

Yichao Zhang

Personal Information

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Institute	Department of Mathematics	the University of Arizona

Education

Ph.D. in Mathematics	University of Toronto	2010
Master of Science in Mathematics	University of Toronto	2005
Bachelor of Science in Mathematics	Peking University	2003

Employment and Teaching

Visiting Assistant Professor, the University of Arizona

Fall 2014 to present

Math125-005&010 Calculus I Fall 2014

Postdoctoral Fellow, University of Connecticut

Fall 2011 to Summer 2014

Math2130-001	Honors Multivariable Calculus	Spring 2014
Math2210-007	Applied Linear Algebra	Spring 2014
Math2110-017	Multivariable Calculus	Fall 2013
Math3240-001	Introduction to Number Theory	Fall 2013
Math3799-007	Independent Study on Algebraic Number Theory	Fall 2013
Math2210-006	Applied Linear Algebra	Spring 2013
Math3240-001	Introduction to Number Theory	Spring 2013
Math1152-003	Honors Calculus II	Fall 2012
Math3230-001	Abstract Algebra I	Fall 2012
Math1152-002	Honors Calculus II	Spring 2012
Math3210-001	Abstract Linear Algebra	Spring 2012
Math2110-007	Multivariable Calculus	Fall 2011
Math2410-001	Elementary Differential Equations	Fall 2011

Researcher, Pohang University of Science and Technology

Fall 2010 to Summer 2011

Instructor of Mathematics, University of Toronto

Summer 2008 to Fall 2009

Research Assistant, University of Toronto

Fall 2006 to Summer 2010

I was a research assistant; worked with Professor Henry H. Kim in the field of number theory.

Teaching Assistant, University of Toronto

Fall 2004 to Summer 2010

Mat223H1S Linear Algebra Summer 2008
Mat188H1F Applied Linear Algebra Fall 2009

Research Interests and Statement

My research interest is in number theory, and among all of its subfields I am most interested in modular forms, as well as their applications.

Recently, I proved the isomorphism between vector-valued and scalar-valued modular forms, generalizing a result of Bruinier and Bundschuh, and we applied such isomorphism to obtain Zagier duality, obstruction theorem and automorphic correction, to name a few. I am also interested in the moment problem of modular L-functions or Dirichlet L-functions, and the related field of multiple Dirichlet series. For example, Kyu-Hwan Lee and I constructed Weyl group multiple Dirichlet series for symmetrizable root systems, and in a joint work with Henry H. Kim and in my thesis we proved the average version of fourth moment problem for L-function attached to newforms.

Many interesting questions can be asked in these subfields. For example, it is believed that the space of weakly holomorphic modular forms with some sign vector has a *Miller-like* basis and satisfies the so-called *Weierstrass property*. As another example, it is not known yet whether the representation of hyperbolic Kac-Moody algebras can be automorphically corrected. These questions will be answered in a few on-going projects in the near future.

Papers and Preprints

Divisibility properties for weakly holomorphic modular forms with sign vectors,
Submitted (2015)

Weakly holomorphic modular forms and rank two hyperbolic Kac-Moody algebras,
To appear in Transactions of AMS. (With Henry H. Kim and Kyu-Hwan Lee)

Newforms of level 4 and of trivial character,
Preprint, arXiv: 1308.3417, 2013. (To appear in Communications of the Korean Mathematical Society)

Zagier duality and integrality of Fourier coefficients for weakly holomorphic modular forms,
Preprint, arXiv: 1308.1037, 2013. (Submitted)

An isomorphism between scalar-valued modular forms and modular forms for Weil representations,
To appear in Ramanujan Journal.

Weyl group multiple Dirichlet series for symmetrizable Kac-Moody root systems,
To appear in Transactions of AMS, 2013. (With Kyu-Hwan Lee)

Divisor functions over quaternion algebras and a type of identities,
Functiones et Approximatio, 46.2 (2012), 235-260.

Determining modular forms of general level by central values of convolution L-functions,
Acta Arithmetica, 150 (2011), 93-103.

L-functions in number theory,

Doctorate thesis, University of Toronto, 2010. Advisor: Henry H. Kim.

Divisor function for quaternion algebras and application to fourth moments of L-functions,
Journal of Number Theory 129 (2009), no.12, 3000-3019. (With Henry H. Kim)

Conferences or Seminar Talks

An Isomorphism between Scalar-Valued Modular Forms and Modular Forms for Weil Representations

Algebra and Number Theory Seminar, University of Arizona, Tucson, AZ.

Oct. 7, 2014

Vector Valued and Scalar Valued Modular Forms

Analysis Seminar, SUNY, Buffalo, NY.

Oct. 30, 2013

Vector Valued and Scalar Valued Modular Forms

Five College Number Theory Seminar, Amherst College, Amherst, MA.

Oct. 8, 2013

Vector Valued and Scalar Valued Modular Forms

Number Theory Seminar, Yale, New Haven, CT.

Oct. 1, 2013

Vector Valued and Scalar Valued Modular Forms

Algebra Seminar, UConn, Storrs, CT.

Sept. 25, 2013

Modular Forms

Algebra Seminar, UConn, Storrs, CT.

Sept. 18, 2013

Weyl group multiple Dirichlet series for symmetrizable Kac-Moody root systems

Algebra Seminar, UConn, Storrs, CT.

March 13, 2013

Multiple Dirichlet series

Algebra Seminar, UConn, Storrs, CT.

March 6, 2013

Fourth moments and an identity of the divisor function

Algebra Seminar, UConn, Storrs, CT.

Oct 11, 2011

Divisor function and fourth moments problem

Tainwan-Postech Workshop-Number Theory, Postech, South Korea.

July 24- 26, 2011

Divisor function over quaternion algebras and fourth moments problem

Number Theory Seminar, KIAS, South Korea.

May 12, 2011

L-functions and moments problem

T-Seminar, Postech, South Korea.

March 23, 2011

Divisor function over quaternion algebras and fourth moments of L-functions associated to newforms

Number Theory and Arithmetic Geometry Seminar, Postech, South Korea.

March 21- 23, 2011

An identity of divisor function defined over quaternion algebras

The Hong Kong University of Science and Technology, Hong Kong, P. R. China.

January 28, 2010

An identity of divisor functions defined over quaternion algebras

CMS Winter Meeting, Windsor, Canada.

December 4-7, 2009

Quaternion algebras and modular forms

Graduate Student Seminar, University of Toronto, Canada.

November 4, 2009

Fourth moments of L-functions of newforms

Number Theory/Representation Theory Seminar, University of Toronto, Canada.

March 11, 2009