

# Raaghav Ramani

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## CONTACT INFORMATION

Center for Nonlinear Studies  
Los Alamos National Laboratory  
Los Alamos, NM 87545

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<https://raagramani.github.io>

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## EMPLOYMENT

### Los Alamos National Laboratory

2024–present

Mark Kac Postdoctoral Fellow in Applied Mathematics  
Center for Nonlinear Studies

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## EDUCATION

### University of California, Davis

2018–2023

Ph.D. in Applied Mathematics

Advisor: Prof. Steve Shkoller

Dissertation: *PDE-based methods for multiscale gas dynamics simulations*

### Trinity College, University of Oxford

2012–2016

MMath Masters in Mathematics, Double First Class Honours

Advisor: Prof. Gregory Seregin

Thesis: *Regularity theory for the axially symmetric incompressible Navier-Stokes equations without swirl*

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## RESEARCH INTERESTS

PDEs, fluid mechanics, computational physics.

Specifically: computational shock formation and development, moving interface and free boundary problems, multiscale modeling, high-resolution WENO schemes, artificial viscosity, adaptive mesh generation, semi-Lagrangian and Arbitrary Lagrangian-Eulerian schemes, vortex methods, fast Poisson solvers, spectral methods, fluid instabilities, combustion, magnetohydrodynamics.

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## PUBLICATIONS

R. RAMANI & S. SHKOLLER

*A fast dynamic smooth adaptive meshing scheme with applications to compressible flow*  
Journal of Computational Physics, 490:112280 (2023)

R. RAMANI & S. SHKOLLER

*A multiscale model for Rayleigh-Taylor and Richtmyer-Meshkov instabilities*  
Journal of Computational Physics, 405:109177 (2020)

R. RAMANI, J. REISNER, & S. SHKOLLER

*A space-time smooth artificial viscosity method with wavelet noise indicator and shock collision scheme, Part 2: The 2-D case*  
Journal of Computational Physics, 387:45 – 80 (2019)

R. RAMANI, J. REISNER, & S. SHKOLLER

*A space-time smooth artificial viscosity method with wavelet noise indicator and shock collision scheme, Part 1: The 1-D case*  
Journal of Computational Physics, 387:81 – 116 (2019)

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FELLOWSHIPS & AWARDS	<i>Mark Kac Postdoctoral Fellowship in Applied Mathematics</i>	2024–2026
	Los Alamos National Laboratory	
	<i>Yueh-Jing Lin Scholarship</i>	2023
	Department of Mathematics, University of California, Davis	
	<i>CSES Student Fellowship</i>	2021–2023
	Center for Space & Earth Science, Los Alamos National Laboratory	
	<i>Graduate Research Fellowship</i>	2019–2023
	Department of Mathematics, University of California, Davis	
	<i>Research Fellowship</i>	2016–2018
	Department of Mathematics, University of California, Davis	
	<i>Met Office Masters Thesis Prize</i>	2016
	University of Oxford	
	<i>Mitchell Scholarship</i>	2014
	University of Oxford	
	<i>Scholarship</i>	2013–2016
	Trinity College, University of Oxford	

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TALKS	<i>Adaptive front-capturing and front-tracking for multiscale fluid flows</i>	
	CNLS Seminar, Los Alamos National Laboratory	06/2025
	Multiphysics Models Conference, Los Alamos National Laboratory	06/2025
	<i>Computational Shock Development</i>	
	MultiMat Conference, Breckenridge	08/2024
	CASC Seminar, Lawrence Livermore National Laboratory	05/2024
	PDE & Applied Math Seminar, UC Davis	05/2024
	<i>PDE-based methods for multiscale computational fluid dynamics</i>	
	ANAG Seminar, Lawrence Berkeley Laboratory	09/2023
	Advanced Modeling and Simulation Seminar, NASA	09/2023
	Applied and Numerical PDEs Seminar, UC Berkeley	09/2023
	LANS Seminar, Argonne National Laboratory	08/2023
	<i>Efficient smooth adaptive meshing in multi-D with applications to gas dynamics</i>	
	Theoretical and Computational Astrophysics Network	05/2023
	T-3 seminar, Los Alamos National Laboratory	04/2023
	EES-16 seminar, Los Alamos National Laboratory	04/2023
	SOCAMS, Harvey Mudd College	05/2022
	<i>A PDE-based multiscale framework for efficient gas dynamics simulations</i>	
	Student-Run Math and Applied Math Seminar, UC Davis	02/2023
	<i>Adaptive mesh methods for an ignition-based fire model</i>	
	CSES symposium, Los Alamos National Laboratory	09/2022
	<i>A multiscale model for unstable interfaces in compressible flows with vorticity</i>	
	Student-Run Math and Applied Math Seminar, UC Davis	05/2020
	<i>PDE methods for the numerical simulation of compressible fluid flow</i>	
	Student-Run Math and Applied Math Seminar, UC Davis	04/2018

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CONFERENCES ATTENDED	<i>SIAM Conference on Analysis of Partial Differential Equations (PD22)</i> Virtual				03/2022
	<i>Convex Integration and Nonlinear Partial Differential Equations</i> ICMS, virtual				11/2021
	<i>Advances and Challenges in Hyperbolic Conservation Laws</i> ICERM, virtual				05/2021
	<i>Mathematical Analysis of Geophysical Models and Data Assimilation</i> Freie Universität Berlin, virtual				06/2020
	<i>AMS Spring Central and Western Joint Sectional Meeting</i> University of Hawaii at Manoa, Honolulu, HI, USA				03/2019
	<i>Conference on Mathematical Analysis of Incompressible Fluids</i> Mathematical Institute of University of Seville, Seville, Spain				06/2018
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TEACHING EXPERIENCE	Spring	2023	MAT 119B	Ordinary Differential Equations	
	Winter	2023	MAT 128B	Numerical Analysis	
	Fall	2022	MAT 22B	Differential Equations	
	Spring	2022	MAT 21C	Calculus	
	Winter	2022	MAT 22B	Differential Equations	
	Fall	2021	MAT 22B	Differential Equations	
	Spring	2021	MAT 189	Advanced Problem Solving	
	Winter	2021	MAT 16B & 17A	Calculus (Lead TA)	
	Fall	2020	MAT 21A & 21C	Calculus (Lead TA)	
	Spring	2020	MAT 127C	Real Analysis	
Winter	2020	MAT 127B	Real Analysis		
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SCIENTIFIC RESEARCH & OTHER WORK EXPERIENCE	Graduate Student Researcher, Los Alamos National Laboratory Group: Methods & Algorithms XCP-4 <i>Adaptive mesh methods for an ignition-based fire model</i>				2022–2023
	Visiting scholar, University of California, Davis Advisor: Prof. Steve Shkoller <i>PDE methods for computational physics</i>				2017–2018
	Undergraduate research student, University of Oxford Advisor: Prof. Ian Hewitt <i>Modelling of ice sheets</i>				2015
	Summer school student, Perm State University <i>Fluid Dynamics, Perturbation Theory, &amp; Lie Group Analysis</i>				2015
	Undergraduate research student, University of Oxford Advisors: Prof. Steve Shkoller & Prof. Ian Hewitt <i>Computational methods for gas dynamics</i>				2014
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PROFESSIONAL ACTIVITIES & SERVICE	Reviewer for Journal of Computational Physics				2022–present
	UC Davis student-run Analysis and PDE seminar, organizer				2020–2022
	American Mathematical Society, member				2018–present
	Society for Industrial and Applied Mathematics, member				2021–present
	Graduate Student Assembly, representative				2019–2020

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GRADUATE  
COURSEWORK

Real, complex, functional, harmonic analysis; linear & nonlinear PDEs; dynamical systems; calculus of variations; fluid mechanics; numerical methods for ODEs & PDEs; classical mechanics, quantum theory, relativity; algebra.

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RELEVANT  
SKILLS

Computing: Fortran, C++, MATLAB, Python, OpenMP  
Languages: English (fluent), Tamil (native)  
Other: First Aid, CPR, & AED certifications from American Heart Association

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