

Chul-hee Lee

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Education

Ph.D. Mathematics, University of California, Berkeley, May 2012 (advisor: Richard Borcherds)

B.S. Mathematics, Seoul National University, Aug 2006

Positions

CMC Fellow (Hyo Chul Myung Assistant Professor), Center for Mathematical Challenges, Korea Institute for Advanced Study, Sep 2021-present

Research Fellow, School of Mathematics, Korea Institute for Advanced Study, Feb 2018-Aug 2021

Lecturer, School of Mathematics and Physics, University of Queensland, Sep 2017-Dec 2017

Research Fellow, School of Mathematics and Physics, University of Queensland, Sep 2014-Aug 2017 (host: Ole Warnaar)

Research Fellow, Department of Mathematical Sciences, Seoul National University, Mar 2014-Aug 2014

Research Fellow, Max-Planck-Institut für Mathematik, Oct 2012-Dec 2013

Research Interests

Representations of Lie algebras and quantum groups

Automorphic forms

Computational mathematics and experimental mathematics

Research Outputs

Publication lists

An inductive formula of the Gross-Keating invariant of a quadratic form (with S. Cho, T. Ikeda, H. Katsurada and T. Yamauchi) **Tohoku Mathematical Journal** (to appear)

Product formula for the limits of normalized characters of Kirillov-Reshetikhin modules, **International Mathematics Research Notices** 13 (2021), 10014-10036

An elliptic hypergeometric function approach to branching rules (with Eric Rains and Ole Warnaar), **SIGMA** 16 (2020), 142

Linear recurrence relations in Q -systems via lattice points in polyhedra, **Transformation Groups** (2019) 24: 429

Positivity and periodicity of Q -systems in the WZW fusion ring, **Advances in Mathematics** Vol. 311 (2017)

Linear recurrence relations in Q -systems and difference L -operators, **J. Phys. A: Math. Theor.** Vol. 48, No. 19 (2015), 195201

Nahm's conjecture and Y -systems, **Communications in Number Theory and Physics** Vol. 7, No.1 (2013), 1-14

A proof of the KNS conjecture : D_r case, **J. Phys. A: Math. Theor.** Vol. 46, No. 16 (2013), 165201

A Note on Nahm's Conjecture in Rank 2 Case (with An Huang), **Communications in Number Theory and Physics** Vol. 4, No. 4 (2010), 609-622

Algebraic structures in modular q -hypergeometric series, Ph.D. dissertation, U.C. Berkeley, (2012)

preprints

On polyhedral formula for Kirillov-Reshetikhin modules

An explicit formula for the extended Gross-Keating datum of a quadratic form (with S. Cho, T. Ikeda, H. Katsurada and T. Yamauchi)

notes

Minor corrections to Nipp's tables of quaternary quadratic forms, arXiv:1902.08459

Honors and Fellowships

Samsung Scholarship, 2006-2010

Conferences and Workshops attended

Cluster Algebras 2019, RIMS, Kyoto University, Kyoto, Japan, Jun. 3-14, 2019

Infinite Analysis 19 : Quantum symmetries and integrable systems, University of Tokyo, Tokyo, Japan, Mar. 5-7, 2019

Workshop on W-algebras, University of Melbourne, Melbourne, Australia, Nov. 28-Dec. 2, 2016

Number Theory Down Under, Newcastle, Australia, Sep. 23-26, 2016

Geometric and categorical representation theory, Mooloolaba, Australia, Dec. 14-18, 2015

The Mathematics of Conformal Field Theory, Australian National University, Canberra, Australia, Jul. 13-17, 2015

Regulators, Mahler measures, and special values of L-functions, Centre de recherches mathématiques, Montreal, Canada, Feb. 16-20, 2015

Infinite Analysis 14 : New Perspectives in Integrable Systems and Representation Theory, University of Tokyo, Tokyo, Japan, Mar. 4-7, 2014

Oberwolfach Seminar: Cluster Algebras and Representation Theory, Oberwolfach, Germany, Oct. 13 -19, 2013

Amplitudes and Periods, Institut des Hautes Études Scientifiques, Bures-sur-Yvette, France, Dec. 3-7, 2012

Joint Introductory Workshop: Cluster Algebras and Commutative Algebra, Mathematical Sciences Research Institute, Berkeley, US, Aug. 27- Sep. 07, 2012

Cluster Algebras and Statistical Physics, Institute for Computational and Experimental Research in Mathematics, Providence, US, Aug. 15-19, 2011

Mock modular forms in combinatorics and arithmetic geometry, American Institute of Mathematics, Palo Alto, US, Mar. 8-12, 2010

Mock theta functions and applications in combinatorics, algebraic geometry, and mathematical physics, Max Planck Institute for Mathematics, Bonn, Germany, May 25-29, 2009

Talks and Presentations

Laplacian on a compact Riemann surface with many automorphisms, UNIST, Ulsan, Korea, Dec. 1, 2022

Numerical decomposition of eigenspaces of the Laplacian on a compact Riemann surface with large automorphism group, QSMS Workshop, Gangneung, Korea, Jun. 27, 2022

Selberg trace formula and its applications, Algebraic geometry-Number theory Winter School, Cheonan, Korea, Jan. 16-21, 2022

Macdonald-type deformations of classical branching rules, 2020 KMS Annual Meeting, Oct. 24, 2020

Dilogarithm function and representation theory, Yonsei University, Sep. 8, 2020

Algorithmic exercises in Coxeter groups, 2020 Summer Workshop on Representation Theory, Aug. 6, 2020

Finite-dimensional representations of quantum affine algebras (as part of intensive lecture series), Seoul National University, Seoul, Korea, Jul. 17-19, 2019

Linear regression for computing with Macdonald polynomials, Sungkyunkwan University, Suwon, Korea, May 17, 2019

String functions and quantum affine algebras, Sogang University, Seoul, Korea, Mar. 19, 2019

A classical introduction to Gross-Keating invariants, Mini Workshop on the Representations of Quadratic Forms, Gwangju (Gyeonggi), Korea, Feb. 19-20, 2019

Quadratic forms over 2-adic integers with computers, Annual Number Theory Conference, Seoul, Korea, Feb. 9, 2019

Computation of Gross-Keating invariants, Conference on the Arithmetic Theory of Quadratic Forms, Seoul, Korea, Jan. 8, 2019

An IMO problem, and fusion ring computations, Pohang Mathematics Workshop, Yeosu, Korea, Nov. 23, 2018

Computer implementation of Katsurada's formula for Siegel-Eisenstein series, Postech, Pohang, May. 23, 2018

KR modules and Ehrhart theory, Seoul National University, Seoul, Korea, May. 11, 2018

An explicit introduction to the Siegel-Weil formula, Sinchon Workshop on Algebraic Geometry, Sinchon Workshop on Algebraic Geometry, Seoul, Korea, Apr. 27, 2018

An IMO problem, Coxeter groups and fusion rings, Korea University, Seoul, Korea, Apr. 19, 2018

Dilogarithm function in arithmetic and geometry, Seoul National University of Science and Technology, Seoul, Korea, Mar. 26 & Apr. 2, 2018

On fusion product of affine integrable representations, Seoul National University, Seoul, Korea, Dec. 27-28, 2016

Nahm's conjecture and representation theory of classical and quantum affine algebras, International Conference for the 70th Anniversary of Korean Mathematical Society, Seoul, Korea, Oct. 23, 2016

- Computation in Weyl groups, Seoul National University, Seoul, Korea, Jul. 19, 2016
- Linear recurrence relations in Q -systems, Australian National University, Canberra, Australia, Mar. 15, 2016
- Linear recurrence relations in Q -systems via lattices points in polyhedra, KAIST, Daejeon, Korea, Feb. 12, 2016
- On some properties of solutions of constant Y -systems, Geometric and categorical representation theory conference, Mooloolaba, Australia, Dec. 18, 2015
- On dilogarithm identities from conformal field theory, The Mathematics of Conformal Field Theory conference, Australian National University, Canberra, Australia, Jul. 13, 2015
- On dilogarithm identities from conformal field theory, Centre de Recherches Mathématiques, Montreal, Canada, Feb. 19, 2015
- Nahm's conjecture and related algebraic structures, KAIST, Daejeon, Korea, Feb. 20, 2015
- Nahm's conjecture and related algebraic structures, Number Theory Down Under, Newcastle, Australia, Oct. 25, 2014
- Kirillov-Reshetikhin modules and the WZW fusion ring, University of Melbourne, Melbourne, Australia, Oct. 10, 2014
- Kirillov-Reshetikhin modules and the WZW fusion ring, RIMS, Kyoto, Japan, May. 10, 2014
- Bethe ansatz for beginners, Korea Institute for Advanced Study, Seoul, Korea, Apr. 7, 2014
- When Kirillov-Reshetikhin modules meet the fusion ring, Infinite Analysis 14, University of Tokyo, Japan, Mar. 5, 2014
- Kirillov-Reshetikhin modules and fusion rings from conformal field theory, Dublin Institute for Advanced Studies, Dublin, Ireland, Sep. 26, 2013
- Nahm's conjecture and related algebraic structures I and II, Lecture series on q -series and modular forms, Korea Institute for Advanced Study, Seoul, Korea, Jul. 24-25, 2013
- Kirillov-Reshetikhin modules and fusion rings from conformal field theory, Seminar on Algebra, Geometry and Physics, Max-Planck-Institut für Mathematik, Bonn, Germany, Jul. 9, 2013
- On the boundary of Q -systems : introduction to the KNS conjecture, Séminaire d'Algèbre, Paris, France, Dec. 3, 2012
- Around Nahm's conjecture, Max-Planck-Institut für Mathematik, Bonn, Germany, Nov. 15, 2012
- Around Nahm's conjecture, Mathematisches Institut der Universität zu Köln, Germany, Nov. 13, 2012

Teaching Experiences

Graduate Student Instructor at the University of California, Berkeley

GSI (teaching assistant) for courses in Calculus, Multivariable Calculus, Linear algebra and Differential equations, Analytic Geometry and Calculus, 2008-2012

Instructor at the University of Queensland

Math 3306 (Set Theory and Mathematical Logic), Semester 2, 2017

Math 3405 (Differential Geometry), Semester 2, 2017

Math 4304 (Number Theory), Semester 2, 2016

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