Yu (Leon) Liu

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`http://leon2k2k2k.github.io`

Education

- **The University of Texas at Austin** — Austin, Texas
  B.S. in Mathematics — September 2017- **December 2020**
    - Major: Pure Mathematics
    - Cumulative GPA: 3.93/4.0
    - Mathematics GPA: 3.93/4.0
    - Expected Graduation: December 2020

Research Projects

- **Abelian Duality in Topological Field Theory** — August 2020- December 2020
  Mathematical Physics
    - See **here** for a draft.
    - My honor thesis with Professor Dan Freed.
    - I formulate and proof a version of abelian duality as equivalences of TFTs (up to tensoring with an invertible TFT), following [FT] .

- **Khovanov-Rozansky TQFT and Geometry of Soergel Bimodules** — May 2020 -
  Geometric Representation theory, Homotopy Theory
    - In collaboration with Aaron Mazel-Gee (Cal-Tech) and David Reutter (Max Planck), both postdocs.
    - We are constructing a spectral version of Soergel bimodules and their braid group actions, using the formalism of spherical functors.

- **Homotopy Type Theory** — January 2020 -
  Formal verification, HoTT
    - See `https://github.com/LaufferN/HoTT-Arend`
    - Ongoing project to translate and verify all the theorems in *Homotopy Type Theory: an Univalent Foundation* in the computer verification program Arend.

Conference & Summer Program

- **Tensor Categories and Topological Quantum Field Theories** — March 2020
  MSRI, moved online
- **(∞, n)-Categories, Factorization Homology, and Algebraic K-Theory** — March 2020
  MSRI, moved 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- December 2020
  Organizer
  - See `https://leon2k2k2k.github.io/EM_dualtiy_and_Geo_Lang`
  - Organized a seminar about electric-magnetic duality in 4D Supersymmetric gauge theories and the connection to Geometric Langlands program.
  - Responsible for scheduling talks, inviting speaker.

- **UT Mathematics Club**   January 2018 - December 2020
  President 2019-2020, Vice President 2018-2019
  - Organized 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
  - Volunteered at UT's Sunday Morning Math Group (SMMG).
  - Introduced 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 and Awards

- Emory and Ella Peterson Endowed Presidential Scholarship April 2020

- UT Distinguished College Scholar

Selected Talks Given

- **Fourier Theory and Categorification** November 2020
  Junior Geometry

- **Abelian Dualities in Topological Field Theory** November 2019
  Junior Geometry and String Theory

- **EM Duality in N=4 SUSY Yang-Mills** October 2020
  EM duatliy 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
  Dyanmics 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-shited 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