

# Jonas Actor

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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 (subject to renewal)  
PI: Lydia Kavradi

**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  $\text{CaCO}_3$  fouling in heat exchangers  
Summer 2015  
PI: Ivo Babuška

Awards and Fellowships    **SIAM Gene Golub Student Summer School**, Summer 2019  
                                  **Predoctoral 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 - 2021

Papers    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).

ACTOR, J., AND KNEPLEY, M. G. An algorithm for computing Lipschitz Inner Functions in Kolmogorov’s Superposition Theorem. *SIAM Journal on Numerical Analysis In preparation* (2019).

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

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

BABUŠKA, I., SILVA, R. S., AND ACTOR, J. Break-off model for CaCO<sub>3</sub> fouling in heat exchangers. *International Journal of Heat and Mass Transfer* 116 (2018), 104–114.

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

ACTOR, J. A. Neural Networks for Image Segmentation of Liver. In *SIAM Texas-Louisiana Sectional Meeting* (2019). 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 Series of Lightning Talks on CAAM Summer Experiences. Lightning Talk, 2019. Departmental Graduate Student Seminar.

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

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

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

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

Posters 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.

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.

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., 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  $\text{CaCO}_3$  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 Seminar Coordinator, Fall 2019 - Spring 2020

**Gulf Coast Consortia**,

NLM Fellows Seminar Coordinator, Fall 2019 - Spring 2020

**Graduate Student Association**, Rice University

Graduate Wellness Peer, Spring 2019 - Spring 2020

Teaching **Rice University**, Rice Emerging Scholars Program (Computer Science Track)

Instructor, UNIV 104, Introduction to Coding, Summer 2019

**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    **Volunteer Youth Adviser**, Congregation Or Ami, Houston, TX  
Spring 2018 - Spring 2020

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

Coding    Python, Matlab, TensorFlow, Keras,  $\text{\LaTeX}$ , Amira, FEniCS, PETSc, ITKSnap

Memberships    SIAM, AMIA, SPIE