Manuel A. Santana

msantana@caltech.edu • manuelarturosantana.github.io

EDUCATION

PhD. Applied and Computational Mathematics — June 2027 (expected)
California Institute of Technology, Pasadena California

B.S. Computational Mathematics, Computer Science Minor — May 2022
Utah State University, Logan, Utah — 3.90 Cum. GPA

Research Interests

I am broadly interested in developing scalable PDE solvers for complex geometries, especially for wave equations. I am currently working on integral equation methods for finding resonances and scattering poles for the Helmholtz and Maxwell equations.

Research Articles

Preprints

O. P. Bruno, , **M. A. Santana,** L. N. Trefethen, 2024 *Evaluation of Resonances via AAA Rational Approximation of Randomly Scalarized Boundary Integral Resolvents* arXiv:2405.19582

Published Articles

Brauer A, Krawick M, and **Santana M. A.** 2020. Numerical Analysis of the 1-D Parabolic Optimal Transport Problem, *SIAM SIURO*, *Vol 14*:150-166

Beasley L, Brown D, Mousley J, and **Santana M. A.** 2023 Cordiality of Digraphs, *Journal of Algebra Combinatorics Discrete Structures and Applications, Vol* 10, Issue 1, pp.1-13

Huynh M, **Santana M. A.** 2021. Alternating Minimization for Computed Tomography with Unknown Geometry Parameters, *SIAM SIURO, Vol 15:62-76,* 2022 DOI:10.1137/21S1441638

Conference Papers:

M. A. Santana, L. N. Trefethen, O. P. Bruno, “Computation of Cavity Resonances via AAA Rational Approximation of Randomly Scalarized Boundary Integral Resolvents”, in L. Gizon (Editor), Book of Abstracts, The 16th International Conference on Mathematical and Numerical Aspects of Wave Propagation (WAVES 2024), pp. 19-24 (2024), DOI 10.17617/3.MBE4AA (Edmond MPDL).

Santana, M., Mousley, J., Brown, D., Beasley, L.B. 2024. (2, 3)-Cordial Trees and Paths. In: Hoffman, F., Holliday, S., Rosen, Z., Shahrokhi, F., Wierman, J. (eds) Combinatorics, Graph Theory and Computing.

SEICCGTC 2021. Springer Proceedings in Mathematics & Statistics, vol 448. Springer, Cham. https://doi.org/10.1007/978-3-031-52969-6_12

Mousley, J.M., Beasley, L.B., **Santana, M.** Brown, D.E. 2024. (2, 3)-Cordial Oriented Hypercubes. In: Hoffman, F., Holliday, S., Rosen, Z., Shahrokhi, F., Wierman, J. (eds) Combinatorics, Graph Theory and Computing. SEICCGTC 2021. Springer Proceedings in Mathematics & Statistics, vol 448. Springer, Cham. https://doi.org/10.1007/978-3-031-52969-6_13

Technical Skills

- Python including Numpy, Pandas, Pytorch
- Matlab including parallel computing toolbox, optimization toolbox, and image processing toolbox.
- C/C++
- Git
- Latex

Professional Experience

SULI Intern June 2022- August 2022

National Renewable Energy Laboratory (NREL)

- I implemented code in python to train several transformer models experimental battery again data in an effort to predict battery lifetime performance.

Teaching Experience

Teaching Assistant August 2023 – Current

California Institute of Technology

- Hold weekly office hours and grade course material.

Linear Algebra Recitation Leader August 2020 – August 2021

Utah State University, Logan, Utah

- Teach four recitations for an introductory Linear Algebra course weekly.
- Assist students in office hours with understanding course material.

Awards

Goldwater Scholar March 2021
NSF Graduate Research Fellowship April 2022
Undergraduate Researcher of the Year - College of Science, Utah State University 2021
Undergraduate Researcher of the Year - Math Department, Utah State University 2021
Hispanic Scholarship Fund Scholar May 2020

Utah State University Presidential Scholar August 2016

Clubs and Organizations

Utah State Science Council – Undergraduate Research VP August 2021 – Current

- Promoted undergraduate research on campus by organizing a research presentation competition, and an REU application workshop night.

College of Science Peer Mentorship Program - Mentor August 2021 – Current

- Met weekly with a freshman student to offer help with knowing what classes to take, developing good study habits, and obtaining a research position.