

Ryan Leal

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Education

Massachusetts Institute of Technology (MIT)

PhD student in the Department of Economics

Awarded Presidential Fellowship for First-Year Graduate Students

Cambridge, MA

2026-

California Institute of Technology (Caltech)

Bachelors of Science in Mathematics and Economics, 4.1/4.3 GPA

Pasadena, CA

2022-2026

Experience

Economics Researcher in Macro-Finance, Treasury Buybacks to Improve Liquidity of Securities Markets **Stanford**

Mentored by Professor Darrell Duffie

June 2025 – September 2025

Named Citadel Global Fixed Income Summer Undergraduate Research Fellow

- Calibrated model of Treasury bond market. Used a dynamic combination of heuristics and optimization algorithms.
- Implemented new model attributes to match empirical moments with data provided by FRBNY.

Mathematics Researcher in Topology, On the Lorentzian Properties of the Alexander Polynomial **Caltech**

Mentored by Professor Yi Ni

June 2024 – September 2024

Named W.H. Halpenny Summer Undergraduate Research Fellow

- Researched various techniques to show log-concavity and the Lorentzian property of multivariable Alexander polynomials for various special families of links. Computed the Lorentzian condition for a database of links.
- Researched homological techniques and combinatorial techniques that have been used to approach the problem for two-bridge links and 3-braid links.

Mathematics Researcher in Discrete Differential Geometry **Caltech**

Mentored by Yousuf Solimon and Professor Peter Schröder

April 2023 – December 2023

- Continuously reviewed various literature in the field of Discrete Differential Geometry.
- Worked through the design and implementation of Mean Curvature flows, Willmore Energy flows, and others.
- Worked on a longer term projects motivated by conformally equilateral triangle configurations and sphere meshes.

Mathematics Researcher in Information Theory, Entropies associated with orbits of finite groups **Caltech**

Mentored by Dr. Juan Pablo Vigneaux under Professor Matilde Marcolli

June 2023 – September 2023

Named Mr. and Mrs. Robert C. Loschke Summer Undergraduate Research Fellow

- Conducted original research in the appearance of entropies, including Shannon and Tsallis 2-entropies in reflection groups and finite groups of Lie type. Manuscript on arXiv:2512.02257

Technical Intern **Applied Research Associates**

Technical Intern under Dr. Delaine Reiter – Geophysical Models, Signatures and Systems

May 2022–August 2022

- Wrote additional features for SpecFEM3D and SpecFEM2D, particularly for coupling with non-linear source simulation.

Technical Intern under Dr. Delaine Reiter – Geophysical Models, Signatures and Systems

May 2021–August 2021

- Used Support Vector Machines, Auto-encoders, and other Machine Learning algorithms to find signatures of depth of event in a seismograph.
- Redesigned software for processing attenuation grids with CUDA-C.

Technical Intern under Dr. Delaine Reiter – Geophysical Models, Signatures and Systems

May 2020–August 2020

- Designed hardware accelerated Short-time Fast Fourier Transform for processing seismological data.
- Wrote hardware accelerated spectrogram visualization program.

Technical Intern under Owen Price – Algorithms, Modelling, and Assessments

May 2018–August 2018

- Designed algorithms to process data on For-Hire Vehicle services in C++ and CUDA-C.

Skills

Expert: C++, CUDA-C, C#, Visual Studio, $\text{\LaTeX}$, Github, Julia

Fluent: Matlab, R, Linux, OpenGL for C, Python, HTML, CSS, Machine Learning (Tensorflow), Numpy, Scikit Learn, CAD, Blender, GIT, Geometry-Central, Polyscope

Conferences

India Ki Khoj at IIT Gandhinagar
NBER Market Frictions and Financial Risks Meeting

Attendee, 2025
Attendee, 2025

Activities

Study Abroad at Cambridge University

Student in Mathematics Tripos Part II during Lent term in Pembroke College.

January 2025-March 2025

Caltech Math Meet Organizing

Member, Treasurer

2022-

- Organized fundraising and sponsorship deals with various corporations such as Jane Street, Hudson River Trading, IMC, and SIG.
- Managed the logistical operation for one of the U.S.'s preeminent high school mathematics competitions.

Walter Johnson High School Math Team

Member, President

2018-2019, 2019-2022

- Wrote yearlong curriculum from scratch in competition mathematics and higher mathematics. Teaching curriculum to students.
- Participated in American Mathematics Competition, Montgomery County Math League, UMD Math Competition, Caltech-Harvey Mudd Math Competition, Purple Comet Competition, American Regional Mathematics League, Harvard-MIT Math Tournament.

Walter Johnson High School Physics Team

Member, Co-President

2019-2020, 2020-2022

Walter Johnson High School USACO Team

Captain

2021-2022