

ADRIAN CELAYA

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EDUCATION

Rice University **May 2025 (expected)**
Ph.D. Computational and Applied Mathematics Houston, TX
Advisors: Beatrice Riviere and David Fuentes

Rice University **May 2023**
M.A. Computational and Applied Mathematics Houston, TX
Advisors: Beatrice Riviere and David Fuentes
Thesis: *PocketNet: A Smaller Neural Network for Medical Image Analysis*
Overall GPA: 3.91/4.00

Rice University **May 2016**
B.A. Computational and Applied Mathematics Houston, TX
Overall GPA: 3.70/4.00

PROFESSIONAL EXPERIENCE

Google Research **June 2024 - Aug. 2024**
Research Intern, Advisor: Keerthana Natarajan San Francisco, CA

- Developed novel machine and deep learning-based algorithms for consumer health applications that improved upon existing internal and commercially available algorithms by as much as 15%.
- Created automated quality assessment tools for identifying noisy or problematic cases in a study that collected data from hundreds of runners, resulting in faster and more consistent quality assessment of data.
- Wrote a Python-based preprocessing library for data collected from runners that can be reused for other projects, resulting in faster development of consumer health-related products and algorithms.

TotalEnergies **May 2023 - Aug. 2023**
Research Intern, Advisor: Mauricio Araya-Polo Houston, TX

- Developed and published novel, state-of-the-art physics informed neural networks for the inversion of surface gravity data for CO₂ sequestration monitoring.
- Developed and published novel, state-of-the-art, deep learning-based methods for the joint inversion of seismic and surface gravity data for CO₂ sequestration monitoring.

TotalEnergies **May 2022 - Aug. 2022**
Research Intern, Advisor: Mauricio Araya-Polo Houston, TX

- Developed and published novel, state-of-the-art deep learning methods for the inversion of surface gravity data for CO₂ sequestration monitoring.

MD Anderson Cancer Center
Research Assistant, Advisor: David Fuentes

Sept. 2020 - July 2021
Houston, TX

- Developed novel, computationally efficient deep learning architectures for 3D medical image segmentation and classification.
- Created Docker images for containerizing complex neuroimaging analysis pipelines, allowing the work of previous researchers to be easily integrated into ongoing and future projects.
- Mentored two summer students through the Cancer Prevention & Research Institute of Texas (CPRIT)-CURE Summer Undergraduate Program.

U.S. Navy - USS Carl Vinson
Information System Security Manager

Aug. 2016 - Aug. 2020
San Diego, CA

- Led a team of 9 highly talented cybersecurity analysts who oversaw the security and integrity of a \$20,000,000 computer network consisting of roughly 4,000 assets with zero intrusions or major incidents.
- Implemented a comprehensive network security program that resulted in the organization's highest ever cybersecurity score when evaluated by external security auditors.
- Received extensive training on computer and communication networks, cryptographic key management, and computer network defense.
- Security clearance: Top Secret/Sensitive Compartmented Information.

GRANTS & FELLOWSHIPS

National Defense Science & Engineering Fellowship
Department of Defense

Sep. 2022 - Aug. 2025
Houston, TX

Loewenstern Fellowship
Rice University

Aug. 2021 - Oct. 2022
Houston, TX

PEER-REVIEWED PUBLICATIONS

Journal Manuscripts

1. **A. Celaya**, D. Fuentes, and B. Riviere. "Learning Discontinuous Galerkin Solutions to Elliptic Problems via Graph Neural Networks," in progress, 2025.
2. **A. Celaya**, Y. Wang, D. Fuentes, and B. Riviere. "Learning Discontinuous Galerkin Solutions to Elliptic Problems via Small Linear Convolutional Neural Networks," submitted to *SIAM Journal on Scientific Computing*, under review, 2025.
3. R. Muthusivarajan, **A. Celaya**, M. Farhat, W. Talpur, H. Langshaw, V. White, A. Elliott, S. Thrower, D. Schellingerhout, D. Fuentes, and C. Chung. "Deep Learning-Based Automated Post-Operative Gross Tumor Volume Segmentation in High-Grade Glioma Patients," in progress, 2024.
4. R. Glenn, T. Netherton, B. Riviere, **A. Celaya**, E. Koay, and D. Fuentes. "Primer of Quantum Computing for Medical Physicists," submitted to *Journal of Applied Clinical Medical Physics*, under review, 2024.

5. **A. Celaya**, B. Riviere, and D. Fuentes. “A Generalized Surface Loss for Reducing the Hausdorff Distance in Medical Imaging Segmentation,” *arXiv preprint arXiv:2302.03868*, in progress, 2024.
6. **A. Celaya**, N. Patel, M. Eltaher, R. Glenn, K. B. Savannah, K. Brock, J. Sanchez, T. Calderone, D. Cleere, A. Elsaiey, M. Cagley, N. Gupta, D. Victor, L. Beretta, E. Koay, T. Netherton, D. Fuentes. “Training Robust T1-Weighted Magnetic Resonance Imaging Liver Segmentation Models Using Ensembles of Datasets with Different Contrast Protocols and Liver Disease Etiologies,” in *Scientific Reports*, doi: 10.1038/s41598-024-71674-y
7. **A. Celaya**, K. Kirk, D. Fuentes, and B. Riviere, “Solutions to Elliptic and Parabolic Problems via Finite Difference Based Unsupervised Small Linear Convolutional Neural Networks,” in *Computers & Mathematics with Applications*, doi: 10.1016/j.camwa.2024.08.013.
8. R. Muthusivarajan, **A. Celaya**, J. Yung, S. Viswanath, D. Marcus, C. Chung, and D. Fuentes. “Evaluating the Relationship Between Magnetic Resonance Image Quality Metrics and Deep Learning-Based Segmentation Accuracy of Brain Tumors,” in *Medical Physics*, doi: 10.1002/mp.17059
9. **A. Celaya**, B. Denel, Y. Sun, M. Araya-Polo, and A. Price. “Inversion of Time-Lapse Surface Gravity Data for Detection of 3D CO₂ Plumes via Deep Learning,” in *IEEE Transactions on Geosciences and Remote Sensing*, doi: 10.1109/TGRS.2023.3273149.
10. **A. Celaya**, J. A. Actor, R. Muthusivarajan, E. Gates, C. Chung, D. Schellingerhout, B. Riviere, and D. Fuentes. “PocketNet: A Smaller Neural Network For Medical Image Analysis,” in *IEEE Transactions on Medical Imaging*, doi: 10.1109/TMI.2022.3224873.
11. E. Gates, D. Suki, **A. Celaya**, J. Weinberg, S. Prabhu, R. Sawaya, J. Huse, J. Long, D. Fuentes, and D. Schellingerhout. “Cellular Density in Adult Glioma, Estimated with MR Imaging Data and a Machine Learning Algorithm, Has Prognostic Power Approaching World Health Organization Histologic Grading in a Cohort of 1181 Patients,” in *American Journal of Neuroradiology*, doi: 10.3174/ajnr.A7620.
12. E. Gates, **A. Celaya**, D. Suki, D. Schellingerhout, and D. Fuentes. “Technical Note: An efficient MR image data quality screening dashboard,” in *Journal of Applied Clinical Medical Physics*, doi: 10.1002/acm2.13557.

Conference Proceedings

1. **A. Celaya**, D. Fuentes, and B. Riviere. “An Adaptive Collocation Point Strategy For Physics Informed Neural Networks via the QR Discrete Empirical Interpolation Method,” *arXiv preprint arXiv:2501.07700*, submitted to *42nd International Conference on Machine Learning*, under review, 2025.
2. **A. Celaya**, E. Lim, R. Glenn, B. Mi, A. Balsells, T. Netherton, C. Chung, B. Riviere, and D. Fuentes. “MIST: A Simple and Scalable End-To-End 3D Medical Imaging Segmentation Framework,” *arXiv preprint arXiv:2407.21343*, submitted to *The 2024 Brain Tumor Segmentation (BraTS) Challenge*, accepted, 2024.
3. **A. Celaya** and M. Araya-Polo. “Deep Learning-Based Joint Inversion of Time-Lapse Surface Gravity and Seismic Data for Monitoring of 3D CO₂ Plumes,” in *4th International Meeting for Applied Geoscience & Energy*, doi: 10.1190/image2024-4093199.1

4. **A. Celaya**, B. Riviere, and D. Fuentes. “FMG-Net and W-Net: Multigrid Inspired Deep Learning Architectures For Medical Imaging Segmentation,” in *Proceedings of LatinX in AI (LXAI) Research Workshop @ NeurIPS 2023*, doi: 10.52591/lxai202312104
5. **A. Celaya**, B. Denel, Y. Sun, and M. Araya-Polo “Inversion of Time-Lapse Surface Gravity Data for Monitoring of 3D CO₂ Plumes via Physics Informed Neural Networks,” in *Proceedings of the 2024 SIAM Conference on Parallel Processing for Scientific Computing*, doi: 10.1137/1.9781611977967.1

CONFERENCE PRESENTATIONS

1. **A. Celaya** “MIST: A Simple and Scalable End-To-End 3D Medical Imaging Segmentation Framework,” in *Brain Tumor Segmentation Challenge Workshop @ MICCAI 2024*. Invited speaker. Marrakesh, Morocco. October 2024.
2. **A. Celaya** “MIST: A Simple and Scalable End-To-End 3D Medical Imaging Segmentation Framework,” in *The University of Texas MD Anderson Institute for Data Science In Oncology Focus Area Forum*. Invited speaker. Houston, TX. September 2024.
3. **A. Celaya** “Inversion of Time-Lapse Surface Gravity Data for Monitoring of 3D CO₂ Plumes via Physics Informed Neural Networks,” in *2024 SIAM Conference on Parallel Processing for Scientific Computing*. Contributed talk. Baltimore, MD. March 2024.
4. **A. Celaya**. “FMG-Net and W-Net: Multigrid Inspired Deep Learning Architectures For Medical Imaging Segmentation,” in *LatinX in AI (LXAI) Research Workshop @ NeurIPS 2023*. Oral Presentation. New Orleans, LA. December 2023.
5. **A. Celaya**. “Joint inversion of Time-Lapse Surface Gravity and Seismic Data for Monitoring of 3D CO₂ Plumes via Deep Learning,” in *LatinX in AI (LXAI) Research Workshop @ NeurIPS 2023*. Oral Presentation. New Orleans, LA. December 2023.
6. **A. Celaya**. “Multigrid Inspired Deep Learning Architectures for Medical Imaging Segmentation,” in *6th Annual SIAM Texas-Louisiana Section Meeting*. Invited Minisymposium Presentation. Lafayette, LA. November 2022.
7. **A. Celaya**. “Solutions to Elliptic and Parabolic Problems via Finite Difference Based Unsupervised Small Linear Convolutional Neural Networks,” in *1st Annual Research Training Group in Numerical Mathematics and Scientific Computing at Rice University Workshop*. Technical Talk. Houston, TX. October 2023.
8. **A. Celaya**. “Multigrid Inspired Deep Learning Architectures for Medical Imaging Segmentation,” in *2nd Annual AI in Health Conference*. Technical Talk. Houston, TX. October 2023.
9. **A. Celaya** “Inversion of Time-Lapse Surface Gravity Data for Detection of 3D CO₂ Plumes via Deep Learning,” in *16th Annual Energy High Performance Computing Conference*. Technical Talk. Houston, TX. February 2023.
10. **A. Celaya** . “PocketNet: A Smaller Neural Network For Medical Image Analysis,” in *5th Annual SIAM Texas-Louisiana Section Meeting*. Invited Minisymposium Presentation. Houston, TX. November 2022.

11. **A. Celaya**. “Small Convolutional Neural Networks for Efficient 3D Medical Image Segmentation,” in *63rd American Association of Physicists in Medicine Annual Meeting*. Virtual. July 2021.

CONFERENCE POSTERS

1. **A. Celaya**, B. Riviere, D. Fuentes. “Multigrid Inspired Deep Learning Architectures for Medical Imaging Segmentation,” in *5th Annual NDSEG Fellows Conference*. New Orleans, LA. July 2024.
2. **A. Celaya**, B. Riviere, D. Fuentes. “Multigrid Inspired Deep Learning Architectures for Medical Imaging Segmentation,” in *39th Annual Society for Thermal Medicine Meeting*. Houston, TX. May 2024.
3. Y. Wang, **A. Celaya**, and B. Riviere. “Discontinuous Galerkin-Based Physics Informed Neural Networks for Elliptic Problems,” in *6th Annual SIAM Texas-Louisiana Section Meeting*. Lafayette, LA. November 2022.
4. **A. Celaya**, A. Diaz, A. Balsells, R. Glenn, B. Riviere, and D. Fuentes. “A Weighted Normalized Boundary Loss for Reducing the Hausdorff Distance in Medical Imaging Segmentation,” in *65th American Association of Physicists in Medicine Annual Meeting*. Houston, TX. July 2023.
5. A. Balsells, B. Riviere, D. Fuentes, and **A. Celaya**. “Interactive Brain Tumor Image Segmentation,” in *5th Annual SIAM Texas-Louisiana Section Meeting*, Houston, TX. October 2022.
6. A. Balsells, B. Riviere, D. Fuentes, and **A. Celaya**. “Interactive Brain Tumor Image Segmentation,” in *32nd Keck Annual Research Conference*, Houston, TX. October 2022.
7. R. Muthusivarajan, **A. Celaya**, J. Yung, S. Viswanath, D. Marcus, C. Chung, and D. Fuentes. “Evaluating the Relationship Between Magnetic Resonance Image Quality Metrics and Deep Learning-Based Segmentation Accuracy of Brain Tumors,” in *64th American Association of Physicists in Medicine Annual Meeting*. Washington, DC. July 2022.
8. E. Gates, **A. Celaya**, D. Schellingerhout, and D. Fuentes. “Automated Cerebrospinal Fluid ROI Selection on Brain Magnetic Resonance Images,” in *30th Keck Annual Research Conference*. Virtual. October 2020.

PROFESSIONAL SERVICE & ACTIVITIES

Manuscript Review: *Medical Physics*, *IEEE Transactions on Geoscience and Remote Sensing*, *IEEE Transactions on Medical Imaging*

Conference Planning: Research Training Group in Numerical Mathematics and Scientific Computing at Rice University Annual Retreat

SOFTWARE

Medical Imaging Segmentation Toolkit (MIST)

MIST is a simple and scalable end-to-end framework for medical image segmentation. The framework can seamlessly handle various medical imaging data and is easily expandable to test new ideas (i.e., new architectures, loss functions, etc.). MIST is open source, written in Python for PyTorch, and available at <https://github.com/mist-medical/MIST>.

HONORS & AWARDS

3rd Place - BraTS Challenge 2024 MICCAI 2024	Oct. 2024 Marrakesh, MAR
Invited Young Researcher 11th Heidelberg Laureate Forum	Sept. 2024 Heidelberg, GE
SIAM PP24 Student Travel Award SIAM	Jan. 2024 Houston, TX
Navy Marine Corps Commendation Medal U.S. Navy	Aug. 2020 San Diego, CA
President's Honor Roll Rice University	May 2016 Houston, TX

SKILLS

Languages Spoken: English (native), Spanish (conversant)
Programming Languages and Software: Python, Matlab, C/C++, Julia, PyTorch, TensorFlow, Keras, Docker, L^AT_EX