

## Nek Sharan

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CONTACT INFORMATION	3200 Canyon Rd, Apt 4102 Los Alamos, NM 87544 USA	<i>Phone:</i> (217) 419-1197 <i>E-mail:</i> nsharan@lanl.gov <i>Web:</i> <a href="https://neksharan.github.io">https://neksharan.github.io</a>
RESEARCH INTERESTS	Numerical methods, Computational fluid dynamics, Turbulent mixing, Large-eddy simulations, Combustion, High-performance computing, Scientific machine learning	
EDUCATION	<b>University of Illinois at Urbana-Champaign, USA</b> Ph.D., Aerospace Engineering, December 2016 <ul style="list-style-type: none"><li>• Dissertation Topic: “Time-stable high-order finite difference methods for overset grids”</li><li>• Advisors: Prof. Daniel J. Bodony &amp; Prof. Carlos Pantano</li><li>• GPA: 4.0/4.0</li></ul> <b>Indian Institute of Technology Bombay, India</b> M. Tech & B. Tech (Dual Degree), Aerospace Engineering, August 2011 <ul style="list-style-type: none"><li>• Dissertation Topic: “Numerical Simulation of Axisymmetric Jets”</li><li>• Advisor: Prof. Avijit Chatterjee</li><li>• GPA: 8.9/10.0</li></ul>	
RESEARCH EXPERIENCE	<b>Los Alamos National Laboratory, USA</b> Postdoctoral Research Associate, working with Dr. Peter Brady and Dr. Daniel Livescu	<b>April 2019 - Present</b>
	<b>California Institute of Technology, USA</b> Postdoctoral Scholar, worked with Prof. Paul Dimotakis and Dr. Josette Bellan	<b>October 2016 - April 2019</b>
	<b>University of Illinois at Urbana-Champaign, USA</b> Graduate Research Assistant, advised by Prof. Daniel Bodony and Prof. Carlos Pantano	<b>August 2012 - September 2016</b>
	<b>Indian Institute of Technology Bombay, India</b> Research Assistant, advised by Prof. Avijit Chatterjee	<b>July 2010 - July 2011</b>
	<b>FH Aachen - Aachen University of Applied Sciences, Germany</b> Assistant Engineer, supervised by Prof. Thomas Esch	<b>May 2009 - July 2009</b>
TEACHING EXPERIENCE	<b>California Institute of Technology, USA</b> Guest Lecturer (Ae239b Turbulence) <ul style="list-style-type: none"><li>- Delivered multiple lectures on turbulence modeling for practical applications</li></ul>	<b>Spring 2018</b>
	<b>University of Illinois at Urbana-Champaign, USA</b> Teaching Assistant (AE410 Computational Aerodynamics) <ul style="list-style-type: none"><li>- Duties included holding weekly office hours, conducting tutorials on scientific programming, preparing homeworks, and grading</li></ul>	<b>Spring 2016</b>
	<b>Indian Institute of Technology Bombay, India</b> Teaching Assistant (AE310 Engineering Design Optimization & AE207 Intro to Engineering Design)	<b>Fall 2010 &amp; Spring 2011</b>

- Organized classroom lessons, activities and presentations; Assigned and graded homeworks & projects

#### National Social Service at IIT Bombay, India

Fall 2006 – Spring 2008

Teaching Associate

- Taught Mathematics, Science, and English classes to disadvantaged school children
- Visited rural areas to conduct computer literacy sessions

#### HONORS AND AWARDS

Laboratory Directed Research and Development–Exploratory Research (LDRD-ER) Award 2020 (with D. Livescu & P. T. Brady): \$330k/year for 3 years

CTO Pathfinder Award for exceptional innovation leadership at Procter & Gamble Co. (P&G), 2012

IIT Bombay Heritage Fund Scholarship for exemplary academic performance in years 2006-07, 2008-09 and 2009-10

Undergraduate Research Opportunity (UROP) for academic excellence and research skills (awarded to 5 out of 600 students) in 2008

Certificate of Merit (national top 1%) in Indian National Physics Olympiad (INPhO) 2006

Science & Technology Merit Certificate (national top 0.1%) in All India Secondary School Examination (AISSE) 2004

#### PUBLICATIONS

**N. Sharan** and J. R. Bellan. Investigation of high-pressure turbulent jets using direct numerical simulation. *Journal of Fluid Mechanics* (Submitted). [Click here for preprint]

**N. Sharan**, P. T. Brady and D. Livescu. High-order time-stable strong boundary conditions in finite-difference schemes solving hyperbolic systems. *Computers & Fluids* (Submitted). [Click here for preprint]

**N. Sharan**, G. Matheou and P. E. Dimotakis. Turbulent shear-layer mixing: initial conditions, and direct-numerical and large-eddy simulations. *Journal of Fluid Mechanics*, 877 (2019): 35-81.

**N. Sharan**, G. Matheou and P. E. Dimotakis. Mixing, scalar boundedness, and numerical dissipation in large-eddy simulations. *Journal of Computational Physics*, 369 (2018): 148-172.

**N. Sharan**, C. Pantano and D. J. Bodony. Time-stable overset grid method for hyperbolic problems using summation-by-parts operator. *Journal of Computational Physics*, 361 (2018): 199-230.

**N. Sharan**. Time-stable high-order finite difference methods for overset grids. *Doctoral Dissertation*, University of Illinois at Urbana-Champaign, 2016.

#### CONFERENCE PROCEEDINGS

**N. Sharan** and J. R. Bellan. Turbulent mixing in supercritical jets: effect of compressibility factor and inflow condition, AIAA Paper 2020-1156, *AIAA Scitech 2020 Forum*.

**N. Sharan**, P. T. Brady and D. Livescu. Stable and conservative boundary treatment for difference methods, with application to cut-cell discretizations, AIAA Paper 2020-0807, *AIAA Scitech 2020 Forum*.

**N. Sharan** and J. R. Bellan. Numerical aspects for physically accurate Direct Numerical Simulations of turbulent jets, AIAA Paper 2019-2011, *AIAA Scitech 2019 Forum*.

**N. Sharan**, C. Pantano and D. J. Bodony. Energy stable overset grid methods for hyperbolic problems. AIAA Paper 2014-2924, *7th AIAA Theoretical Fluid Mechanics Conference*.

**N. Sharan** and D. J. Bodony. High-order provably stable overset grid methods for block-structured adaptive mesh refinement. AIAA Paper 2013-2872, *21st AIAA Computational Fluid Dynamics Conference*.

**N. Sharan** and A. Chatterjee. Parallel Computation of Axisymmetric Jets. *Proceedings of the Python for Education and Scientific Computing (SciPy.in) 2010*.

## TALKS

“Free-shear flow mixing computations: initial conditions, scalar boundedness and subgrid-scale effects”, *GALCIT Colloquium*, California Institute of Technology, Pasadena, May 2020 (**Invited**)

“High-order energy-stable boundary treatment for finite-difference cut-cell method”, *72<sup>nd</sup> American Physical Society Division of Fluid Dynamics (APS DFD) Annual Meeting*, Seattle, November 2019

“Direct numerical simulation of high-pressure mixing in turbulent jets”, *11<sup>th</sup> US National Combustion Meeting*, Pasadena, March 2019

“Stable, high-order methods for overset grids and turbulent mixing in large-eddy simulations”, Computational Physics and Methods (CCS-2), Los Alamos National Laboratory, Los Alamos, November 2018 (**Invited**)

“Low-dissipation methods for overset/AMR grids and scalar boundedness in turbulent mixing simulations”, Computational Engineering Division, Lawrence Livermore National Laboratory, Livermore, October 2018 (**Invited**)

“Effects of numerical dissipation and unphysical excursions on scalar-mixing estimates in large-eddy simulations”, *70<sup>th</sup> American Physical Society Division of Fluid Dynamics (APS DFD) Annual Meeting*, Denver, November 2017

“Time-stable and conservative high-order finite difference methods for overset grids”, *UIUC AE Department Seminar*, Urbana, April 2016.

“High-order provably stable overset grid methods for hyperbolic problems, with application to the Euler equations”, *68<sup>th</sup> American Physical Society Division of Fluid Dynamics (APS DFD) Annual Meeting*, Boston, November 2015

“Stable interface treatment in overset grid methods”, *67<sup>th</sup> American Physical Society Division of Fluid Dynamics (APS DFD) Annual Meeting*, San Francisco, November 2014.

“Intermittent Communication in Parallel Computation”, *23<sup>rd</sup> International Conference on Parallel Computational Fluid Dynamics*, Barcelona, May 2011.

“Axisymmetric Navier Stokes solver using Python and Cython”, *12<sup>th</sup> Annual CFD Symposium*, IISc Bangalore, August 2010.

## SERVICES AND LEADERSHIP ROLES

- **Reviewer** for AIAA Journal (AIAA), Journal of Computational Physics (Elsevier), Journal of Applied Acoustics (Elsevier), Journal of Hydro-environment Research (Elsevier), Sensors (Open Access), Energies (Open Access)
- **Organizer** for Caltech K-12 Outreach Activities (2016–2019)
  - Conducted introductory workshops on Linux at Southern California Linux Expo (SCaLE-16x) 2018, Pasadena, CA
  - Engaged K-12 students in STEM research through events like Caltech Science for March, TeachWeek etc.
- **Work-Culture Team Lead** at Procter & Gamble Co. (P&G), India (2011–2012)

- Partnered with local NGOs to conduct classes and trips for less-privileged children
- **Institute Student Mentor** at IIT Bombay, India (2009–2011)
  - Advised 5 students overcome multiple backlogs through comprehensive course planning
  - Guided 24 freshmen to ensure their smooth transition into campus life

INDUSTRY  
EXPERIENCE

**Procter & Gamble Co. (P&G)**, Bengaluru, India

**August 2011 - July 2012**

*Analyst, Modeling & Simulation Group*

**Jet Airways (India) Ltd.**, Mumbai, India

**December 2008 - January 2009**

*Management Trainee, Engineering Materials Department*