

RITVIK TEEGAVARAPU

✉ rteegava@caltech.edu | [in](#) [Ritvik Teegavarapu](#) | [ORCID](#) | [RitvikT](#) | ☎ 561-479-9015

Summary

Applied mathematics undergraduate student at Caltech with background in SDE theory and interacting particle systems toolled for optimization, and passionate about teaching through experience of being a teaching assistant and leading student-led classes. Aspiring to pursue a PhD in applied mathematics to further research in interacting particle systems.

Education

California Institute of Technology

B.S. in Applied and Computational Math

Sep. 2022 – June 2026

Pasadena, California

- GPA: 4.19/4.00
 - Senior Thesis: TBD | Prof. Franca Hoffmann
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Relevant Coursework

Pure Mathematics Coursework

Physics, Mathematics, and Astronomy Department

- Group Theory & Discrete Mathematics
- Real Analysis & Measure Theory
- Applied Linear & Functional Analysis

Applied Mathematics Coursework

Computing and Mathematical Sciences Department

- Numerical Linear Algebra & Numerical Analysis
 - Applied & Numerical Methods for PDEs, Theoretical PDEs & Computational Mean Field Games
 - Measure-Theoretic Probability Theory, Stochastic Processes, Statistical & Bayesian Inference, Optimal Transport
 - Machine & Statistical Learning, Inverse Problems & Data Assimilation
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Publications

Papers

Convergence Guarantees for Particle Swarm Optimization

Preprint in progress

- Franca Hoffmann, Dohyeon Kim, Ritvik Teegavarapu

Classification of Artificial & Real Objects Using Faster R-CNNs

Dec. 2021

2021 IEEE Symposium Series on Computational Intelligence

- Ritvik Teegavarapu, Dr. Debojit Biswas
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Conferences & Talks

Convergence Guarantees for Particle Swarm Optimization

Oral Presenter

- Summer Undergraduate Research Fellowship (SURF) Seminar Day, Caltech (Aug. 2024)
- Southern California Conference for Undergraduate Research, CSU San Bernardino (Nov. 2024)

Incorporating Stochastic Loading into Droplet-Based Digital PCR Model

Oral Presenter

- Summer Undergraduate Research Fellowship (SURF) Seminar Day, Caltech (Oct. 2023)

Classification of Artificial & Real Objects Using Faster R-CNNs

Oral Presenter

- IEEE Symposium Series on Computational Intelligence, Orlando (Dec. 2021)

Research

Convergence Guarantees for Particle Swarm Optimization (PSO)

with Doh Yeon Kim & Franca Hoffmann

Mar. 2024 – Present
Hoffmann Group, Caltech

- Named SURF Fellow for Summer 2024
- Proved first PSO convergence theorem using consensus-based optimization with memory model
- Illustrated tradeoffs in parameters through memory effect and choice of initial distribution
- Implementing both algorithms to showcase exponential convergence rate

Incorporating Stochastic Loading into Droplet-Based Digital PCR Model

with Matt Cooper & Rustem Ismagilov

Jun. 2023 – Sep. 2023
Ismagilov Lab, Caltech

- Named SURF Fellow for Summer 2023
- Sought to improve efficacy of lab measurements using droplet-based digital PCR
- Created forward model of droplet-based digital PCR reaction using Poisson processes
- Performed comparative analysis on forward model with and without loading noise

Classification of Artificial & Real Objects Using Faster R-CNNs

with Debojit Biswas

Oct. 2019 – Dec. 2021
FAU Research Park, FAU

- Implemented two CNN architectures; one with SSD detector back-end and R-CNN
- Performed comparative analysis between architectures in their efficiency and accuracy

Projects

Model Error Correction in Ensemble Data Assimilation

Class Project

Mar. 2024 – Jun. 2024
Caltech

- Investigated the two-scale Lorenz-96 system with surrogate model by learning increment step in data assimilation via neural network
- Implemented Ensemble Kalman filter, as well as auto-differentiable and neural-network corrected variant

Uncertainty Quantification in Climate Models

Class Project

Jan. 2024 – Mar. 2024
Caltech

- Investigated parameter recovery and uncertainty quantification in climate calibration models
- Utilized Ensemble Kalman Inversion & Sampler to recover the conversion rate in cloud microphysics model

Teaching

Head Teaching Assistant

ACM 116: Introduction to Probability Models

Fall 2024
On-site, part-time

- Led team of 8 TAs by making grading schedule, organizing office hours, answering questions on Piazza
- Typeset existing written lecture notes while also adding content through appendices or in lecture
- Hosted weekly office hours and exam review sessions to facilitate understanding of content

Teaching Assistant

ACM 11: Introduction to Computational Science and Engineering

Spring 2024
On-site, part-time

- Re-designed problem sets to further conceptual understanding of class topics
- Improved existing lecture notes to assist learning by adding appendices and code sections
- Hosted weekly office hours and additional recitations to facilitate understanding of content
- Received 4.98/5.00 rating in 2024

Teaching Assistant

Ma 1ab: Calculus of One Variable and Linear Algebra

Fall 2023, Winter 2024
On-site, part-time

- Hosted weekly office hours and exam review sessions to facilitate understanding of content
- Wrote in-depth recitation notes for students, as well as weekly grading of assignments
- Received 4.94/5.00 rating for Ma 1a, 4.89/5.00 rating for Ma 1b

Rise Tutor*Caltech Y*

Sep. 2022 – Present

On-site/Remote, part-time

- Tutored 10+ high school students for over 200+ hours in mathematics multiple times a week
- Developed resources (worksheets, presentations, examples) for students to learn concepts

Employment

Mentor/Consultant*My Mentor Global*

June 2022 – Present

Remote, part-time

- Helped international students review college essays, provided advice about studying in the United States, how to do well in high school
- Created presentations to reinforce important concepts about the college application process, and general mentoring

Test Writer*Florida Association of Mu Alpha Theta*

May 2022 – Present

Remote, part-time

- Wrote 300+ original math questions (statistics, calculus, algebra) for state and regional math competitions administered throughout year
- Served as an editor for the state and regional competitions

Leadership & Service

American Heritage Math Competition Team*Undergraduate Instructor*

Aug. 2024 – Present

- Led a mini-course on group theory and other undergraduate math topics for motivated high school math competition students
- Gave talks to introduce high schoolers to mathematics research and applied mathematics

Caltech Undergraduate Admissions Office*Lead Admissions Ambassador*

Apr. 2023 – Present

- Lead campus tours for interested students and parents
- Interact with students to help answer questions through webinars and Q+A's

Academics and Research Committee (ARC)*Freshman Rep. (2022-2023), At-Large Rep. (2023-2024), Secretary (2024-2025)*

Oct. 2022 – Present

- Serve on the committee of students to strengthen student-faculty relations
- Listen to students about course concerns, and actively work to improve classes

Caltech Math Meet (CMM)*Problem Writer (2022-2023), Vice President (2023-2025)*

Sep. 2022 – Present

- Organized a math competition for over 250+ high school students nationally
- Wrote 50+ problems for the inaugural integration bee, as well as individual and proof rounds

Awards

Hugh F. and Audy Lou Colvin SURF Fellow

Jul. 2024

CMS Teaching Assistant Fellow

Sep. 2023

John Stauffer SURF Fellow

Jun. 2023

Skills

Languages: English, Telegu

Computer Languages: \LaTeX , Python, MATLAB, Julia, R, Java

Developer Tools: Jupyter Notebooks, VS Code

References

Franca Hoffmann

Assistant Professor of Computing and Mathematical Sciences

Ricardo Baptista

von Karman Instructor of Computing and Mathematical Sciences

Kostia Zuev

Teaching Professor in Computing and Mathematical Sciences

✉ franca.hoffmann@caltech.edu

California Institute of Technology

✉ rsb@caltech.edu

California Institute of Technology

✉ kostia@caltech.edu

California Institute of Technology