

Emile Timothy Anand

Student at Caltech

Education:

California Institute of Technology / B.S. Computer Science

SEPTEMBER 2019 - JUNE 2023
(EXPECTED) / PASADENA, CA

- GPA: 4.13
- Focus: Distributed Computing, Theory of Computing & ML
- Clubs: Caltech Data Science Club & Caltech Eskrima Club

GEMS Cambridge International School, Dubai

GRADUATED JUNE 2019

- Top 1% of class
- Head Boy
- Campaign Manager for Green Hope Foundation (outreach in Suriname, Nepal, Bangladesh, Netherlands, India, and UAE)

Awards:

- Caltech SURF '21, '22
- George Housner Student Discovery Fund Award '22
- Richard Brewer Memorial Fellowship (Physics 11) '19
- IPhO UAE National Team
- Peterson-Ligocki Award '21
- Doris Everhart Award '21
- High School Valedictorian
- Ranked 2nd nationally in the A-level & IGCSE examinations, '19
- Winner of the World Scholars Cup Global Round, '17

Teaching (TA):

- CS 156ab: Learning From Data (Fall '21 / Spring '22)
- Ma 6a: Discrete Math ('21)
- CS 21: Decidability & Tractability (Winter '22)
- CS 11: Language Lab (C) '20
- Caltech Rise Volunteer Tutor
- Caltech Deans Tutor

Conferences:

- CCC '21 '22
- NeurIPS '21
- SIGACT TTIC School of Theory Computer Science '22
- QCoalition Hackathon, '21
- Caltech Hackathon, '20 '21

Other Interests:

- Varsity Track (800/1500) & XC
- Piano (Trinity Grade 8 Distinction)
- Languages: Tamil, French, Arabic, & Mandarin

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Portfolio: emiletimothy.github.io



Work & Research Experience:

The Associates Caltech Summer Undergraduate Research Fellowship

THE RIGOROUS SYSTEMS RESEARCH GROUP / FEB 2022 - CURRENT / ADAM WIERMAN AND YISONG YUE

- Proved a competitive ratio for the Model Predictive Control of LTV systems with noisy disturbance predictions & used perturbation analysis to show that the regularized online balanced descent (R-OBD) algorithm can be managed by a linear feedback policy by bounding the dynamic regret & competitive ratio.
- Theorized and implemented a novel ML pipeline with multi-armed bandits and losses derived by MPC – the result was an online data-adaptive MPC algorithm that could learn its optimal prediction window.
- Constructed a framework to measure variance propagation in dimensionality reduction methods to show that the variance of a dataset does not correlate with the variance-plots from t-SNE (implying that t-SNE does not preserve variance).

Caltech Independent Research and Undergraduate Thesis

THEORY OF COMPUTING GROUP / MARCH 2021 – CURRENT / PASADENA, CA / CHRIS UMANS

- Developed a framework to study random walks on expander graphs & showed how it explains correlations between the majority and parity bit of random strings from the random walk distribution.
- Proved that the total variational distance between a m-vertex sticky random walk & random m-ary string depends linearly on the bias which implies that randomness extractors are bias-likely to be fooled by pseudorandom bits, showed that HDX graphs originate from naïve simplicial complexes, & showed that any expander graph could be expressed as the topological minor of a uniform Markov chain on a complete graph

Caltech Independent Research

DECISION, OPTIMIZATION, LEARNING LAB (DOLCIT) / MARCH 2021 - CURRENT / YASER ABU-MOSTAFA

- Adapted financial deep-learning models (ARIMA, LSTM, SIR, VAR, & Neural Networks) on web-scraped data of COVID-19 vaccine delivery & variant infection rates to quantify vaccine efficacy for a project class.
- Proposed a novel learning-theoretic reason to explain why algorithms learn better with more data in terms of mutual cross-regularization.

Caltech Summer Undergraduate Research Fellowship

AUG 2021 - JUN 2021 / NIELS BOHR INSTITUTE, COSMIC DAWN CENTER, UC DENMARK / CHARLES STEINHARDT

- Trained ML models on mass-spectrographs of various chemicals to identify unknown chemicals, & used dimensionality-reduction (t-SNE, PCA, UMAP, NMF) to feature engineer the 'ogbg-molhiv' dataset.

Caltech Summer Undergraduate Research Fellowship

AUG 2020 - JUN 2020 / LIGO and IQIM / RANA ADHIKARI, MARIA SPIROPULU, AND ROBIE RAYMOND

- Used Finite Element Analysis & Particle Swarm Optimization to simulate acoustic band-limiting filters on COMSOL, & performed a cost-benefit analysis to test if they would efficiently shield the LIGO detector from detecting the thermal vibrations of the silicon metamaterial atoms in the mirror cavity.

Coding Projects:

Optimized Dynamic Memory Allocator and Address Sanitizer in C

MAR 2021 / JUN 2021

- Used free-lists to create an optimal dynamic memory allocator by minimizing `sbrk()` calls & using coalescing & block-splitting to enhance the allocator's utility and speed. Implemented an address sanitizer software with a heap buffer overflow feature.

Created a Programming Language (Tim) and a Compiler (TCompiler)

SEP 2021 / DEC 2021

- Used node-extraction & parsing to create a compiler for a basic syntax for complex computations.

Leveraged Solutions of the Binary Matrix to Solve Kanoodle (OCaml)

SEP 2021 / DEC 2021

- Implemented Y Combinators and Functors to solve the dancing links problem in the Kanoodle puzzle.

Skills:

- Proficient in Python (PyTorch, TensorFlow), R, C, MATLAB, Mathematica, Java, HTML/CSS/JS, MySQL, MongoDB, OCaml & LaTeX
- Experience with probability & control theory, supervised/unsupervised machine learning & dimensionality reduction algorithms.