

Jonas Actor

Ph.D. Candidate, Rice University
Department of Computational and Applied Mathematics
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Education **Rice University**, Houston, TX
Ph.D., Computational and Applied Mathematics, May 2021 (expected).
Advisers: Beatrice Riviere and David Fuentes
Thesis: Physics-Based Machine Learning for Image Segmentation

Rice University, Houston, TX
M.A., Computational and Applied Mathematics, August 2018.
Adviser: Matthew Knepley
Thesis: Computation of the Kolmogorov Superposition Theorem

University of Chicago, Chicago, IL
B.S., Mathematics, June 2016.

Research **Rice University**, Department of Computational and Applied Mathematics
PDE's and neural networks in image segmentation for hepatocellular carcinoma
August 2018 - May 2021
PI: Lydia Kaviraki

Lawrence Berkeley National Laboratory, Department of Energy
Computation of inertia for HSS matrices via STRUMPACK
May 2018 - August 2018
PI: Xiaoye Li

Rice University, Department of Computational and Applied Mathematics
Computation of Kolmogorov Representation for multivariate continuous functions
August 2016 - May 2018
PI: Matthew Knepley

NanoEar, Research Consultant
Modeling vibration of tympanic membrane to develop new hearing aid technology
September 2017 - May 2018

University of Texas, Institute for Computational Engineering and Sciences
Modeling of CaCO_3 fouling in heat exchangers
Summer 2015
PI: Ivo Babuška

Awards and Fellowships

Center for Teaching Excellence, Rice University, November 2020
Graduate Teaching Award for Course Support (nominated/pending)
Center for Teaching Excellence, Rice University, October 2020
Graduate Teaching Award for Independent Instruction (nominated/pending)
SIAM Imaging Sciences 20 Student Travel Award, July 2020
SIAM Gene Golub Student Summer School, Summer 2019
Predocctoral Fellow, National Library of Medicine, 2018 - 2021
Training Grant in Biomedical Informatics and Data Science
Honorable Mention, National Science Foundation GRFP, 2018
Alan Weiser Memorial Travel Award, Summer 2018
Ken Kennedy Institute Graduate Enhancement Fellowship, 2016 - 2020

Papers

ACTOR, J. A., AND RIVIERE, B. Fully Implicit DG Formulations for Time-Dependent Coupled Darcy - Navier-Stokes Equations. (2020). In preparation.

ACTOR, J. A., ESCOBAR, S., FUENTES, D., AND RIVIERE, B. Depthwise Convolution Factorization for Network Compression. In *Computer Vision and Pattern Recognition (CVPR) 2021* (2021). In preparation.

ACTOR, J. A., RIVIERE, B., ELSAYES, K., AND FUENTES, D. Effects of CT Scanner Type on Deep Learning Segmentation Algorithms. In *IEEE International Symposium of Biomedical Imaging 2021* (2021). Submitted.

ACTOR, J. A., FUENTES, D. T., AND RIVIERE, B. Robust Regularized Networks in the Presence of Noise. *Medical Image Analysis* (2020). In revision.

ACTOR, J. A., AND MYERS, R. B. Bridging the Gaps: Adapting a Deep Learning Model for a Mixed Audience. *ACM TOCE* (2020). Submitted.

ACTOR, J. A., FUENTES, D., AND RIVIERE, B. Identification of Kernels in a Convolutional Neural Network: Connections Between Level Set Equation and Deep Learning for Image Segmentation. In *SPIE Medical Imaging Conference 2020* (2020).

BABUŠKA, I., SILVA, R. S., AND ACTOR, J. Break-off model for CaCO₃ fouling in heat exchangers. *International Journal of Heat and Mass Transfer* 116 (2018), 104–114.

Reports

ACTOR, J. A. Computation for the Kolmogorov Superposition Theorem. Thesis for degree of Masters of Arts, 2018. Rice University.

ACTOR, J. A., AND KNEPLEY, M. G. An algorithm for computing Lipschitz Inner Functions in Kolmogorov's Superposition Theorem. *arXiv* (2017).

KNEPLEY, M. G., ACTOR, J. A., BAUMAN, P., AND ADAMS, M. The Kolmogorov Superposition Theorem for Machine Learning. Tech. rep., Department of Energy, 2018. Scientific Machine Learning Workshop.

Presentations ACTOR, J. A. Lipschitz Regularization of Convolution Operators for Stable Image Segmentation. In *SIAM Computational Science and Engineering 2021* (2021). Contributed Talk.

ACTOR, J. A. Upwind Schemes and Neural Networks for Image Segmentation. In *SIAM Texas-Louisiana Sectional Meeting* (2020). Invited Minisymposium Presentation.

ACTOR, J. A. Spectral Norms of Convolution Kernels for Medical Image Segmentation. In *SIAM Imaging Sciences 2020* (2020). Contributed Talk.

ACTOR, J. A. Stabilized Image Segmentation in the Presence of Noise. In *National Library of Medicine Informatics Training Conference* (2020). Open Mic Talk.

ACTOR, J. A. Neural Networks for Image Segmentation of Liver. In *SIAM Texas-Louisiana Sectional Meeting* (2019). Invited Minisymposium Presentation.

ACTOR, J. A., FUENTES, D., AND RIVIERE, B. Identification of Kernels in a Convolutional Neural Network: Connections Between Level Set Equation and Deep Learning for Image Segmentation. In *Ken Kennedy Institute Rice Data Science Conference* (2019). Presentation.

ACTOR, J. A. Upwind Schemes and Deep Learning for Image Segmentation. In *SIAM Gene Golub Student Summer School 2019 Student Panel* (2019). Lightning Talk.

ACTOR, J. A., AND KNEPLEY, M. G. Exploiting Lipschitz Continuity for the Kolmogorov Superposition Theorem. In *Sparse Grids and their Applications* (2018). Presentation.

Seminars ACTOR, J. A. Nonnegative Matrix Factorizations. Presentation, 2020. Rice University SIAM Student Chapter Journal Club.

ACTOR, J. A. Models for Medical Image Segmentation. Presentation, 2020. Departmental Graduate Student Seminar.

ACTOR, J. A. Understanding Neural Networks for Image Segmentation. Presentation, 2019. Departmental Graduate Student Seminar.

ACTOR, J. A. A Series of Lightning Talks on CAAM Summer Experiences. Lightning Talk, 2019. Departmental Graduate Student Seminar.

ACTOR, J. A. Tensor Decompositions. Presentation, 2019. Rice University SIAM Student Chapter Journal Club.

ACTOR, J. A. Level Set Networks for Medical Image Segmentation. Presentation, 2019. Departmental Graduate Student Seminar.

ACTOR, J. A. Fast Marching Methods. Presentation, 2019. Rice University SIAM Student Chapter Journal Club.

ACTOR, J. A. Finding the Inertia of HSS Matrices. Presentation, 2018. Departmental Graduate Student Seminar.

ACTOR, J. A. A Primer on Image Segmentation. Presentation, 2018. Departmental Graduate Student Seminar.

ACTOR, J. A. Lipschitz Inner Functions in Kolmogorov Superposition Theorem. Presentation, 2017. Departmental Graduate Student Seminar.

Posters ACTOR, J. A., RIVIERE, B., AND FUENTES, D. Stabilized Image Segmentation in the Presence of Noise. In *30th Annual Keck Center Research Conference: A Science Odyssey* (2020). Poster Talk.

ESCOBAR, S., AND ACTOR, J. A. Effects of Convolution Dimension for Medical Image Segmentation. In *SIAM Texas-Louisiana Sectional Meeting* (2020). Poster.

ACTOR, J. A., RIVIERE, B., AND FUENTES, D. Stabilizing Deep Convolutional Neural Networks for Image Segmentation. In *Ken Kennedy Institute Rice Oil and Gas High Performance Computing Conference 2020* (2020). Poster.

ACTOR, J. A., RIVIERE, B., AND FUENTES, D. Efficient and Robust CT Image Segmentation with a Level Set Network. In *AMIA Annual Symposium* (2019). Poster.

ACTOR, J. A., RIVIERE, B., AND FUENTES, D. Kernel Analysis of a Neural Network for Liver Segmentation. In *29th Annual Keck Center Research Conference: Precision Environmental Health* (2019). Poster.

MCCOLLUM, E., GATES, E., ACTOR, J. A., AND FUENTES, D. Opening the Black Box of a Convolutional Neural Network Used for Brain Tumor Segmentation. In *2019 CPRIT CURE Summer Undergraduate Research Program* (2019). Poster.

ACTOR, J. A., RIVIERE, B., AND FUENTES, D. A Comparison of Image Segmentation Methods. In *SIAM Gene Golub Student Summer School 2019 Poster Session* (2019). Poster.

ACTOR, J. A., RIVIERE, B., AND FUENTES, D. A Comparison of Image Segmentation Methods. In *Ken Kennedy Institute Rice Oil and Gas High Performance Computing Conference 2019* (2019). Poster.

ACTOR, J. A., RIVIERE, B., AND FUENTES, D. Liver Segmentation via Unrolled Mumford-Shah Neural Network. In *28th Annual Keck Center Research Conference: Data Science and Machine Learning for Bioinformatics* (2018). Poster.

ACTOR, J. A., GHYSELS, P., AND LI, X. Inertia of HSS Matrices using STRUMPACK. Poster, 2018. CSSSP Poster Session, Lawrence Berkeley National Laboratory.

ACTOR, J. A., AND KNEPLEY, M. G. Kolmogorov Superposition Theorem: Univariate Encodings for Multivariate Functions. In *Ken Kennedy Institute Rice Data Science Conference* (2017). Poster.

BABUŠKA, I., SILVA, R. S., AND ACTOR, J. Modeling CaCO_3 Fouling in Heat Exchangers. In *Advances in Mathematics of Finite Elements Conference* (2016). Poster.

ACTOR, J. A., HWANG, S.-A., MONROE, W., MORADO, D., PAREDES, A., LIU, J., AND ACTOR, J. K. Serial Block Face SEM Visualization of Tuberculosis-Infected Macrophages. In *Fall Meeting of the American Society of Microbiology, Texas Branch* (2014). Poster.

Service **SIAM Student Chapter**, Rice University
President, Fall 2017 - Fall 2018
Secretary, Fall 2016 - Fall 2017

Center for Academic and Professional Communication, Rice University
Graduate Consultant, August 2019 - May 2021

Center for Teaching Excellence, Rice University
Graduate Liaison, Fall 2019 - Spring 2021

Department of Computational and Applied Mathematics, Rice University
Graduate Student Advisory Committee, Summer 2020 - Fall 2020
Graduate Seminar Coordinator, Fall 2019 - Spring 2020

Gulf Coast Consortia,
NLM Fellows Seminar Coordinator, Fall 2019 - Spring 2021

Graduate Student Association, Rice University
Graduate Wellness Peer, Spring 2019 - Spring 2021

Mentoring **Sofia Escobar**, Rice University
Undergraduate, Computational and Applied Mathematics
Deep Learning and Mathematics for Medical Image Segmentation
September 2019 - May 2021

Xinru Zhang, Rice University
Professional Master's Program, Computational and Applied Mathematics
Peer Mentoring Program
August 2020 - May 2021

Teaching **Rice University**, Rice Emerging Scholars Program (Coding Track)
Instructor, UNIV 105, Introduction to Coding in Python, Summer 2020
Instructor, UNIV 105, Introduction to Coding in Python, Summer 2019

Rice University, Department of Computer Science
Guest Lecturer, COMP 543, Graduate Tools and Models - Data Science, Fall 2019

Rice University, Program in Writing and Communication
Guest Lecturer, UNIV 600, Academic Reading and Writing, Fall 2020

Rice University, Department of Computational and Applied Mathematics
Grader, CAAM 520, Computational Science II, Spring 2020
Grader, CAAM 519, Computational Science I, Fall 2019
Grader, CAAM 336, Differential Equations in Science and Engineering, Spring 2019
Grader, CAAM 336, Differential Equations in Science and Engineering, Fall 2018
Course Assistant, CAAM 536, Numerical Methods for PDEs, Spring 2018
Grader, CAAM 453, Numerical Analysis I, Fall 2017
Grader, CAAM 335, Matrix Analysis, Spring 2017
Grader, CAAM 335, Matrix Analysis, Fall 2016

Extracurricular **Board of Directors**, Houston Hillel, Houston, TX
June 2020 - June 2021

Volunteer Youth Adviser, Congregation Or Ami, Houston, TX
Spring 2018 - Spring 2021

Youth Adviser, Congregation Brith Shalom, Bellaire, TX
Fall 2016 - Spring 2018

Coding Python, Matlab, TensorFlow, Keras, \LaTeX , Amira, FEniCS, PETSc, ITKSnap

Memberships SIAM, AMIA, SPIE