Luke Trujillo

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Education

Harvey Mudd College Graduated: December 2020
Bachelors of Science in Mathematics *Claremont, CA*
Thesis: *A Coherent Proof of Mac Lane's Coherence Theorem*
Math Courses: Graduate Analysis, Topology, Galois Theory, Differential Geometry
CS Courses: Intro. to CS (Python), Principles of CS (Python/Java), Discrete Differential Geometry (Javascript)

Technical Skills

Languages: Python, C, Rust, C++, Bash/Zsh, Javascript
Developer Tools: Git, Vim, Tmux, Jupyter Notebook, Black (Python), Pytest
Skills: Asynchronous programming, Postgresql, Kubernetes, Grafana/Loki

Work Experience

Elpha Secure December 2021 – Present
Software Engineer *Remote (COVID-19)*

- Duties include Python-based backend designing, testing, documenting, and development of our microservices architecture that powers our cybersecurity and cyberinsurance products.
- Perform backend engineering for a wide set of different customer-facing platforms, ranging from online React based portals to C++ based Desktop applications.
- Adherence to rigorous CI/CD deployment processes, unit testing, and to mature coding and logging practices to quickly iterate on tasks and to respond to bug reports.
- Frequently collaborate with other engineers, both more senior and junior than myself, and assist junior engineers with technical help and advice.
- Frequently participate in discussions with team members and senior engineers to discuss technical tradeoffs regarding tasks, and I proactively take notes and create technical drawings to share with others.

Harvey Mudd College May – June 2019, May – June 2018
Summer Math Tutor and Grader *Claremont, CA*

- Graded and tutored for Harvey Mudd's notorious and intensive 3 week Summer Math undergraduate program for two years in a row.
- Tutored highly talented Harvey Mudd freshmen in topics including advanced linear algebra, multivariate calculus, and differential equations.

Research Experience

Georgia Institute of Technology May 2020 – July 2020
Undergraduate Researcher *Remote (COVID-19)*

- Participated in the Georgia Tech Math REU for Summer 2020, and studied algebra, topology, and category theory to generalized the famous work of mathematicians Andre Joyal and Ross Street.
- Used Python to implement categorical and linear algebra calculations to find a singular knot invariant.

Mathematical Sciences Research Institute June 2018 – July 2018
Undergraduate Researcher *Berkeley, CA*

- Participated in the MSRI Math REU for 2018 and performed research in persistence homology, an area of applied topology with applications to machine learning.
- Our model's classification accuracy, which classified sick and healthy ECG patient data, exceeded that of academic researchers and resulted in a published machine learning conference paper.

Projects

Poly: A Command Line Tool for Math People — September 2021 – Present

- Developing a C written, Unix-style command line program using the GNU Readline C Library that implements a recursive descent parsing algorithm on a polynomial grammar I came up with to perform fast, accurate polynomial arithmetic.

TikzPy — March 2021 – Present

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

DES Encryption Algorithm — September 2021

- Implemented the DES encryption algorithm in Python via Bruce Schneider's *Applied Cryptography*. Created a blog post detailing the algorithm procedures and the corresponding Python code.

Hobby Curve Drawing Algorithm — September 2021

- Wrote separate Python, Javascript, and C++ implementations of John Hobby's curve drawing algorithm, after discovering publicly available implementations had bugs.

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.

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*