

Yu "Leon" Liu

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<http://leon2k2k2k.github.io>

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Education

- **The University of Texas at Austin** September 2017- **December 2020**
B.S. in Mathematics Honor, in Progress Austin, Texas
 - Dean's Scholars Honor Program
 - GPA: 3.93/4.0

Research and Projects

- **Chern-Simon Theory** August 2020- **December 2020**
Mathematical Physics
 - I am completing my honor thesis on the topic of Chern-Simon theory under Professor Dan Freed.
- **Khovanov-Rozansky TQFT and Geometry of Soergel Bimodules** May 2020 -
Geometric Representation theory, Topological Field Theory
 - Collaborating with Aaron Mazel-Gee and David Reutter
 - The research project is on finding the braided monoidal 2-category that corresponds to Khovanov-Rozansky. This is a categorification of the ReshetikhinTuraev TQFT that give rise to Jones polynomial. We are currently focusing on understanding the braid group action on Soergel bimodules from a geometric standpoint.
- **Homotopy Type Theory** January 2020 -
Formal verification, HoTT
 - See <https://github.com/LaufferN/HoTT-Arend>
 - This is an ongoing project to translate and verify all the theorems in *Homotopy Type Theory: an Univalent Foundation* into computer verification program Arend.

Conference & Summer Program

- **Tensor Categories and Topological Quantum Field Theories** March 2020
MSRI, online
- **(∞, n) -Categories, Factorization Homology, and Algebraic K-Theory** March 2020
MSRI, online
- **Summer School on Homological Algebra in Mirror Symmetry** August 2019
Fields Institute, Toronto
- **Park City Mathematics Institute: QFT and Manifold Invariants** July 2019
Park City, Utah
- **Arizona Winter School: Topology and Arithmetic** March 2019
University of Arizona, Arizona
- **Texas Algebraic Geometry Symposium** February 2019
UT Austin
- **Between Topology and Quantum Field Theory** January 2019
UT Austin
- **Texas Algebraic Geometry Symposium** November 2018
Texas A&M

Services

- **Electric-Magnetic Duality** September 2020-
Organizer

- see https://leon2k2k2k.github.io/EM_duality_and_Geo_Lang
- Organizing a seminar about electric-magnetic duality in 4D Supersymmetric gauge theories and the connection to Geometric Langlands program.
- Responsible for scheduling talks, inviting speaker.
- Created a mailing list and a website.

• **UT Mathematics Club**

January 2018 - May 2020

President

- Organizing weekly meeting, responsible for contacting professors, scheduling the lectures, as well as preparing food and drinks for the lectures.
- Created platform where Undergraduate mathematics students can practice their lecture skills.
- Created workshops about LaTeX, GRE, Graduate School Application for UT undergraduate who are interested in graduate school in Mathematics

• **Homotopy Type Theory Class**

January 2020- May 2020

Organizer

- Created and leading a student-run seminar over Homotopy Type Theory.
- Creating an Arend documentation to formalize the theorems and proofs in *Homotopy Type Theory: an Univalent Foundation*.

• **Sunday Morning Math Group**

January 2020 - May 2020

Volunteer

- Volunteer at UT's Sunday Morning Math Group (SMMG).
- Introduce interesting math concepts to 6-12 graders.

• **Mathnasium at South Austin**

May 2018 - June 2018

Instructor

- Tutored elementary, middle, and high school students in mathematics.

Relevant Courses Taken

M373 Algebra	A
M275 Algebraic Geometry	A
M375 Homotopy Theory	A
M375 Riemannian Geometry	A
M375 Riemann Surfaces	A
M475 p-adic Homotopy Theory	A-
M475 Research in Koszul Duality	A
M375T Analysis On Manifold	A
M375 Geometric Langlands Conjecture	A
M380D Algebra†	A-
M382D Differential Topology†	A
M385C Theory of Probability†	A
M392C Morse Theory†	A
M392C Algebraic Geometry†	A
M392C Mathematical Gauge Theory †	A
M392C Stability Conditions †	A
M392C P-adic Hodge Theory †	A
M392C Gromov-Witten Theory †	A
PHY387M Relativity Theory	A
PHY396K Quantum Field Theory †	A
PHY396P String Theory	A-
CS370 Homotopy Type Theory	A
M379H Honor Thesis *	

* = Current Courses

† = Graduate Courses

Honor, awards, and fellowships

- Emory and Ella Peterson Endowed Presidential Scholarship April 2020
- UT Distinguished College Scholar

Selected Talks Given

- **EM Duality in N=4 SUSY Yang-Mills** October 2020
EM duality and Geometric Langlands Seminar
- **EM Duality in N=2 SUSY Yang-Mills** September 2020
EM duality and Geometric Langlands Seminar
- **Electric Magnetic Duality and Magnetic Monopoles** September 2020
Junior Geometry and String Theory Seminar
- **Representation Theory in Physics: Classification of Particles in QFT** April 2020
Junior Geometry
- **Renormalization of Perturbative Quantum Field Theories** February 2020
Junior Geometry and String Theory Seminar
- **Spontaneously Broken Symmetry and Higgs Mechanism** February 2020
Dynamics of QFT Seminar
- **Line Bundles and Divisor Correspondence** February 2020
Junior Algebraic Geometry Seminar
- **Proof of Triangulation Conjecture** November 2019
Triangulation Conjecture Seminar
- **T-duality on 2D Sigma Models** November 2019
Junior Geometry and String Theory Seminar
- **Seibert-Witten Equation and the Coulomb Gauge** October 2019
Triangulation Conjecture Seminar
- **Topological Hochschild Homology and Applications to Arithmetic Geometry** May 2019
Directed Reading Program
- **2-shifted Symplectic Structure on the Derived Stacks of Perfect Complexes** May 2019
Derived Algebraic Geometry Seminar
- **Derived Stack of Perfect Complexes and Its Cotangent Bundle** April 2019
Derived Algebraic Geometry Seminar
- **Shifted Symplectic Structure on Intersections of Lagrangians** April 2019
Derived Algebraic Geometry Seminar
- **Bauer-Furuta Invariants** April 2019
Furuta 10/8 Seminar
- **A_∞ categories and derived Fukaya categories** March 2019
Floer Lagrangian Seminar
- **Introduction to Morse Theory via Pictures** February 2019
UT Math Club
- **Finite Dimensional Approximations to the Monopole Map** February 2019
Furuta 10/8 Seminar
- **Bar Construction** January 2019
UT Math Club
- **Presentable ∞ Category and ∞ topos** November 2018
Higher Topos Theory Seminar
- **Moduli Space of Triangles** September 2018
UT Math Club
- **Category Theory and Linear Algebra** April 2018
UT Math Club
- **27 Lines** February 2018
UT Math Club
- **Elliptic Curves are Group Schemes** November 2017
Directed Reading Program
- **Algebraic Geometry and Bezout's Theorem** October 2017
UT Math Club