ADRIAN CELAYA

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EDUCATION

Rice University   **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

Research Intern   **May 2023 - Aug. 2023**
                                                                              May 2022 - Aug. 2022
TotalEnergies, 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 CO_2 sequestration monitoring
- Developed novel, state-of-the-art physics informed neural networks for the inversion of surface gravity data for CO_2 sequestration monitoring
- Developed novel, state-of-the-art, deep learning-based methods for the joint inversion of seismic and surface gravity data for CO_2 sequestration monitoring

Research Assistant   **Sept. 2020 - July 2021**
MD Anderson Cancer Center, Advisor: David Fuentes   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

Information System Security Manager   **Aug. 2016 - Aug. 2020**
U.S. Navy, USS Carl Vinson   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

GRANTS & FELLOWSHIPS

National Defense Science & Engineering Fellowship **Sep. 2022 - May 2025**
Department of Defense Houston, TX

Loewenstern Fellowship **Aug. 2021 - Oct. 2022**
Rice University Houston, TX

PEER-REVIEWED PUBLICATIONS

Journal Manuscripts

1. **A. Celaya**, K. Kirk, D. Fuentes, and B. Riviere, "Finite Difference Solutions to Elliptic and Parabolic Problems via Unsupervised Small Linear Convolutional Neural Networks," in progress, 2023.

2. R. Glenn, **A. Celaya**, B. Riviere, T. J. Netherton, and D. Fuentes. "Comparison of Quantum Image Segmentation with AI Image Segmentation," in progress, 2023.

3. **A. Celaya**, A. Diaz, A. Balsells, B. Riviere, and D. Fuentes. "A Weighted Normalized Boundary Loss for Reducing the Hausdorff Distance in Medical Imaging Segmentation," *arXiv preprint arXiv:2302.03868*, to be submitted, 2023.

4. **A. Celaya**, B. Denel, Y. Sun, M. Araya-Polo, and A. Price. "Inversion of Time-Lapse Surface Gravity Data for Detection of 3D CO_2 Plumes via Deep Learning," in *IEEE Transactions on Geosciences and Remote Sensing*, doi: 10.1109/TGRS.2023.3273149.

5. 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," *arXiv preprint arXiv:2111.01093*, submitted to *Medical Physics*, under review, 2022.

6. **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.

7. 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.

8. 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**, B. Riviere, and D. Fuentes. "FMG-Net and W-Net: Multigrid Inspired Deep Learning Architectures For Medical Imaging Segmentation," *arXiv preprint arXiv:2304.02725*, submitted to *LatinX in AI (LXAI) Research Workshop @ NeurIPS 2023*, under review, 2023.

2. **A. Celaya**, B. Denel, Y. Sun, and M. Araya-Polo "Inversion of Time-Lapse Surface Gravity Data for Monitoring of 3D CO_2 Plumes via Physics Informed Neural Networks," submitted to *SIAM Conference on Parallel Processing for Scientific Computing*, under review, 2023.

3. **A. Celaya**, M. Araya-Polo, "Joint inversion of Time-Lapse Surface Gravity and Seismic Data for Monitoring of 3D CO_2 Plumes via Deep Learning," submitted to *Supercomputing 2023: 4th Workshop on Artificial Intelligence and Machine Learning for Scientific Applications*, under review, 2023.

CONFERENCE PRESENTATIONS

1. **A. Celaya** "Inversion of Time-Lapse Surface Gravity Data for Detection of 3D CO_2 Plumes via Deep Learning," in *16th Annual Energy High Performance Computing Conference*. Technical Talk. Houston, TX. February 2023.

2. **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.

3. **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**, 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.

2. 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.

3. A. Balsells, B. Riviere, D. Fuentes, and **A. Celaya**. "Interactive Brain Tumor Image Segmentation," in *32nd Keck Annual Research Conference*, Houston, TX. October 2022.

4. 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.

5. 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*

SOFTWARE

Medical Imaging Segmentation Toolkit (MIST)
The Medical Imaging Segmentation Toolkit (MIST) is a simple, fully automated framework for deep learning-based 3D medical image segmentation. The framework can seamlessly ingest 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 TensorFlow, and available at `https://github.com/aecelaya/MIST`.

HONORS & AWARDS

Navy Marine Corps Commendation Medal   **Aug. 2020**
U.S. Navy   San Diego, CA

President's Honor Roll   **May 2016**
Rice University   Houston, TX

SKILLS

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