Lucy Liuxuan Zhang

Homepage: http://www.math.toronto.edu/lzhang/

Email: lzhang@math.utoronto.ca **Phone**: (647) 886-3961

Address: Department of Mathematics, University of Toronto, 40 St. George St., Toronto, ON, M5S 2B4, Canada.

Birth Date: November 9, 1983 **Birth Place**: Guangzhou, China

Citizenship: Canadian

Education:

2007-	Ph.D. at Department of Mathematics, University of Toronto, Canada.
2006-2007	M.Sc. at Department of Physics, University of Toronto, Canada.
2003-2006	B.Sc. at Department of Mathematics, University of Toronto, Canada; Specialist program: Mathematics and Physics.
2002-2003	B.Mus. at Department of Music, McGill University, Quebec, Canada; Major program: Violin Performance (withdrew after transferring to U of T).
1999-2002	Clarkson Secondary School, Mississauga, Canada.

Research Interests:

Primary	Topological quantum computation, topological phases, Kitaev's model; Modular tensor categories, topological quantum field theories, modular functors.
Secondary	Categorification of knot invariants and quantum groups; Quantum error correction and fault tolerance.

Papers:

2007	M.Sc. Project, "Fate of entanglement in surface codes"; supervised by Dr. Robert Raussendorf and Prof. Daniel James.
2006	Marcos Curty, Lucy-Liuxuan Zhang, Hoi-Kwong Lo, "Sequential attacks against differential-phase-shift quantum key distribution with weak coherent states", Quantum Information & Computation Vol. 7 (2007) 665-688, quant-ph/0609094.
2005	Lucy Liuxuan Zhang and Ue-Li Pen, "Fast n-point correlation functions and three-point lensing application", New Astron. 10 (2005) 569-590, astro-ph/0305447.

Academic Awards and Honours:

2011-2012	Queen Elizabeth II Graduate Scholarships in Science and Technology, $15,000.
2010-2011	Faculty of Arts and Science Blyth Fellowship, $16,039.
2007-2010	U of Toronto Fellowships (for Mathematics Ph.D.), around $15,000.
2007-2008	Helen Sawyer Hogg Graduate Admission Award, $2,850.
Fall 2007	Perimeter Institute Graduate Scholarship, $2,293.
2006-2007	U of Toronto Fellowships (for Physics M.Sc.), around $21,000.
Summer 2006	NSERC Undergraduate Student Research Award, Mathematics, $6,000.

2005-2006	Galois OSOTF Award, $2,000.
Summer 2004	NSERC Undergraduate Student Research Award, Astronomy & Astrophysics, $8,000.
2002	Member of the Chair's Circle of Excellence in the Department of Computer Science, Faculty of Arts and Science, U of Toronto.
2001-2002	Selected participant in U of T Mentorship Program for high school students.
2000-2001, 2001-2002	Participated in the Physics Olympiad Preparation Programme run by the U of T, and was invited to the Invitational Weekend Training & Selection Camp both years (among top 20 in Ontario).
2000-2001, 2001-2002	Winner at International Mathematics Tournament of Towns at Toronto (sponsored by U of Toronto).
2000-2001	Canadian Open Mathematics Challenge (U of Waterloo math contest): Ontario Central Gold Medalist, top 4% nationally.
2000-2001	Fermat (U of Waterloo Gr. 11 math contest): top 1% nationally, invitee to Invitational Mathematics Challenge Grade 11.
2000-2001	Euclid (U of Waterloo Gr. 12 math contest): first place at Clarkson S. S., top 4% nationally.
2000-2001	Descartes (U of Waterloo OAC math contest): first place at Clarkson S. S., top 3% nationally.
1999-2000	AMC 12 (American Mathematics Contest 12): top 2% internationally, invitee to AIME (American Invitational Mathematics Examination).
1999-2000	Fermat: School Champion Medal.
1999-2000	Avogadro Examination (U of Waterloo Gr. 11 chemistry contest): first at Clarkson S. S., top 5% nationally.
1999	Municipal Environmental Protection Design Project Competition: I designed a garbage collection system for classroom use which was awarded 1st prize in the city of Guangzhou, China; my high school received a cash prize equivalent to CAD$1000 for a trial of my design; more money was to be awarded to my school for implementation if trial was successful.

TA/Teaching Experiences:

2011-	Private violin teaching.
2011-2012	Fall & Winter: TA for MAT135Y (Calculus for Life Science I).
Winter 2011	U of T Mentorship Program: Mentor for 3 high school students in project "Towards TQFTs: topology, categories and algebra".
2010-2011	Fall & Winter: TA for MAT135Y (Calculus for Life Science I); Fall & Winter: Marker for MAT235Y (Calculus for Life Science II); Fall: Marker for MAT237Y (Multivariable Calculus); Winter: TA for MAT157Y (Analysis I).
Summer 2010	Full-summer: Marker and Math Aid for MAT237Y (Multivariable Calculus).
2009-2010	Fall & Winter: TA for MAT135Y (Calculus for Life Sciences I); Fall & Winter: Marker for MAT237Y (Multivariable Calculus).
2008-2009	Fall & Winter: TA for MAT135Y (Calculus for Life Science I); Fall: Marker for MAT301F (Groups and Symmetries).
Winter 2009	Grad Talk series, Perimeter Institute: I gave a "Mini-course on Quantum Groups"

	(consisting of a series of 9 one-hour lectures; for course information, see http://www.math.toronto.edu/lzhang/Teaching/quantum_groups2009W.html).
2007-2008	Winter: TA for MAT185S (Linear Algebra for Engineering Science I).
2006-2007	Fall & Winter: TA for PHY138Y (Physics for the Life Sciences I).
2000-2002	Private math tutoring.

Research Positions and Projects:

2008-	Ph.D. advisor: Prof. Joel Kamnitzer, Mathematics, U of Toronto.
2007-2008	Ph.D. co-advisor: Prof. Joe Repka, Mathematics, U of Toronto.
Fall 2007	Ph.D. co-advisor: Prof. Daniel Gottesman, Perimeter Institute, Waterloo.
2006-2007	Master advisor: Prof. Daniel James, Physics, U of Toronto. a) Undergraduate research course PHY479Y: theory of cluster-state quantum computation and trapped ion implementation; b) Master: theory of fault-tolerant cluster-state quantum computation (in collaboration with Dr. Robert Raussendorf).
Summer 2006	Supervised by Prof. Joe Repka, Mathematics, U of Toronto. NSERC USRA 2006 (paid): representation of the symmetric groups.
Fall 2005	Supervised by Prof. Hoi-Kwong Lo, Physics & ECE, U of Toronto. Undergraduate research course PHY478H: security of differential-phase-shift quantum key distribution.
2003-2005	Supervised by Prof. Chris Matzner, Astronomy and Astrophysics, U of Toronto. a) Summer student 2003: developed efficient compressible isothermal MHD code to study turbulence in molecular clouds; b) Research assistant under the U of T Work-Study Program 2003-04 (paid): developed Message-Passing-Interface version of the code to simultaneously utilize 540 CPUs; c) NSERC USRA 2004 (paid): analyzed energetics and power spectra of high-Mach number astrophysical turbulence, studied implications on star formation rate; learnt about astrophysical dynamo; d) Informal 2004-05: computed decomposed power spectra to understand the nature of turbulence and transitions between modes; studied the theory of MHD turbulence.
2001-2002	Supervised by Prof. Ue-Li Pen, CITA, U of Toronto. a) U of T Mentorship Program for high school students: data analysis for gravitational lensing; b) Summer research assistant 2002 (paid): wrote fast library subroutines for N-body simulations using Intel assembly language.
Spring 2002	High School Co-op program: microscopy lab assistant; Xerox Research Centre of Canada, Mississauga.

Talks:

Aug. 1, 2011	JCHS 2011: Categories, Geometry and Physics, Universidad Sergio Arboleda (Colombia): "Kitaev's quantum double models as extended topological quantum field theories".
Jul. 20, 2011	Women in Physics Canada, Perimeter Institute: "Mathematics and Topological Quantum Computation".
Jun. 17, 2011	8th Canadian Student Conference on Quantum Information, Quebec:

	"Kitaev's quantum double models and (2+1)-dimensional extended topological quantum field theories".
Apr. 22, 2011	Institute for Quantum Information, Caltech: Introductory talk on "(2+1)D extended TQFTs and doubled topological phases".
Apr. 6, 2011	Math Graduate Student Seminar, U of Toronto: "Kitaev's quantum double model for topological quantum computation: representations, higher categories and extended TQFTs".
Mar. 31, 2011	Khovanov-Lauda Categorification Learning Seminar, U of Toronto: "Quantum groups and the Grothendieck ring of R".
Oct. 6, 2010	Bakalov-Kirillov Learning Seminar, U of Toronto: "Modular Tensor Categories and Quantum Double of a Finite Group".
Jun. 7, 2010	Quantum Information group meeting, Perimeter Institute: "Ribbon operators in 2D lattice anyon models".
Jun. 11, 2009	Quantum Groups and Representations Learning Seminar, U of Toronto: "Existence and uniqueness of universal enveloping algebras for semisimple Lie algebras using cohomology arguments".
Jan. 21, 2009	Math Graduate Student Seminar, U of Toronto: "Introduction to quantum groups".
Oct. 26, 2008	2nd Pure and Applied Mathematics Graduate Student Conference, McMaster U: "Hopf algebras and quantum computation".
Jun. 23, 2008	Quantum Information group meeting, Perimeter Institute: "Colour codes".
Jun. 17, 2008	Math Graduate Student Seminar, U of Toronto: "Introduction to topological quantum computation".
Nov. 2007	Prof. Daniel James' group meeting, Dept. of Physics, U of Toronto: "Introduction to stabilizer formalism".
Oct. 9, 2007	Math group meeting, Institute for Quantum Computing, Waterloo: "Minimum-weight perfect matching in surface code recovery".
Sep. 8, 2007	Perimeter Institute's Budding Minds Conference: "Learning about topological quantum memory" (Version II).
Jun. 4, 2007	4th Canadian Quantum Information Students' Conference, Perimeter Institute: "Learning about topological quantum memory".
Mar. 2007	Institute for Quantum Optics and Quantum Information, Innsbruck: "Fault-tolerant cluster-state quantum computation".
Mar. 2007	Quantum Optics group meeting, U of Toronto: "Introduction to cluster-state quantum computation".
Dec. 11, 2006	Quantum Computation and Quantum Information (the book by Nielsen and Chuang) Learning Seminar, U of Toronto: "On measurements".
Jul. 2006	Canadian Undergraduate Mathematics Conference 2006, McGill U: "Attacking a new quantum communication protocol".
Oct. 2005	Canadian Undergraduate Physics Conference 2005, U of Western Ontario: "USD Attack on Differential Phase Shift QKD".
Mar. 2004	Toronto Astrophysical Gas Dynamics Group meeting, U of Toronto: "MHD turbulence: direct simulations".

Mar. 2004	University of Toronto Undergraduate Math Seminar: "Physics & Astrophysics of Magnetohydrodynamical Turbulence".
Nov. 2003	Canadian Undergraduate Physics Conference 2003, McGill U: "Compressible magnetohydrodynamic turbulence in molecular clouds".
Aug. 2003	National Astronomical Observatories of China, Beijing, China: "Fast n-point correlation functions and the application of three-point function on weak lensing".
Jul. 2003	Canadian Undergraduate Mathematics Conference 2003, York U: "Fast n-point correlation functions".

Posters:

Jan. 2011	QIP 2011 (14th Workshop on Quantum Information Processing), Singapore: "Twists arising from group automorphisms in the Kitaev model".
Aug. 2005	International Conference on The Origin and Evolution of Cosmic Magnetism, Bologna, Italy: "Simulations of MHD Turbulence in ISM".
Aug. 2005	Open Questions in Cosmology: the First Billion Years, Garching, Germany: "Fast Three-point Correlation Function Algorithm for Weak Lensing".
Aug. 2004	International Conference on Cosmic Rays and Magnetic Fields in Large Scale Structure, Busan, Korea: "Compressible Magnetohydrodynamic Turbulence in Molecular Clouds".
Jun. 2003	Canadian Astronomical Society Annual Meeting 2003, U of Waterloo: "Fast n-point correlation functions and three-point lensing application".
Jun. 2002	University of Toronto Mentorship Program poster session: "Study of weak gravitational lensing effect".

Contributions to Academic Community:

Summer 2011-	Founder and organizer of the Women-in-Math Seminar series at U of T.
Aug. 16, 2011	Invited speaker at the Classroom Adventures in Mathematics Summer Institute, Toronto: "Challenges faced by young women in mathematics and how teachers can help".
Winter 2011	Volunteer mentor for U of T Mentorship Program.
2010-11	Secretary and Social Committee member of the Math Graduate Students Association at U of T; supporting fellow student organizers and fought hard on student issues.
Oct. 2009	Volunteer presenter for Quantum to Cosmos Festival, Perimeter Institute, Waterloo.
2008-09	President, Social Committee, Departmental Council and Graduate Planning Committee member of the Math Graduate Students Association at U of T.
2007-08	Vice President and Secretary of the Math Graduate Students Association.
2005-07	Involvement in local practices for the Association for Computing Machinery International Collegiate Programming Contest.
2005-06	VP Social of the (Undergraduate) Math Union at U of T.
2001-03	Organized reunions for POPTOR alumni.
2001-02	Minister of Finance for the Peel Region Student Presidents' Council.
2000-01	Executive of the Student Activities Council at Clarkson Secondary School.

Hobbies Past and Present:

Artistic	Violin, voice, ballet.
Intellectual	Languages, bridge, chess, programming.
Relaxation	Horse riding, swimming, juggling, yoga.

Selected musical deeds (A bit out of date):

VOICE

2008-10, 11-	Studied voice with Inna Golsband. (Previous teachers not listed.)
Aug. 6, 2010	Performed Cherubino's aria "Non so piu cosa son" from Mozart's Marriage of Figaro, as part of Atelier Ballet Summer Program.
2009-10	Chorus member of Opera Kitchener: productions include Mozart's Marriage of Figaro and Pucini's Madama Butterfly.
Jul. 31, 2008	Performed the role of Catherine in Offenbach's operetta Le Mariage aux Lanternes, with the Royal Conservatory of Music Opera Scene Study Program.
Jul. 5, 2008	Performed the role of Amore in Gluck's opera Orfeo e Euridice, with Opera by Request.
Feb. 2008	Intermediate Voice Trophy Finalist at Kiwanis Music Festival of Greater Toronto.
Jul. 20, 2007	Received full scholarship to sing in the Atelier Ballet Summer Program production of Handel's Fairy Queen.
Jan. 27, 2007	Performed the role of Hero in exerpts from Berlioz's opera Beatrice et Benedict, with the Royal Conservatory of Music Opera Scene Study Program, supported by the Morris Katz Opera Scene Study Bursary.

VIOLIN

2000-02, 03, 06, 09-	Studied violin with Alec Hou. (Other teachers not listed.)
2010-2011	Member of the Mississauga Symphony Orchestra.
2003-04, 05-07, 09-11	Member of the Hart House Orchestra.
Dec. 2 2009	Delivered voice-violin recital at the Hart House Midday Mosaic Series, U of T.
May 2007	1st in class for String Quartets at Toronto Music Festival.
2002	Member of the McGill Symphony Orchestra.
2002	a) 1st in class for String Quartet (Age 18 & Under) at the Greater Toronto; Kiwanis Music Festival b) 1st in class for String Quartet (any age) at Peel Music Fetival, winning the Hilda Kirton Memorial Scholarship; c) 2nd in class for Concerto for Violin and Orchestra (Open) at Peel Music Festival.
2001	Senior scholarship recipient at Mississauga Music Festival (for solo violin).
Summer 2001	Member of the National Youth Orchestra of Canada, selected based on highly competitive national auditions.
2000-02	Concertmaster of Mississauga Youth Orchestra.
1998	Gr. 9 Violin (Guangzhou, China).

BALLET

2009-2011	Studied ballet at the Contemporary School of Dance, Waterloo.
Winter 07	Studied ballet at the School of Atelier Ballet, Toronto.
Summer & Fall 2006	Studied ballet at the National Ballet School, Adult Ballet Program.
Summer 04, Winter 06	Studied ballet at Hart House, U of Toronto.

MUSIC THEORY

May 2010	RCM Exam: Advanced Rudiments 99%, First Class Honours with Distinction.
Dec. 2010	RCM Exam: Basic Harmony 88%, First Class Honours.
Dec. 2011	RCM Exam: History 1: An Overview 3 85%, First Class Honours.

Progress on bridge:

2010	Obtained the title of Junior Master from American Contract Bridge League.

Language Proficiencies:

Fluent	English, Mandarin and Cantonese.
Intermediate	Italian, German, French.
Basic	Spanish.