Yu Leon Liu

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Education

- **The University of Texas at Austin**　　　　　　　　　　　　　　Austin, Texas
  B.S. in Mathematics Honor, in Progress　　　　　September 2017- **December 2020**
    - Dean's Scholars Honor Program
    - GPA: 3.9359/4.0

Research and Projects

- **TQFT and Koszul Duality**　　　　　　　　　　　　　　　September 2019-
  Derived Algebraic Geometry, Topological Field Theory
    - Currently doing research with Professor David Ben-Zvi
    - The research project is on categorifying a version of Koszul Duality that relates tangent bundles and cotangent bundles. The goal is to extend this duality to the level of categories, which relates sheaves of categories $2QCoh(X)$ and $2IndCoh(T^*X)$, which is the value of Rozansky-Witten TFT valued at a point. This is an attempt to develop a theory of singular support for local Geometric Langlands.

- **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.

- **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

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

Services

- **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

* = **Current Courses**
† = **Graduate Courses**

Selected Talks Given

- **Algebraic Geometry and Bezouts Theorem** October 2017
  UT Math Club
- **Elliptic Curves are Group Schemes** November 2017
  Directed Reading Program
- **27 Lines** UT Math Club
  February 2018

- **Category Theory and Linear Algebra** — April 2018
  UT Math Club
- **Moduli Space of Triangles** — September 2018
  UT Math Club
- **Presentable ∞ Category and ∞ topos** — November 2018
  Higher Topos Theory Seminar
- **Bar Construction** — January 2019
  UT Math Club
- **Finite Dimensional Approximations to the Monopole Map** — February 2019
  Furuta 10/8 Seminar
- **Introduction to Morse Theory via Pictures** — February 2019
  UT Math Club
- **A_∞ categories and derived Fukaya categories** — March 2019
  Floer Lagrangian Seminar
- **Bauer-Furuta Invariants** — April 2019
  Furuta 10/8 Seminar
- **Shifted Symplectic Structure on Intersections of Lagrangians** — April 2019
  Derived Algebraic Geometry Seminar
- **Derived Stack of Perfect Complexes and Its Cotangent Bundle** — April 2019
  Derived Algebraic Geometry Seminar
- **2-shited Symplectic Structure on the Derived Stacks of Perfect Complexes** — May 2019
  Derived Algebraic Geometry Seminar
- **Topological Hochschild Homology and Applications to Arithmetic Geometry** — May 2019
  Directed Reading Program
- **Seibert-Witten Equation and the Coulomb Gauge** — October 2019
  Triangulation Conjecture Seminar
- **T-duality on 2D Sigma Models** — November 2019
  Junior Geometry and String Theory Seminar
- **Proof of Triangulation Conjecture** — November 2019
  Triangulation Conjecture Seminar
- **Line Bundles and Divisor Correspondence** — February 2020
  Junior Algebraic Geometry Seminar
- **Spontaneously Broken Symmetry and Higgs Mechanism** — February 2020
  Dyanmics of QFT Seminar
- **Renormalization of Perturbative Quantum Field Theories** — February 2020
  Junior Geometry and String Theory Seminar
- **Representation Theory in Physics: Classification of Particles in QFT** — April 2020
  Junior Geometry
- **Statistical Field Theory, QFT, Domain walls and Quantum Tunneling** — April 2020
  Junior Geometry and String Theory Seminar