTECH, Korea, July 11–16, 2013.

Workshop on moduli and birational geometry III, Busan, Korea, July 9–13, 2012.

Workshop on moduli and birational geometry II, Gyeong-Ju, Korea, July 11–14, 2011.

Workshop on moduli and birational geometry, POSTECH, Korea, August 5–8, 2010.

Workshop on moduli spaces, Sogang University, Seoul, Korea, January 6–8, 2009.

Service

University

Seoul National University

Associate Chair, 2023

Colloquium Chair, 2020–2021

Graduate committee, 2019–Present.

Associate director, Industrial & Mathematical Data Analytics Research Center (ERC-IMDARC), 2017–Present.

Associate director, Institute for Industrial Mathematics, 2015–Present.

Undergraduate committee, 2015–Present.

POSTECH

Curriculum committee, 2010–2011, 2013–2014.

Graduate committee, 2013–2014.

Global Excel TFT, 2013–2014.

POSTECH Five Gold Button Math Competition committee chair, 2010–2014.

Colloquium chair, 2009–2010.

Marshall University

Calculus committee, 2008.

Colloquium committee, 2008.

Northern Illinois University

Department Colloquium organizing committee, 2006.

Math Club faculty advisor, 2005–2006.

Undergraduate Studies committee, 2004–2005.

Rice University

Department Colloquium organizer, 2003

Math Career Lecture Series organizer, 2001–2002.

Teaching

Seoul National University

Linear Algebra, spring 2025, fall 2021, spring/fall 2020, fall 2015

Modern Algebra, spring 2025, fall 2024

Topics in algebraic geometry: Computation and formalization of algebraic geometry, fall 2024

Mathematics in informational society, fall 2024, fall 2023

Homological algebra, fall 2023, fall 2021, spring 2021, fall 2017

Homological methods, spring 2024, spring 2023, spring 2021

Special study in algebra, fall 2022

Mathematics in informational society, fall 2023, fall 2022

Linear Algebra 2, fall 2022

Topics in Algebra: Applications of linear algebra to computer vision, spring 2021

Topics in algebraic geometry: Multiple view geometry, spring 2020

Calculus II, fall 2019

Topics in algebra: Geometry and algebra of computational complexity, fall 2019, spring 2021

Calculus I, spring 2019

Algebraic geometry, spring 2019

Algebraic number theory, spring 2017

Cryptography, spring 2017

Multivariate calculus, fall 2016

Introduction to algebraic geometry, fall 2016

Commutative algebra, spring 2016

Set theory and mathematical logic, spring 2016

Algebra II, fall 2015

Algebra I, spring 2015

Harvard University

Topics course: Geometry and algebra of computational complexity, fall 2018

POSTECH

Introduction to algebraic curves, fall 2014.

Lie groups and their representations, spring 2014.

Introduction to geometry, fall 2013.

Discrete mathematics, fall 2013.

Algebraic geometry, spring 2013.

Introduction to algebraic geometry, fall 2012.

Introduction to algebraic topology, spring 2012.

Étale cohomology, fall 2011.

Calculus, spring 2011, spring 2014.

Applied linear algebra, fall 2010.

Differentiable manifolds and Lie groups, spring 2010.

Introduction to number theory, fall 2009.

Marshall University

Elementary linear algebra, spring 2009.

Calculus I, spring 2009, fall 2008.

Calculus I Honors Option, fall 2008.

Northern Illinois University

Discrete mathematics, spring 2008.

Calculus I, fall 2004, fall 2006, fall 2007.

Abstract algebra I, fall 2004, fall 2005, fall 2007.

Topology, spring 2005, spring 2007.

Linear algebra, spring 2005, fall 2005, spring 2006, fall 2006, spring 2007.

Abstract algebra II, Abstract algebra II honors, spring 2006.

Rice University

Algebraic geometry, fall 2003.

Abstract algebra, spring 2003.

Complex analysis, spring 2002, spring 2004.

Multivariable calculus, spring 2003, fall 2002, spring 2002, fall 2001.

University of Illinois

Calculus and analytic geometry I, fall 2000.

Teaching Assistant to Calculus and analytic geometry I, II, Advanced Calculus, Elementary linear algebra with applications

Research assistant: Helped establishing an interactive website WebAlgebra for teaching basic algebra, trigonometry, and calculus

Presentations

"Mathematics of AI vision", Industrial Mathematics Colloquium, NIMS, November 16, 2023

"Applications of AI vision in smart healthcare", SNU Bio-Day, September 20, 2023

"Mathematics of AI vision", 10-10 Summer School on Mathematics of Deep Learning and AI, August 8, 2023

"Toward unifying theory of computation: A preliminary report", Bern Logic Seminar, April 28, 2023

"3D Geometry: Theory & Applications", Colloquium, UNIST, April 13, 2023

" An algebro-geometric approach to computational complexity", Bern Logic Seminar, University of Bern, Nov 9, 2022

" An algebro-geometric approach to computational complexity", Seminar, CNU, June 9, 2022

"Private AI: Theory & Applications", Special Session, KSIAM Sprring Meeting, May 27, 2022

" An algebro-geometric approach to computational complexity", Seminar, Chosun University , May 15, 2022

" An algebro-geometric approach to computational complexity", Jeju Algebraic Geometry and Topology Seminar, May 1 4, 2022

"Multiple view geometry and applications to industry", Colloquium, KAIST SAARC, May 14, 2021

"Jet bundles, punctual Hilbert schemes, and GIT", KMS Special Session, April 29, 2021

"Jet bundles, punctual Hilbert schemes, and GIT", Jeju Algebraic Geometry Workshop, April 23, 2021

"Multiple view geometry and applications to industry", Colloquium, Ewah Women's University, October 29, 2020.

"How to see the world in 3D through mathematics", AI-X Lecture (KAOS Foundation), October 14, 2020.

"Toward a unifying theory of computation & Complexity of Deep Learning", SNU Theoretical AI research Group seminar , September 10, 2020.

“Towards a unifying model of computation”, KAIST, December 20, 2019.

“Towards a unifying model of computation”, Samsung STF Annual Forum, November 1, 2019.

“Twisted cubics and calibration”, KMS Annual Meeting, October 26, 2019.

“Commuting nilpotents, punctual Hilbert schemes and jet bundles”, Algebraic Geometry Seminar, Fudan University, May 10, 2018.

“Commuting nilpotents, punctual Hilbert schemes and jet bundles”, Algebraic Geometry Seminar, Tokyo University, April 8, 2018.

“Conjugacy classes of commuting nilpotents”, Workshop on Quotients, stability and invariants, TSIMF Sanya, China, December 18–21, 2017.*

"Computer vision & algebraic geometry", Seoul National University Bundang Hospital Seminar, September 6, 2017.

"Applications of Cryptography", Seoul National University Bundang Hospital Seminar, June 1, 2017.

"Birational geometry of moduli spaces", Geometry and physics of augmented bundles (in honor of Steven Bradlow’s 60th birthday), Allerton Center, Illinois, USA, May 5–7, 2017.

"Cryptography: Next Generation", Seoul National University Bundang Hospital Seminar, April 22, 2017.

"Commuting nilpotents modulo conjugation and Hilbert scheme", Harvard-MIT Algebraic Geometry Seminar, February 21, 2017.

"Multivariate Quadratic Equations", PQC Asia Forum, Seoul National University, November 28–29, 2016.

"A stratification of Hilbert scheme via generic initial ideals", Seoul Seminar on Algebraic Geometry, Yonsei University, Sep 30–Oct 1, 2016.

"Commuting nilpotents modulo conjugation and Hilbert scheme", 2nd French-Korean conference in mathematics, University of Bordeaux, France, July 7–12, 2016.

"Commuting nilpotents modulo conjugation and Hilbert scheme", The 7th Pacific Rim Conference in Mathematics, Seoul National University, June 27–July 1, 2016.

"Turing machines Bridge Algebraic geometry", Algebra Camp, Jeongseon, Korea, February 14-18, 2016.

"Generic semistability of representations of reductive groups", Tokyo-Seoul Conference in Mathematics, University of Tokyo, Japan, December 2-5, 2015.

"Generic semistability of representations of reductive groups", Conference on Algebraic Surfaces and Related Topics, ICTS, Bangalore, India, November 29, 2015.

"Regularity and stability of zero dimensional subschemes of the projective plane", Workshop on Algebraic Geometry, Shanghai, China, November 1, 2015.

"Regularity and stability of zero dimensional subschemes of the projective plane", INdAM-Korea meeting on Algebraic Geometry, Cortona, Italy, July 1, 2015.

"Regularity and stability of zero dimensional subschemes of the projective plane", 2015 Spring KMS Meeting, April, 25, 2015.

"Generic semistability for actions of reductive groups", Algebra session invited speaker at the 2015 Spring KMS Meeting, April 25, 2015.

"Toric GIT", Applied Algebraic Geometry School, NIMS, April 23-24, 2015.

"Geometry, algebra and computation in moduli theory", Seoul National University Colloquium, March 12, 2015.

"Generic initial ideals and the geometry of Hilbert schemes", SNU Algebra CAMP, Yang Yang, Korea, February 6, 2015.

"Geometry, algebra and computation in moduli theory", Yonsei University Colloquium, October 23, 2014.

"Generic state polytopes and stability", Seoul ICM satellite conference on algebraic and complex geometry, Daejeon, Korea, August 6-10, 2014.

"Toric GIT", The Geometry, Topology and Physics of Moduli Spaces of Higgs Bundles, National University of Singapore, July 7-11, 2014.

"Generic state polytopes and stability", The GAIA-IF Workshop on Geometry, Institut Fourier, France, May 26-30, 2014.

"Geometry, algebra and computation in moduli theory", Sungkyunkwan University Colloquium,May 8, 2014.

"GIT of pluricanonical curves of low genera", Workshop on birational geometry and stability of moduli stacks and spaces of curves, VIASM, Vietnam, February 13, 2014.

"Generic state polytope and stability", Symposium on projective algebraic varieties and moduli, Seoul National University, Korea, February 11, 2014.

"Differential forms on toric manifolds", KIAS winter school on differential geometry, Gohan, Korea, January 23, 2014.

"Generic initial ideals and stability", Symposium on Algebraic Geometry, Busan, Korea, December 19-20, 2013.

"Generic algebraic objects and Geometric Invariant Theory", Algebraic Geometry in East Asia, Beijing, China, October 10-14, 2013.

September 30-October 3, 2013, "Log minimal model program for the moduli space of curves", Plenary speaker at the 57th Annual Meeting of the Australian Mathematical Society, Sydney, Australia, September 30-October 3, 2013.

Mathematics Department Colloquium, Pusan National University, September 13, 2013.

GAIA-Institut Fourier Joint Conference on Geometry, POSTECH, Korea, July 11-16, 2013.

Korea-Japan Joint Conference in Algebraic Geometry, Gunsan, Korea, August 19-23, 2012.

Fudan-Sogang-Warwick Algebraic Geometry Workshop, Warwick, United Kingdom, July 19-21, 2012.

Symposium of projective algebraic varieties and moduli, Busan, Korea, February 13-16, 2012.

Workshop on Periods and Moduli, KIAS, September 20-22, 2011.

NIMS-SNU Algebra Camp, Pyung-Chang, Korea, August 15-19, 2011.

Fudan-Sogang-Warwick Algebraic Geometry Workshop, Gui-Yang, China, August 8-12, 2011.

Colloquium, Pusan National University, March 18, 2011.

Algebraic Geometry Seminar, University of Illinois at Urbana-Champaign, January 25, 2011.

Geometry and Physics Seminar, Northwestern University, January 18, 2011.

Colloquium, Konkuk University, December 5, 2010.

Colloquium, Yonsei University, November 25, 2010.

Topology Seminar, Seoul National University, November 16, 2010.

Colloquium, KAIST, November 11, 2010.

Compact moduli and vector bundles conference, University of Georgia, USA, October 21-24, 2010.

Colloquium, Ewha Womans University, October 7, 2010.

The 7th KWMS (Korean Women in Mathematical Sciences) International Conference, Chungnam University, June 21-22, 2010.

Colloquium, Seoul National University, May 13, 2010.

The 2nd Kyushu University/POSTECH Joint Workshop – Algebraic geometry and related topics, Kyushu University, March 14-17, 2010.

Workshop on Invariant Theory and Related Topics, Inha University, Inchon, Korea, February 17-19, 2010.

Geometry and Physics Seminar, Northwestern University,January 28, 2010.

Workshop on moduli and birational geometry, KIAS, December 21-22, 2009.

Colloquium, POSTECH, December 4, 2009.

Algebraic Geometry Seminar, KAIST, September 22, 2009.

Fudan-Sogang Algebraic Geometry Wokshop, September 18-19, 2009.

Moduli and Discrete Groups, RIMS (Kyoto University), June 8-12, 2009.

Colloquium, University of Georgia, April 9, 2009.

Algebraic Geometry Seminar, University of Illinois at Urbana-Champaign, March 17, 2009.

Workshop on moduli spaces, Sogang University, January 8, 2009.

Colloquium, Marshall University, October 17, 2008.

Algebraic Geometry Seminar, Sogang University, August 1, 2008.

Algebraic Geometry Seminar, POSTECH, March 31, 2008.

Colloquium, Marshall University, February 19, 2008.

Workshop on Moduli Spaces, Sogang University, Korea, December 28, 2007,

Algebraic Geometry Seminar, University of Wisconsin-Madison, October 2, 2007.

Algebraic Geometry Seminar, POSTECH, Korea, June 21, 2007.

Algebraic Geometry Seminar, Rice University, January 30, 2007.

The Winter School on Algebraic geometry – Algebraic curves and Related areas (National Institute of Mathematical Sciences, Korea), January 8-10, 2007.

The International Workshop on Mathematical Sciences (Algebraic Geometry and its Applications) , Sogang University, Korea, January 4-6, 2007.

Algebraic Geometry Seminar, University of California at Los Angeles, September 29, 2006.

Algebraic Geometry Seminar, Research Institute for Mathematical Sciences, Kyoto University (Kyoto, Japan), June 15, 2006.

Algebraic Geometry Seminar, Sogang University (Seoul, Korea), January 9, 2006.

Algebraic Geometry Seminar, University of Illinois at Chicago, October 19, 2005.

Algebraic Geometry Seminar, University of Illinois at Urbana-Champaign, September 6, 2005.

Algebraic Geometry Seminar, KIAS, July 13, 2005.

Geometry Seminar, Northern Illinois University , February 2005.

Algebraic Geometry Seminar, KIAS, January 5, 2005.

Algebraic Geometry Seminar, Sogang University, December 31, 2004.

Seminar talks at KIAS, Korea University, Sogang University and KAIST, May–Jun 2004.

Algebra Seminar, University of Texas at Austin,April 27, 2004.

Special Seminar, TCU, April 1, 2004.

Special Seminar, Northern Illinois University, March 17, 2004.

Colloquium, Oklahoma State University, January 14, 2004.

Algebraic Geometry Seminar, University of Illinois at Urbana-Champaign, December 9, 2003.

Geometry and Analysis Seminar, Rice University, November 2003.

VBAC (Vector Bundles on Algebraic Curves) meeting, Porto, Portugal, July 2003.

AMS-RSME meeting, Seville, Spain, June 2003.

Colloquium, KAIST, May 2003.

Seminar talks at Sogang University, KIAS, Ewha Women's University, May 2003.

Algebraic Geometry Seminar, University of Michigan at Ann Arbor, April 2003.

Geometry and Analysis Seminar, Rice University, February 2003.

AMS Western Sectional Meeting, November 2001.

Geometry and Analysis Seminar, Rice University, September 26, 2001.

Geometry and Analysis Seminar, Rice University, September 19, 2001.

Special Seminar, Rice University, April 25, 2001.

*: upcoming talks

Last updated: July 1, 2025