Luke Trujillo

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Education

Harvey Mudd College Graduated: December 2020

Bachelors of Science in Mathematics *Claremont, CA*

Major GPA: 3.68

Math Courses: Graduate Analysis, Topology, Galois Theory, Differential Geometry, PDEs, Probability

CS Courses: Intro. to CS (Python), Principles of CS (Python/Java), Discrete Differential Geometry (Javascript)

Technical Skills

Languages: Python, C++, Javascript, MySQL, HTML/CSS, C, Bash, TEX/LATEX

Platforms: Red Hat Enterprise, Kali Linux, Mac OS

Developer Tools: Git, Black (Python), Oh-My-Zsh, Tmux, Vim, PyCharm, CLion, Visual Studio Code

Work Experience

Manifold Technologies January 2021 – Present

Software Engineer *Remote (COVID-19)*

- Perform backend development (Django, React) as well as other system designing, testing and implementing of high frequency quantitative trading software.
- Development is done on Red Hat Linux machines using computational and low level libraries including NumPy and Multiprocessing, unit testing with PyTest, and database management with MySQL.

Harvey Mudd College May – June 2019, May – June 2018

Summer Math Tutor and Grader *Claremont, CA*

- Graded and tutored for Harvey Mudd's intensive 3 week Summer Math undergrad program for two years in a row. Topics included advanced linear algebra, multivariate calculus, and differential equations.

Ivy Focus Education August 2016 – May 2019

Mathematics, Physics, English Tutor *Claremont, CA*

- Tutored for a program connecting local Claremont high school students with Claremont College students.

Research Experience

Georgia Institute of Technology May 2020 – July 2020

Undergraduate Researcher *Remote (COVID-19)*

- Extended Joyal and Street's work for braided monoidal categories and generalized quasitriangular Hopf algebras
- Used categorical and computational techniques to find a singular knot invariant

Mathematical Sciences Research Institute June 2018 – July 2018

Undergraduate Researcher *Berkeley, CA*

- Part of team that studied algorithms in applied topology to characterize intrinsic geometry of raw time series data, which led to a published machine learning ECG classification model.
- Classification accuracy via topological features compared to and exceeded previous research projects from 2017 PhysioNet Computations in Cardiology Challenge

Projects

YAPL (Yet Another PDF Library) July 2021 – Present

- YAPL is a C++ library that abstracts PDF object components to generate PDF code and hence PDFs. It is intended to be very lean and fast, and it can additionally draw geometric objects and Bezeir curves.

TikzPy March 2021 – May 2021

- Created a Python package with documentation for Ti*k*z graphics code generation, allowing one to programmatically design and create complex mathematical drawings.

Category Theory for Pure Mathematics: With Examples and Exercises. August 2019 – March 2021

- Wrote an advanced mathematics textbook on Category Theory (413 pages) while an undergraduate.

TikZ Drawer for LaTeX. December 2020 – February 2021

- Created an interactive web application using `d3.js` to make a drawing tool that generates Ti*k*z graphics code.

Interactive 3D Associahedra Viewer. October 2020 – November 2020

- Used `three.js` libraries and Python to create a 3D interactive web app of the first 10 Associahedron polytopes. Published on the Higher Category Theory wiki nLab under the Associahedron page.

Publications

Classification of Single-Lead Electrocardiograms: TDA Informed Machine Learning. Paul Samuel Ignacio, David Uminsky, Christopher Dunstan, Esteban Escobar, Luke Trujillo. 18th IEEE International Conference On Machine Learning And Applications.

Conferences Attended

3rd Conference on Operad Theory and Related Topics September 18, 2020
Online (COVID-19)

Applied Category Theory Session, AMS Western Sectional Meeting November 9 – 10, 2019
University of California, Riverside

Joint Mathematics Meetings January 16 – 19, 2019
Baltimore, MD

SACNAS Conference October 10 – 12, 2018
San Antonio, TX

Outreach

Casa de Amistad September 2021 – Present, October 2015 – May 2016
Tutor and Mentor for K-12 students *Solana Beach, CA*

Uncommon Good Tutoring September 2017 – May 2018
STEM Tutor for K-12 students *Claremont, CA*

Free Mathematics Tutor August 2015 – June 2016
Independent Free Tutor for Low-income San Diegans. *San Diego County*