Nikhil Chandra Admal

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Employment

University of Illinois at Urbana-Champaign, Illinois

Jan 2019–Present	**Assistant Professor**, Mechanical Science and Engineering

University of California, Los Angeles, California

Sep 2014–Jan 2019	**Postdoctoral Research Scholar**, Materials Science and Engineering
Sep 2013–Dec 2013	**Visiting Research Scholar**, Institute for Pure and Applied Mathematics

Education

The University of Minnesota, Minneapolis, MN, 2007–2014

Sep 2014	**Ph.D.** *Aerospace Engineering and Mechanics*
Dec 2011	**M.S.** *Mathematics* Concentration in Real and Functional analysis
Aug 2010	**M.S.** *Aerospace Engineering and Mechanics*

Indian Institute of Technology (IIT) Madras, Chennai, TN, India, 2001–2006

Aug 2006	**B.Tech., M.Tech.** *Dual Degree in Mechanical Engineering*

Research Interests

Research:	Interfacial mechanics of grain/phase boundaries and 2D heterostructures; Defect mechanics and crystal plasticity; Severe plastic deformation - recovery, recrystallization, grain growth; Nanocrystalline alloys; Microscopic foundations of continuum mechanics and gradient elasticity; Multiscale modeling and simulation of materials; Numerical analysis of multiscale modeling

Honors and Awards

2023	*National Science Foundation Early Career Award*,

2019	*Listed in "Teachers ranked as excellent" by the Center for Innovation in Teaching & Learning (CITL) for Spring 2019*, University of Illinois at Urbana-Champaign, IL
2016	*Institute for Digital Research and Education (IDRE) Postdoctoral Fellowship $9000*, University of California Los Angeles, CA
2012–2013	*Doctoral Dissertation Fellowship*, University of Minnesota, Minneapolis, MN
2007	*Summer Fellowship*, University of Minnesota, Minneapolis, MN
2005	*Inventor Bonus Award*, GE: John F. Welch Technology Center, Bangalore, India
2005	*Best Outgoing Intern*, awarded by GIPLO Lab, GE: John F. Welch Technology Center, Bangalore, India
2004	*Percentile of 98.19 in Graduate Aptitude Test in Engineering (GATE) 2004*, India
2001–2005	*Pratibha scholarship*, State government of Andhra Pradesh, India
2001	*Ranked 1081 in IIT Joint Entrance Examination among over 200,000 aspirants*

Travel Grants

MMM 2016	*From the organizers of the 8th International Conference on Multiscale Materials Modeling, Dijon, France*
USACM 2016	*USACM Workshop on Recent Advances in Computational Methods for Nanoscale Phenomena, Ann Arbor, MI*

Journal Articles

1 N. C. Admal, E. B. Tadmor. "A unified interpretation of stress in molecular systems." *Journal of Elasticity*, 100:63–143, 2010

2 N. C. Admal, E. B. Tadmor. "Stress and heat flux for arbitrary multibody potentials: A unified framework." *The Journal of Chemical Physics*, 134:184,106, 2011

3 Nikhil Chandra Admal, E.B. Tadmor. "The non-uniqueness of the atomistic stress tensor and its relationship to the generalized beltrami representation." *Journal of the Mechanics and Physics of Solids*, 93:72 – 92, 2016. Special Issue in honor of Michael Ortiz

4 Nikhil Chandra Admal, Ellad B Tadmor. "Material fields in atomistics as pull-backs of spatial distributions." *Journal of the Mechanics and Physics of Solids*, 89:59–76, 2016

5 N. C. Admal, J. Marian, Giacomo Po. "The atomistic representation of first strain-gradient elastic tensors." *Journal of the Mechanics and Physics of Solids*, 99:93 – 115, 2017

6 Nikhil Chandra Admal, Giacomo Po, Jaime Marian. "Diffuse-interface polycrystal plasticity: Expressing grain boundaries as geometrically necessary dislocations." *Materials Theory*, 1(1):6, 2017

7 Giacomo Po, Markus Lazar, Nikhil Chandra Admal, Nasr Ghoniem. "A non-singular theory of dislocations in anisotropic crystals." *International Journal of Plasticity*, 103:1–22, 2018

8 Nikhil Chandra Admal, Giacomo Po, Jaime Marian. "A unified framework for polycrystal plasticity with grain boundary evolution." *International Journal of Plasticity*, 106:1–30, 2018

9 Giacomo Po, Nikhil Chandra Admal, Markus Lazar. "The green tensor of Mindlin's anisotropic first strain gradient elasticity." *Materials Theory*, 3(1):3, Mar 2019. ISSN 2509-8012

10 Nikhil Chandra Admal, Javier Segurado, Jaime Marian. "A three-dimensional misorientation axis- and inclination-dependent Kobayashi–Warren–Carter grain boundary model." *Journal of the Mechanics and Physics of Solids*, 2019. ISSN 0022-5096

11 Giacomo Po, Nikhil Chandra Admal, Bob Svendsen. "Non-local thermoelasticity based on equilibrium statistical thermodynamics." *Journal of Elasticity*, pp. 1–23, 2019

12 M Shi, NC Admal, EB Tadmor. "Noise filtering in atomistic stress calculations for crystalline materials." *Journal of the Mechanics and Physics of Solids*, 144:104,083, 2020

13 Jaekwang Kim, Matt Jacobs, Stanley Osher, Nikhil Chandra Admal. "A crystal symmetry-invariant Kobayashi– Warren–Carter grain boundary model and its implementation using a thresholding algorithm." *Computational Materials Science*, 199:110,575, 2021. ISSN 0927-0256

14 Junyan He, Nikhil Chandra Admal. "Polycrystal plasticity with grain boundary evolution: A numerically efficient dislocation-based diffuse-interface model." *Modelling and Simulation in Materials Science and Engineering*, 30(2):025,006, 2021

15 Ganesh Ananthakrishnan, Mitisha Surana, Matthew Poss, Jad Jean Yaacoub, Kaihao Zhang, Nikhil Admal, Pascal Pochet, Sameh Tawfick, Harley T Johnson. "Graphene-mediated stabilization of surface facets on metal substrates." *Journal of Applied Physics*, 130(16):165,302, 2021

16 Himanshu Joshi, Junyan He, Nikhil Chandra Admal. "A finite deformation theory for grain boundary plasticity based on geometrically necessary disconnections." *Journal of the Mechanics and Physics of Solids*, p. 104949, 2022

17 Mitisha Surana, Tusher Ahmed, Nikhil Chandra Admal. "Interface mechanics of 2D materials on metal substrates." *Journal of the Mechanics and Physics of Solids*, p. 104831, 2022

18 Nikhil Chandra Admal, Tusher Ahmed, Enrique Martinez, Giacomo Po. "Interface dislocations and grain boundary disconnections using Smith normal bicrystallography." *Acta Materialia*, p. 118340, 2022

19 Jaekwang Kim, Nikhil Chandra Admal. "A stochastic framework for evolving grain statistics using a neural network model for grain topology transformations." *Computational Materials Science*, 216:111,812, 2023

20 Mitisha Surana, Ganesh Ananthakrishnan, Matthew M Poss, Jad Jean Yaacoub, Kaihao Zhang, Tusher Ahmed, Nikhil Chandra Admal, Pascal Pochet, Harley T Johnson, Sameh Tawfick. "Strain-driven faceting of graphene-catalyst interfaces." *Nano letters*, 23(5):1659–1665, 2023

21 Md Tusher Ahmed, Chenhaoyue Wang, Amartya S Banerjee, Nikhil Chandra Admal. "Bicrystallography-informed frenkel–kontorova model for interlayer dislocations in strained 2d heterostructures." *Mechanics of Materials*, 190:104,903, 2024

22 Jaekwang Kim, Nikhil Chandra Admal. "Statistics of grain microstructure evolution under anisotropic grain boundary energies and mobilities using threshold-dynamics." *Modelling and Simulation in Materials Science and Engineering*, 32(3):035,022, feb 2024. URL `https://dx.doi.org/10.1088/1361-651X/ad2787`

23 Himanshu Joshi, Ian Chesser, Brandon Runnels, Nikhil Chandra Admal. "An atomistic survey of shear coupling in asymmetric tilt grain boundaries and interpretation using the disconnections framework." *Acta Materialia*, 275:119,994, 2024

Technical Publications

1 Nikhil Chandra Admal. *A unified interpretation of stress in molecular systems*. Master's thesis, University of Minnesota, Department of Aerospace Engineering and Mechanics, Minneapolis, MN 55455, 2010

2 Nikhil Chandra Admal. *Results on the interaction between atomistic and continuum models*. Ph.D. thesis, University of Minnesota, Department of Aerospace Engineering and Mechanics, Minneapolis, MN 55455, 2014

3 Junyan He, Nikhil Chandra Admal. "A study of the beveling instability in solenoid conductors." *A report submitted to FermiLab, Batavia, Illinois*, 2020

Invited Talks

1 "The non-uniqueness of the atomistic stress tensor and its relationship to the generalized Beltrami representation." Fifteenth Pan-American Congress of Applied Mechanics, Champaign, IL, May 2015

2 "The atomistic representations of strain gradient elasticity tensors." 2nd Schöntal Symposium: Dislocation based Plasticity, Schöntal, Germany, February 2016

3 "Bridging atomistic, mesoscale and continuum models for materials." Department of Mechanical Engineering, University of Houston, Houston, TX, April 2016

4 "Grain growth in dynamic recrystallization." Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA, March 2017

5 "Grain growth in dynamic recrystallization." School of Engineering, Brown University, Providence, RI, March 2017

6 "Plasticity in extreme environments: Recrystallization and grain growth." Department of Mechanical Engineering, State University of New York at Buffalo, Buffalo, NY, March 2018

7 "Plasticity in extreme environments: Recrystallization and grain growth." Department of Mechanical Science and Engineering, University of Illinois at Urbana Champaign, Urbana-Champaign, IL, March 2018

8 "Plasticity in extreme environments: Recrystallization and grain growth." Department of Materials Science and Engineering, University of Arizona, Tucson, Tucson, AZ, April 2018

9 "Plasticity in extreme environments: Recrystallization and grain growth." Department of Mechanical and Aerospace Engineering, University of California, Irvine, Irvine, CA, April 2018

10 "Polycrystal plasticity with grain boundary evolution - a framework to model recovery, recrystallization and grain growth." University of Minnesota, Oct 2019

11 "Polycrystal plasticity with anisotropic grain boundary evolution." USACM Thematic Workshop on Recent Advances in the Modeling and Simulation of the Mechanics of Nanoscale Materials, University of Pennsylvania, PA, 2019

12 "Modeling 3-d grain boundary evolution driven by the five-dimensional grain boundary energy landscape." Dislocations conference, Technion-Israel Institute of Technology, Haifa, Sep 2019

13 "Emergence of texture from grain boundary mechanics at the mesoscale." Auburn University, Sep 2020

14 "Mechanics of interfaces." Alumni Board Meeting, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Mar 2021

15 "Geometric incompatibility and interface evolution in polycrystals and graphene-metal interfaces." University of California Los Angeles, Apr 2021

16 "Continuum modeling of grain boundary plasticity - dislocations and disconnections." 1^{st} FRASCAL Virtual Colloquium, Friedrich-Alexander-Universität Erlangen-Nürnberg, Jul 2021

17 "Interface dislocations and grain boundary disconnections using smith normal bicrystallography." University of Minnesota, Aug 2022

18 "Interface dislocations and grain boundary disconnections using smith normal bicrystallography." Department of Mechanical and Aerospace Engineering, University of Colorado Colorado Springs, Sep 2022

19 "Characterizing interface dislocations in 2D heterostructures." Society for Engineering Science, College Station, TX, October 2022

20 "Interface dislocations in grain boundaries and 2D heterostructures using Smith normal bicrystallography." Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, March 2023

21 "Trends in shear coupling factors of asymmetric tilt grain boundaries – An examination of the disconnection model." Cairo Symposium on the Physics of Plasticity, Cairo, Egypt, March 2023

22 "The Energetics of Disconnections in Grain Boundaries." XVII International Conference on Computational Plasticity, Barcelona, Spain, September 2023

23 "Interface dislocations in grain boundaries and 2D heterostructures using SNF bicrystallography." Aerospace and Mechanical Engineering, University of Southern California, Los Angeles, California, November 2023

24 "Interface dislocations in grain boundaries and 2D heterostructures using SNF bicrystallography." Department of Materials Science and Engineering, Carnegie Mellon University, Pittsburgh, PA, January 2024

Technical Presentations

1 "A unified interpretation of stress in molecular systems." 16th U.S. National Congress of Theoretical and Applied Mechanics, University Park, PA, June 2010

2 "Interatomic potentials, forces and the stress tensor." Future directions in mechanics research, NSF workshop and symposium in honor of Professor L. B. Freund, Providence, RI, June 2011

3 "Stress and heat flux for arbitrary multibody potentials." 11th U.S. National Congress on Computational Mechanics, Minneapolis, MN, July 2011

4 "Interatomic potential energy representation and the atomistic stress tensor." Society for Engineering and Science, Providence, RI, July 2013

5 "Interatomic potential energy representation and the atomistic stress tensor." Graduate Aerospace Laboratories, Caltech, CA, August 2013

6 "Interpretation of stress in molecular systems." Institute for Pure and Applied Mathematics, UCLA, CA, November 2013

7 "A decomposition of the atomistic stress into an elastic and a residual component." Society for Natural Philosophy Meeting: Mathematics and Mechanics in the Physical Sciences, A Tribute to James Serrin, University of Minnesota, November 2013

8 "The elastic-plastic decomposition of the atomistic stress tensor." The Minerals, Metals and Materials Society, San Diego, CA, February 2014

9 "Referential continuum fields in atomistics." 13th US National Congress on Computational Mechanics, San Diego, CA, 2015

10 "A diffuse-interface elasto-plastic model to study grain boundary evolution." 8th International Conference on Multiscale Materials Modeling, Dijon, Frace, October 2016

11 "Polycrystal plasticity with grain boundary evolution." Centre Européen de Calcul Atomique et Moléculaire (CECAM), Lugano, Switzerland, February 2017

12 "A fast thresholding algorithm for the Kobayashi-Warren-Carter grain boundary model." Society for Engineering Science, Sep 2020

13 "A disconnection-based diffuse-interface approach to model grain boundary motion." United States National Conference on Computational Mechanics, Jul 2021

14 "Mesoscale modeling of facet formation in graphene-metal interfaces." United States National Conference on Computational Mechanics, Jul 2021

15 "A thresholding method for the kobayashi–warren–carter grain boundary model with general mobilities." United States National Conference on Computational Mechanics, Jul 2021

16 "A crystal plasticity framework to model continuum disconnections in polycrystals." The Minerals, Metals and Materials Society, Anaheim, CA, Feb-Mar 2022

17 "Interface mechanics of 2d materials on metal substrates." 19th U.S. National Congress of Theoretical and Applied Mechanics, Austin, TX, Jun 2022

18 "Interface dislocations and grain boundary disconnections using smith normal bicrystallography." 10th International Conference on Multiscale Materials Modeling, Baltimore, MD, October 2022

19 "Interlayer Dislocations in Large Twist Bilayer Graphene and 2D Heterostructures." 17th United States National Conference on Computational Mechanics, Albuquerque, NM, July 2023

20 "Modeling Strain Solitons in 2D Heterostructures." Society of Engineering Science Annual Technical Meeting, Minneapolis, MN, October 2023

21 "Characterization Of Coupling Factors of Asymmetric Tilt Grain Boundaries." Society of Engineering Science Annual Technical Meeting, Minneapolis, MN, October 2023

22 "Towards micromechanics of step-bunching in graphene-metal interfaces." Society of Engineering Science Annual Technical Meeting, Minneapolis, MN, October 2023

Book Chapters

1 N. C. Admal, E. B. Tadmor. *Statistical mechanics, molecular modeling, and the notion of stress*, chapter A unified interpretation of stress in molecular systems. Springer, New York, 2010

Patents

1 Nikhil C. Admal, Parag Thakre, Atanu Phukan, Sriharsha Aradhya. *MEMS flow sensor*. Number US 7337678 B2. Issued March 2008

Professional Service

Journal Referee

International Journal of Plasticity

Nano Letters, ACS Publications

Journal of Statistical Physics

Mechanics of Materials

Acta Materialia

Journal of Chemical Theory and Computation

Journal of Chemical Physics

Archive for Rational Mechanics and Analysis

Journal of Elasticity

Modeling and Simulation in Materials Science and Engineering

Physical Review E

Physical Letters A

Nuclear Inst. and Methods in Physics Research, B

International Journal of Solids and Structures

Fusion Science and Technology

Journal of Mechanics and Physics of Solids

Journal of Micromechanics and Microengineering

Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences

Crystal

Metals

Nuclear Fusion

Technical Service and Conference Activities

USNCCM 2015	**Symposium co-organizer, Atomistic computation of continuum quantities**
MMM 2018	**Symposium co-organizer, Crystal plasticity and discrete defect mechanics**
SES 2020	**Scientific track co-chair, Advances in Nanomechanics**
SES 2020	**Symposium co-organizer, Grain boundary and Interfacial mechanics**
MMS 2021-	**Coordinator for the Midwest Mechanics Seminar series**
USNCCM 2021	**Symposium co-organizer, Computational methods for modelling stationary and non-stationary interfaces at multiple scales**

USACM 2021 **Virtual Workshop co-organizer, New Trends and Open Challenges in Computational Mechanics: from Nano to Macroscale**

USACM 2023 **Workshop co-organizer, Data-Driven and Computational Modeling of Materials Across Scales, University of California Los Angeles**

Knowledgebase of Interatomic Models (http://openkim.org)

2012–Present **Contributor**

I am an active contributor to the KIM repository of interatomic potentials and tests.

Software

1 *MDStressLab version 2.0.0*, Released: September 2021. URL `https://github.com/nikhil-admal/mdstresslab`. N. C. Admal, M. Shi, E. B. Tadmor

2 *open Interface Lab (oILAB) version 1.0.0*, Released: September 2022. URL `https://github.com/oilab-project/oILAB`. N. C. Admal, G. Po

Relevant Skills

Software: Unix/Linux, Windows, Matlab, Comsol, Mathematica, perl, Fortran, C, C++, Python, LaTeX, BibTeX, Asymptote, GNUplot, ANSYS, AutoCad