# Raymond Tana

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San Francisco, CA

## Education
**Penn State University**

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|---|---|
| - PhD in Mathematics (Logic). | 2019-2025 |
| - Honors B.S. in Mathematics, | 2015-2019 |
| - B.S. in Physics. | 2015-2019 |

## Developer Skills
- **Languages**: Go, Rust, Zig, C, TypeScript, Python.
- **Technologies**: LaTeX, Git, Docker, AWS (S3, ECS), PostgreSQL, CUDA, SvelteKit.
- **Libraries**: PyTorch, Pandas, Vercel AI SDK, Seaborn, Plotly, OpenTelemetry.

## Work and Academic Experience

**Butter: R&D and Software Engineer**  — Sep. 2025.-Mar. 2026
- Built **bVisor**, a lightweight, in-process, local Linux sandbox for coding agents.
- Emulated Linux syscalls intercepted by SECCOMP User Notifier, running many userspace-programs used by coding agents such as bash, python, grep, etc.
- Built **Butter**, an LLM response-cache as a chat-completions proxy.
- Implemented a template-induction pipeline for templatizing messages.

**The Erdős Institute Data Science Teaching Assistant**  — Jan.-June 2025
- Lead weekly problem-solving sessions for cohorts of 3-5 PhD students, with hands-on guidance in Python, modeling, and ML.
- Improve overall cohort performance through collaborative learning and best practices, as evidenced by positive student feedback.

**The Erdős Institute Fall 2024**  — Aug.-Dec. 2024
- Enrolled in Data Science Boot Camp, Software Engineering for Data Scientists, and Job Help programs.

**ASML Reliability Engineering & UX Engineering Internship**  — May-Aug. 2024
- Authored software to perform a new, dynamic reliability growth analysis of failure data of various components found in the lithography machines at ASML.
- Developed and disseminated more sophisticated models for anticipating component failure trends over time and for estimating the parameters for such models.
- Advised various projects in their use of Information Theoretic methods and AI to predict failures in individual components found in the lithography machines.

**BlueDot Impact AI Safety Fundamentals: Alignment Bootcamp**  — Mar.-June 2024
- For my final project, I demonstrated empirically how modern large language models can only perform inference so proficiently due to their ability to losslessly compress quite well, suggesting some near-term safety implications with AIXI.
- Curriculum covered Machine Learning, General Intelligence, Reward Specification, Convergence, Goal Generalization, Task Decomposition, Adversarial Techniques, Interpretability, Governance, and Agent Foundations.

**Developer for "Calculus-with-Jupyter"**  — Jan. 2021.-Aug 2023
- Designed a Jupyter Book and Notebook experience for alternative, accessible, and open-source mathematics education at the collegiate level.
- Introduced accessible ChatGPT assistant to Jupyter notebook experience.
- Specialized in content creation, IPython cell magics, error handling, & text parsing.
- Pursued improved accessibility of educational materials through a universal scripting language suitable for various platforms.
- Implemented a sophisticated machine learning model for automated long descriptions of graphs found in calculus textbooks.

**CET Summer in Brazil through Tulane University** June-July 2023
- Funded by the US Department of Education through a FLAS Scholarship to study the Portuguese language and Brazilian Contemporary Social Issues at the China Educational Tours Center in São Paulo, Brazil for six weeks.
- Researched the ethnomathematics of various indigenous communities within Brazil and the future of Brazilian mathematical education.
- Received top grades in both courses, both taught in Portuguese.

**Computability & Combinatorics Workshop at the University of Connecticut** May 2023
- Explored the intersection of combinatorics and computability theory and logic, including three tutorials on the complexity of Ramsey theorems, model-theoretic constructions of random combinatorial structures, and constructive solutions to combinatorial problems.

**MSRI Mathematics of Machine Learning Summer School at the Courant Institute** July-Aug. 2022
- Studied five main pillars of theoretical machine learning: convex optimization, online learning, deep learning, statistical learning, and reinforcement learning.
- Collaborated with other mathematics graduate students to solve problem sets and establish opportunities for further investigations beyond the program.

**IMS Logic Summer School at the National University of Singapore** July 2022
- Studied continuous logics, tracial von Neumann algebras, quantum complexity theory, gauge theory, Kolmogorov complexity theory, and forcing axioms.
- Collaborated with other logic graduate students to solve exercises, establishing relationships for working beyond the program.
- Reinforced my awareness of the forefront of logic research.

**IMA Math-to-Industry Boot Camp VI** June-July 2021
- Rigorously studied Statistical Modelling, Optimization, Machine Learning.
- Designed a new approach to price modelling at C.H. Robinson for its surface transit division within a team of six other PhD students via Neural Networks & Clustering.
- Presented findings in regular check-ins and to C.H. Robinson's Data Science division.

**Trace Technologies** Feb.-Aug. 2021
- Placed in the final round of the Nittany AI Competition 2021 by collaborating with four other students to produce a proposal, prototype, marketing video, and MVP.
- Promoted, documented, and steered the group within the competition.
- Implemented ML models on large-scale geophysical data to predict human activity across a geographical area.

**Stellar AI** Jan.-July 2022
- Placed in the final round of the Nittany AI Competition 2022.
- Advised a team of 15+ graduate and undergraduate students to produce a minimum viable product with proper documentation, user experience, and market analysis.
- Implemented AI solutions to make searching for, applying to, or posting jobs easier.

**Eberly College of Science Sustainability Council Graduate Chair** Oct. 2019-Aug. 2025
- Performed the college's first greenhouse gas inventory, collaborating with multiple offices and stakeholders to lay an efficient roadmap towards decarbonization.
- Identified syllabi in which sustainability could be further incorporated.
- Facilitated a sustainability town hall and drawdown discussion for the college.
- Advocate for better transportation and carbon reductions strategies.

## Language Skills
Native speaker of English. Proficient in both Spanish (B2) and Portuguese (B2).

## Mathematical Communications

**Iowa Conference on Information, Complexity, and Logic**    Mar. 2026
- *Some Developments in Algorithmic Information Theory.*

**Penn State Mathematics Student Colloquium**    Feb. 2026
- *Mathematics in the AI Industry.*

**Doctoral Dissertation Defense**    June 2025
- *The Algorithmic Theory of Information and its Applications to Geometric Measure Theory*; Advisors: Jan Reimann and Linda Westrick.

**AMS 2025 Eastern Sectional Meeting – Special Session in Computability Theory**    Apr. 2025
- *Algorithmic Information Theory on Net Spaces*; Advisor: Jan Reimann.

**Graduate Student Probability Conference at University of Wisconsin – Madison**    Sep. 2024
- *The Role of Semimeasures in Connecting Algorithmic Information Theory and Geometric Measure Theory*; Advisor: Jan Reimann.

**Mathematics Club at Penn State**    Mar. 2024
- *Unpacking Compression.*

**Logic Student Seminar at University of Pennsylvania**    Feb. 2024
- *Dimension Spectrum Conjecture and Finitization*; Advisor: Jan Reimann.

**Logic Seminar at Penn State**    Feb. 2024
- *Semimeasure Formalization of Algorithmic Information Theory*; Advisor: Jan Reimann.

**Logic Student Seminar at Penn State**    Oct. 2023
- *Hyperarithmetic Sets and Definability,* $\Delta^1_1 = HYP$ ; Advisor: Linda Westrick.

**Logic Student Seminar at Penn State**    Apr. 2023
- *Infinite Computable Monty Hall Problem*; Advisor: Linda Westrick.

**Logic Student Seminar at Penn State**    Mar. 2023
- *Guessing Principles and Jensen's Diamond Sequences*; Advisor: Linda Westrick.

**Logic Student Seminar at Penn State**    Feb. 2023
- *Dimension Spectrum Conjecture and Finitization*; Advisor: Linda Westrick.

**Logic Seminar at Penn State**    Jan. 2023
- *Kolmogorov Complexity and Effective Hausdorff Dimension*; Advisor: Linda Westrick.

**Logic Seminar at Penn State**    Nov. 2022
- *Degree Spectra within Computable Structure Theory Part II*; Advisor: Jan Reimann.

**Logic Seminar at Penn State Presentation**    Nov. 2022
- *Degree Spectra within Computable Structure Theory Part I*; Advisor: Jan Reimann.

**Comprehensive Oral Exam**    Apr. 2022
- *Effective Hausdorff Dimension Spectrum & Marstrand's Projection Theorem*; Advisor: Linda Westrick.

**Quantum Computational Theory**    Dec. 2021
- *Perfect Embezzlement of Infinite Entanglement for Nonlocal Games using C\*-algebras*; Advisor: Chunhao Wang.

**Logic Seminar at Penn State**    Oct. 2021
- *Effective Hausdorff Dimension and Point to Set Principles*; Advisor: Jan Reimann.

**Logic Seminar at Penn State**    Sep. 2021
- *Kolmogorov Complexity and Information Theory*; Advisor: Jan Reimann.

**C.H. Robinson Data Science Division**    July 2021
- *Long-term Predicting Trucking Cost*; Advisor: Kaisa Taipale. IMA Boot Camp VI.

**Quantum Information and Computation Club at Penn State**    May 2021
- *Introduction to Quantum Computation.*

**Logic Seminar at Penn State**    Feb. 2021
- *Robust Rigidity of the CHSH Game*; Advisor: Linda Westrick.

**Logic Seminar at Penn State**    Nov. 2020
- *Applications of the Quantum Fourier Transform*; Advisor: Linda Westrick.

**Undergraduate Honors Thesis**    May 2019
- *Computational Approach to Symplectic Billiards*; Advisor: Sergei Tabachnikov.

**Introduction to Quantum Mechanics II Research Report**                    Dec. 2018
- *A Universe without Doppelgängers*; Advisor: Sarah Shandera.

**MASS Program 2017 [Mathematical Advanced Study Semester]**               Dec. 2017
- *Edwards Coordinates*; Advisor: Yuriy Zarkhin.

**Mathematical Outing for Undergraduates at Penn State**                    Apr. 2017
- *Moduli Spaces and SL(2, ℝ) Actions*; Advisor: Zihren Wang. Group presentation to
  other math majors on the theory of moduli spaces and actions under SL(2, ℝ).

**MASS Program 2016 [Mathematical Advanced Study Semester]**               Dec. 2016
- *Geometric and Arithmetic Coding and Geodesics on the Modular Surface*; Advisor:
  Federico Rodriguez Hertz.
- *Classification of Quaternion Algebras over ℚ*; Advisor: Svetlana Katok.
- *Weierstrass and Müntz Theorems*; Advisor: Ludmil Zikatanov.

**Discrete Mathematics Report**                                            Dec. 2015
- *Generalized Fermat Numbers*; Advisor: Svetlana Katok. Generalized the properties
  of Fermat numbers to other sequences.


## Other Presentations and Reports
**Final Presentation for Intern Project at ASML**                          Aug. 2024
- *Dynamic Reliability Growth Analysis: a new Software Tool*; Advisor: David Chang.

**FLAS Scholar Summer in Brazil Final Report**                             Jul. 2023
- *A Etnomatemática Aplicada aos Povos Indígenas do Brasil*; Advisor: Luiz Filipe
  Correia.

**2023 Eberly College of Science Sustainability Expo Graduate Poster Competition**   Apr. 2023
- *ECoS CY2019 Greenhouse Gas Inventory and its Outcomes*; Advisor: Charles
  Anderson.

**2023 Penn State Sustainability Summit**                                  Apr. 2023
- *The State of Sustainability Education*; Advisor: Russ deForest.

**2023 Pennsylvania Regional Math Alliance Conference**                    Feb. 2023
- *My Journey to Graduate School*; Advisor: Jan Reimann.

**JMM Lightning Talks in Environmental Mathematics**                       Jan. 2023
- *Advocacy with Data*; Advisor: Charles Anderson.

**JMM Workshop on Mathematics for Sustainability**                         Jan. 2023
- *Quantitative and Ethical Reasoning in General Education Mathematics*; Advisor: Russ deForest.

**SPAN 215: Introduction to Spanish Linguistics**                          Nov. 2022
- *Proyecto de Análisis Lingüístico de la Variedad Española de Puerto Rico*.

**Penn State University Office of the President Presentation**             Apr. 2022
- *SSAC Final Presentation Spring 2022*; Advisor: Robert Cooper.

**Council of Commonwealth Student Governments Report**                     Mar. 2022
- *Lifetime CCSG Greenhouse Gas Inventory*.

**Penn State University Office of the President Presentation**             Nov. 2021
- *SSAC Final Presentation Fall 2021*; Advisor: Robert Cooper.

**Eberly College of Science Executive Council**                           June 2021
- *ECoS CY2019 Greenhouse Gas Inventory*; Advisor: Charles Anderson.

**Penn State University Office of the President Presentation**             May 2021
- *SSAC Final Presentation Spring 2021*; Advisor: Robert Cooper.

**Eberly College of Science Sustainability Council Town Hall Presentation**   Mar. 2021
- *Sustainability in Mathematics Education*; Advisor: Russ deForest.

**Penn State University Office of the President Presentation**             Nov. 2020
- *SSAC Final Presentation Fall 2020*; Advisor: Robert Cooper.


## Teaching Experience
**Mathematics Graduate Teaching Assistantship at Penn State**             2020-2025
- MATH 033 (*Mathematics for Sustainability*): primary instructor across five
  semesters and nine sections, creating content on case studies, discussions, writing

projects. We prepare students to tackle mathematical and ethical problems in sustainability.

- MATH 230 (*Calculus and Vector Analysis*): primary instructor for one semester, created exam and review materials, contributed to course coordination meetings, extended accessibility of course content.
- MATH 486 (*Mathematical Theory of Games*): primary instructor for two semesters and in-class teaching assistant across three semesters, lead review sessions and office hours, and ran computational simulations for assignments.
- MATH 033 (*Mathematics for Sustainability*): as a mentee for one semester, facilitated group work and class discussions, and lectured a couple of times.

### ESL Instructor through the Mid-State Literacy Council 2022-2025
- Instructor of five semesters for Basic English for Spanish Speakers.
- Design lessons in both Spanish and English relevant to working adults and university-level students.
- Help students navigate the conversations involved with personal matters such as obtaining health insurance and preparing for university.

## Research Experience
### Auburn University REU in Mathematics June-July 2018
- Generalized "achievement sets" to groups, solving an open question.
- Constructed counterexamples to existing conjectures for simple, oriented graphs.
- Presented findings at the Clemson University REU Conference.

### MASS Program at Penn State [Mathematical Advanced Study Semester] Fall 2016 & 2017
- Presented four research projects over two separate semesters.
- Received Best Project in Algebra in both 2016 and 2017.

## Awards/Scholarships
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| - Charles H. Hoover Memorial Award – Department of Mathematics for Teaching | 2024 |
| - Foreign Language and Area Studies Fellowship in Portuguese | 2024 |
| - Teaching Associate Status | 2023 |
| - John Roe Sustainability Impact Award | 2023 |
| - U.S. Foreign Language and Area Studies (FLAS) Fellowship | 2023 |
| - Second Place Poster in Eberly Sustainability Expo | 2023 |
| - Student Leader Scholarship | 2022 |
| - Robert and Betsy Wilson Endowed Scholarship – Department of Mathematics for Teaching | 2021 |
| - Student Leader Scholarship | 2021 |
| - Student Leader Scholarship | 2020 |
| - Student Leader Scholarship | 2018 |
| - John & Elizabeth Holmes Teas Scholarship in Science | 2018 |
| - Boyd A. and Bernice K. Mullen Awards in Mathematics | 2018 |
| - Academic Excellence Scholar Scholarship | 2018 |
| - Elsbach Honors Scholarship in Physics | 2017 |
| - Best Projects in Algebra, MASS | 2017 |
| - Lewis C. Cowley Scholarship | 2017 |
| - Best Project Presentation in Algebra | 2016 |
| - Best Performance Overall from MASS Program | 2016 |
| - Graduation with Distinction from MASS Program | 2016 |
| - Lewis C. Cowley Scholarship | 2016 |
| - Lewis C. Cowley Scholarship | 2015 |

## Leadership
### Officer of Penn State Quantum Information & Computation Club Mar. 2020-May 2023
- Prepare and deliver lecture content for educational meetings.
- Plan for workshops and guest speaker events.
- Spearhead efforts to expand access and knowledge of Qiskit.

Student Sustainability Advisory Council Working Group Leader                  Aug. 2020-May 2023
-   Advise university administration on carbon drawdown, divestment, carbon offsets,
    zero-waste, and sustainability-related outreach and educational experiences.
-   Advocate for improved campus navigability and safety for non-drivers.

President and Secretary of Penn State Club Cross Country                      Nov. 2016-Nov. 2018
-   Communicated with and led the largest club sport at Penn State.
-   Organized multiple highly-respected invitationals hosting over 1,000 athletes.
-   Represented the club to the national running league and university
    administration.

Vice President and Treasurer of Penn State Math Club                          Apr. 2016-Apr. 2018
-   Established records of past finances and future budgets.
-   Organized a weekly lecture series primarily with Penn State faculty members.
-   Created and presented competition and lecture material for the club.


## Community Service

Mid-State Literacy Council                                                    2022-2025
-   Instructor of Basic English for Spanish Speakers to local community members.

Prison Mathematics Project                                                    2023-2025
-   Correspond with incarcerated individuals as their pen-pal and mentor.
-   Provide research-track mathematical problems and solutions to help prisoners
    with low access to educational and technological resources to develop their skills
    in research and practical mathematics.

Penn State Club Cross Country Benefiting THON                                 2015-2023
-   Facilitated the largest alternative fundraiser in THON history: Miles for Smiles.
-   Danced for 46 hours straight in THON 2019, helping the club raise $67,400.
-   To date have assisted in raising $370,000 for the Four Diamonds Fund.

Bike Tour de PA for CHILD USA                                                 Summer 2019
-   Completed a two week, 800-mile, solo bike tour around Pennsylvania benefiting
    CHILD USA, raising a few thousand dollars.
-   Met with CHILD USA representatives to encourage specific policies be proposed.
-   Featured on news to raise awareness of CHILD USA's mission against child abuse.