v.1/2024

BIOGRAPHICAL SKETCH

Veera Sundararaghavan
Professor of Aerospace Engineering, University of Michigan

a. Personal

Education

Ph.D.	Mechanical Engineering, Cornell University, 2007 *Thesis: Multi-scale Computational Techniques for Design of Polycrystalline Materials* Prof. Nicholas Zabaras, Chair
M.S.	Mechanical Engineering, Cornell University, 2006
M.Tech/B.Tech	Mechanical Engineering, Indian Institute of Technology, Madras, 2003

Positions

09/2020-present	Professor of Aerospace Engineering
09/2013-current	Associate Professor of Aerospace Engineering (tenured)
09/2007 – 09/2013	Assistant Professor of Aerospace Engineering (tenure track)

Other: Naturalized US Citizen

Honors and Awards

2024	ASME Fellow
2023	World's Top 2% most-cited scientists list by Stanford University
2022	Invited Speaker, Gordon conference on computational materials science
2022	Robert M. Caddell Memorial Award for Research
2021	AIAA Associate Fellow
2021-23	AFRL Summer Faculty Fellow
2018	Defense innovation award, as part of LIFT project team for "Forging and Processing of Al-Li for improved performance and structural life" at Defense Tech Connect Conference
2018	The minerals, metals and materials society (TMS) Conference Structural Materials Division Best Poster Award (with PhD student Iman Javaheri)
2017	Aerospace Engineering Department Award, University of Michigan Ann Arbor
2017	Finalist, AIAA ICME Prize for LIFT-UTRC project on microstructure modeling of Al-Li fan blades
2016	ONR Science award, International Workshop on Environmental Damage in Structural Materials, Cork, Ireland.
2013	Defense Threat Reduction Agency (DTRA) Young Investigator Award
2012	Invited Participant in the Materials Genome Initiative Kick-off event at White House, Washington DC
2011	TMS Young Faculty Grant, First ICME World Congress
2010	National Science Foundation (NSF) CAREER Award
2009	TRW Endowed Automotive Research Award
2004	Prof. V. Radhakrishnan Endowment Award, Indian Institute of Technology-Madras and Institute Silver medal for best academic performance

Biographical sketch:

Prof. Sundararaghavan's research interests lie in the fields of computational materials science, computational mechanics, crystal plasticity, and materials informatics. He graduated top of his class with a B.Tech/M.Tech (dual) degree in Mechanical Engineering from IIT-Madras in 2003 and went on to earn his Ph.D. in Mechanical Engineering from Cornell University in 2007. Upon joining the University of Michigan Aerospace Engineering Department as an Assistant Professor in the fall of 2007, he was promoted to Associate Professor with tenure in 2013, and later to Professor in 2020. He has authored over 100 peer-reviewed journal papers and has engaged in extensive collaborations within UM and with external academics on several large research projects, including centers such as PRISMS, LIFT, America Makes, and MRSEC, as well as multidisciplinary centers funded by the Air Force and NASA. His industry collaborations have included projects funded by Boeing, Collins, and P&W. Among his accolades are the NSF CAREER Award, the DTRA Young Investigator Award, and the Defense Innovation Award. He is esteemed as an AIAA Associate Fellow and an ASME Fellow for his 'sustained contributions to multiscale computational methods for aerospace materials, and for pioneering new frontiers in materials informatics for microstructural design.'

b. Research

Full articles in refereed publications

(As of 2023, **106 journal papers, Google Scholar: 3574 citations, H-index: 36**)

1. Roy, A. M., Guha, S., Sundararaghavan, V. and Arroyave, R., Physics-infused Deep Neural Network for Solution of Non-associative Drucker Prager Elastoplastic Model, Journal of the Mechanics and Physics of Solids, 2024 (in press)
2. Duran, A.V., Ramazani, A. and Sundararaghavan, V., 2023. Multi-scale modeling of shock wave propagation in energetic solid-state composites, International Journal of Solids and Structures, Volume 285, 112535.
3. Roy, A.M., Ganesan, S., Acar, P., Arroyave, R. and Sundararaghavan, V., 2024. Combining crystal plasticity and phase field model for predicting texture evolution and the influence of nuclei clustering on recrystallization path kinetics in Ti-alloys. Acta Materialia, 266, p.119645.
4. Roy, A.M., Arroyave, R. and Sundararaghavan, V., 2023. Incorporating dynamic recrystallization into a crystal plasticity model for high-temperature deformation of Ti-6Al-4V. Materials Science and Engineering: A, p.145211.
5. Sundararaghavan, V., Shah, M.N. and Simmons, J.P., 2023. Methodology for estimation of intrinsic dimensions and state variables of microstructures. Physical Review E, 108(3), p.035001.
6. Andani, M.T., Sundararaghavan, V. and Misra, A., 2023. Novel Approach to Grain Boundary Modification in Stainless and Duplex Steel L-PBF Components through In Situ Heat Treatment. Crystals, 13(9), p.1314.
7. Lakshmanan, A., Andani, M.T., Yaghoobi, M., Sundararaghavan, V., Allison, J. and Misra, A., 2023. A combined experimental and crystal plasticity study of grain size effects in magnesium alloys. Journal of Magnesium and Alloys, in press.
8. Srivastava, S. and Sundararaghavan, V., 2023. Generative and discriminative training of Boltzmann machine through quantum annealing. Scientific Reports, 13(1), p.7889.
9. Roy, A.M., Bose, R., Sundararaghavan, V. and Arroyave, R., 2023. Deep learning-accelerated computational framework based on Physics Informed Neural Network for the solution of linear elasticity. Neural Networks, 162, pp.472-489.
10. Chen, Z., Yaghoobi, M., Sundararaghavan, V., Allison, J. and Daly, S., 2022. The effects of microstructure on deformation twinning in Mg WE43. Materials Science and Engineering: A, 859, p.144189.
11. Yaghoobi, M., Allison, J.E. and Sundararaghavan, V., 2022. PRISMS-Plasticity TM: An open-source rapid texture evolution analysis pipeline. Integrating Materials and Manufacturing Innovation, 11(4), pp.479-496.
12. A Senthilnathan, I Javaheri, H Zhao, V Sundararaghavan, M De Graef, P Acar, Uncertainty Quantification of Metallic Microstructures Using Principal Image Moments, Computational Materials Science, Volume 215, 111775, 2022.
13. Srivastava, S. and Sundararaghavan, V., 2022. Bandgap optimization in combinatorial graphs with tailored ground states: application in quantum annealing. Optimization and Engineering, pp.1-19.
14. Lakshmanan, A., Yaghoobi, M., Stopka, K.S. and Sundararaghavan, V., 2022. Crystal plasticity finite element modeling of grain size and morphology effects on yield strength and extreme value fatigue response. Journal of Materials Research and Technology, 19, pp.3337-3354.
15. Yaghoobi, M., Chen, Z., Murphy-Leonard, A.D., Sundararaghavan, V., Daly, S. and Allison, J.E., 2022. Deformation twinning and detwinning in extruded Mg-4Al: in-situ experiment and crystal plasticity simulation. International Journal of Plasticity, p.103345.
16. Javaheri, I., Luo, J., Lakshmanan, A. and Sundararaghavan, V., 2022. Higher-Order Approximations for Stabilizing Zero-Energy Modes in Non-Ordinary State-Based Peridynamics Models. AIAA Journal, pp.1-17.
17. Javaheri, I., Andani, M.T. and Sundararaghavan, V., 2022. Large-Scale Synthesis of Metal Additively-Manufactured Microstructures Using Markov Random Fields. Computational Materials Science, 206, p.111228. (Article named Editor's choice).
18. Andani, M.T., Lakshmanan, A., Sundararaghavan, V., Allison, J. and Misra, A., 2021. Estimation of micro-Hall-Petch coefficients for prismatic slip system in Mg-4Al as a function of grain boundary parameters. Acta Materialia, p.117613.
19. Yaghoobi, M., Chen, Z., Sundararaghavan, V., Daly, S. and Allison, J.E., Crystal Plasticity Finite Element Modeling of Extension Twinning in WE43 Mg Alloys: Calibration and Validation. Integrating Materials and Manufacturing Innovation, 10(3), pp.488-507, 2021.
20. Singh, G., Waas, A.M. and Sundararaghavan, V., Understanding defect structures in nanoscale metal additive manufacturing via molecular dynamics. Computational Materials Science, 200, p.110807, 2021.
21. F. Abdi, A. Eftekharian, D. Huang, R.B. Rebak, M. Rahmane, V. Sundararaghavan, A. Kanyuck, S. K. Gupta, S. Arul, V. Jain, Y. Hu, K. Nikbin, Grain Boundary Engineering of New Additive Manufactured Polycrystalline Alloys, Forces in Mechanics, vol 4, 100033, 2021.
22. M Yaghoobi, G.Z. Voyiadjis , V. Sundararaghavan, Crystal Plasticity Simulation of Magnesium and Its Alloys: A Review of Recent Advances, Crystals, 11, 435, 2021
23. Ganesan, S., Javaheri, I. and Sundararaghavan, V., Constrained Voronoi models for interpreting surface microstructural measurements. Mechanics of Materials, 159, p.103892, 2021.

24. Lakshmanan, A., Luo, J., Javaheri, I. and Sundararaghavan, V., 2021. Three-dimensional crystal plasticity simulations using peridynamics theory and experimental comparison. International Journal of Plasticity, 142, p.102991.
25. M. Yaghoobi, Stopka, K.S., Lakshmanan, A., Sundararaghavan, V., Allison, J.E. and McDowell, D.L., PRISMS-Fatigue computational framework for fatigue analysis in polycrystalline metals and alloys. npj Computational Materials, 7(1), pp.1-12, 2021.
26. Ganesan, S., Yaghoobi, M., Githens, A., Chen, Z., Daly, S., Allison, J.E. and Sundararaghavan, V., The effects of heat treatment on the response of WE43 Mg alloy: crystal plasticity finite element simulation and SEM-DIC experiment. International Journal of Plasticity, 137, p.102917, 2021.
27. Srivastava, S., Yaghoobi, M. and Sundararaghavan, V., A graph-theoretic approach for multiscale modeling and prediction of crack propagation in polycrystalline materials. Engineering Fracture Mechanics, 241, p.107406, 2021.
28. Singh, G. and Sundararaghavan, V., Modeling self-healing behavior of vitrimers using molecular dynamics with dynamic cross-linking capability. Chemical Physics Letters, 760, p.137966, 2020.
29. Andani, M.T., Lakshmanan, A., Sundararaghavan, V., Allison, J. and Misra, A., Quantitative study of the effect of grain boundary parameters on the slip system level Hall-Petch slope for basal slip system in Mg-4Al. Acta Materialia, 200, pp.148-161, 2020.
30. S. Sundar, V. Sundararaghavan, Database development and exploration of process-microstructure relationships using variational autoencoders, Materials Today Communications, Volume 25, 101201, 2020.
31. M. T. Andani, A. Lakshmanan, J. E. Allison, V. Sundararaghavan, A. Misra, A quantitative study of stress fields ahead of a slip band blocked by a grain boundary in unalloyed magnesium, Scientific Reports, volume 10, Article: 3084 (2020)
32. M. Yaghoobi, J. Allison, V. Sundararaghavan, Multiscale modeling of twinning and detwinning behavior of HCP polycrystals, International Journal of Plasticity, Volume 127, 102653, 2020
33. I. Javaheri, V Sundararaghavan, Polycrystalline Microstructure Reconstruction Using Markov Random Fields and Histogram Matching, Computer Aided Design, Volume 120, 102806 (2020)
34. A. Githens, S. Ganesan, Z.Chen, J. Allison, V. Sundararaghavan, S. Daly, Characterizing Microscale Deformation Mechanisms and Macroscopic Tensile Properties of a High Strength Magnesium Rare-Earth Alloy: A Combined Experimental and Crystal Plasticity Approach, Acta Materialia , Vol 186, Pages 77-94, 2020
35. D Greeley, M Yaghoobi, D Pagan, V Sundararaghavan and J Allison, Using synchrotron radiation to improve understanding of deformation of polycrystalline metals by measuring, modelling and publishing 4D information, IOP Conf. Ser.: Mater. Sci. Eng. 580, p. 012017, 2019
36. S. Srivastava, V. Sundararaghavan. Graph Coloring Approach to Mesh Generation in Multiphase Media with Smooth Boundaries, AIAA Journal, Vol. 58, No. 1, 2020.
37. M. Yaghoobi, S. Ganesan, S. Sundar, A. Lakshmanan, S. Rudraraju, J. E. Allison, V. Sundararaghavan, PRISMS-Plasticity: An open-source crystal plasticity finite element software, Computational Materials Science, 169, 109078 (2019).
38. S. Srivastava, V. Sundararaghavan. Box algorithm for the solution of differential equations on a quantum annealer, Physical Review A, 99, 052355(1-10) (2019)
39. A. Paul, P. Acar, W-K. Liao, A. Choudhary, V. Sundararaghavan, A. Agrawal, Microstructure Optimization with Constrained Design Objectives using Machine Learning-Based Feedback-Aware Data-Generation, Computational materials science, 160, pp. 334-351 (2019).
40. E.L.S. Solomon, A R Natarajan, A M Roy, V Sundararaghavan, A. Van der Ven, E. A. Marquis, Stability and strain-driven evolution of beta prime precipitate in Mg-Y alloys, Acta Materialia, 166, 148-157 (2019).
41. P. Acar, V. Sundararaghavan, Do Epistemic Uncertainties Allow for Replacing Microstructural Experiments with Reconstruction Algorithms?, AIAA Journal, 57(3), 1078-1091, (2019).
42. N. Habibi, V. Sundararaghavan, U. Prahl and A. Ramazani,Experimental and Numerical Investigations into the Failure Mechanisms of TRIP700 Steel Sheets, Metals 8(12), 1073, (2018).
43. L.K. Aagesen, J.F. Adams, J.E. Allison et al. PRISMS: An Integrated, Open-Source Framework for Accelerating Predictive Structural Materials Science, JOM, Volume 70, Issue 10, pp 2298-2314, (2018).
44. A. Reihani, A. Soleimani, S. Kargar, V. Sundararaghavan, A. Ramazani, Graphyne Nanotubes: Materials with Ultralow Phonon Mean Free Path and Strong Optical Phonon Scattering for Thermoelectric Applications, J. Phys. Chem. C, 122 (39), pp 22688--22698, 2018.
45. P. Acar, V. Sundararaghavan, Stochastic Design Optimization of Microstructural Features using Linear Programming for Robust Material Design, AIAA Journal,Vol. 57(1), 2019.
46. P. Acar, V. Sundararaghavan, M De Graef, Computational modeling of crystallographic texture evolution over cubochoric space, Modelling and Simulation in Materials Science and Engineering 26 (6), 065012, 2018.
47. P. Acar, V. Sundararaghavan, Reduced Order Modeling Approach for Materials Design with a Sequence of Processes, AIAA Journal, AIAA Journal, Vol. 56, No. 12 , pp. 5041-5044 (2018).
48. J. Luo, V. Sundararaghavan, Stress point method for stabilizing zero energy modes in non ordinary state based peridynamics, International Journal of Solids and Structures Volume 150, Pages 197-207, 2018.
49. S. Panwar, J.F. Adams, J.E. Allison, J.W. Jones, V. Sundararaghavan, A grain boundary interaction model for microstructurally short fatigue cracks, International Journal of Fatigue, Volume 113, Pages 401-406, 2018.

50. A. Lakshmanan, S. Srivastava, A. Ramazani, V. Sundararaghavan, Thermal conductivity of pillared graphene-epoxy nanocomposites using molecular dynamics, Appl. Phys. Lett. 112, 151902 (2018).
51. P. Acar, N. Fasanella, V. Sundararaghavan, Multi-Scale Optimization of Nanocomposites with Probabilistic Feature Descriptors, AIAA Journal, Vol. 56, No. 7 pp. 2936-2941. 2018.
52. P. Acar, A. Ramazani, V. Sundararaghavan, Crystal Plasticity Modeling and Experimental Validation with an Orientation Distribution Function for Ti-7Al Alloy, Metals, 7(11), p.459, 2017.
53. J. Luo, A. Ramazani, V. Sundararaghavan, Simulation of Micro-Scale Shear Bands Using Peridynamics with an Adaptive Dynamic Relaxation Method, International Journal of Solids and Structures, 130, pp.36-48, 2018.
54. S. Panwar, V. Sundararaghavan, Dislocation theory-based cohesive model for microstructurally short fatigue crack growth, Materials Science and Engineering A, 708, pp. 395-404, 2017.
55. A. Paul, P. Acar, R. Liu, W-K. Liao, A. Choudhary, V. Sundararaghavan, A. Agrawal, Data Sampling Schemes for Microstructure Design with Vibrational Tuning Constraints, AIAA Journal, Vol. 56, No. 3 (2018), pp. 1239-1250.
56. S. Sun, A. Ramazani, V. Sundararaghavan, A hybrid multi-scale model of crystal plasticity for handling stress concentrations, Metals, 7(9), 345, 2017.
57. A. Ramazani, A. Reihani, A. Soleimani, R. Larson, V. Sundararaghavan, Molecular Dynamics Study of Phonon Transport in Graphyne Nanotubes, Carbon, 123, p. 635-644, 2017.
58. N. Habibi, A. Ramazani, V. Sundararaghavan and U. Prahl, Failure predictions of DP600 steel sheets using various uncoupled fracture criteria. Engineering Fracture Mechanics, Vol 190, pp 367-381, 2018.
59. G. Moeini, A. Ramazani, S. Myslicki, V. Sundararaghavan, C. Koenke, Low Cycle Fatigue Behaviour of DP Steels: Micromechanical Modelling vs. Validation, Metals, 7(7), p. 265(1--13) ,2017.
60. P. Acar, S. Srivastava, V. Sundararaghavan, Stochastic Design Optimization of Microstructures with Utilization of a Linear Solver, AIAA Journal, Vol. 55(9), pp. 3161-3168, 2017.
61. V. Sundararaghavan, S. Srivastava, MicroFract: An Image based code for microstructural crack path prediction, SoftwareX, Volume 6, pp. 94-97, 2017
62. P. Acar, V. Sundararaghavan, Uncertainty Quantification of Microstructural Properties due to Experimental Variations, AIAA Journal, Vol. 55, No. 8 (2017), pp. 2824-2832.
63. C. Heinrich, V. Sundararaghavan, A method to predict fatigue crack initiation in metals using dislocation dynamics, Corrosion reviews, 35 (4-5), pp. 325-341, 2017.
64. A. Kumar, V. Sundararaghavan, Simulation of magnetostrictive properties of Galfenol under thermomechanical deformation, Finite Elements in Analysis and Design, v. 127, p.1-5, 2017.
65. G. Moeini, A. Ramazani, V. Sundararaghavan, C. Koenke, Micromechanical modeling of fatigue behavior of DP steels, Materials Science and Engineering: A, Vol 689, pp. 89-95, 2017
66. P. Acar, V. Sundararaghavan, Uncertainty Quantification of Microstructural Properties due to Variability in Measured Pole Figures, Acta Materialia, v. 124, p. 100-108, 2017.
67. P. Acar, V. Sundararaghavan, A Markov Random Field Approach for Modeling Spatio-Temporal Evolution of Microstructures, Modelling Simul. Mater. Sci. Eng. 24 (2016) 075005 (15pp)
68. S. Panwar, S.Sun, V.Sundararaghavan, Modelling fatigue failure using variational multiscale method, Engineering Fracture Mechanics, 162, p. 290--308, 2016.
69. P. Acar, V Sundararaghavan, A linear solution scheme for microstructure design with process constraints, AIAA Journal, 54(12), pp. 4022-4031 (2016).
70. A.V. Duran, V Sundararaghavan, Modeling the mechanics of HMX detonation using Taylor Galerkin Scheme, Theoretical and Applied Mechanics Letters, 6(3), 2016, 143--147.
71. N. Fasanella, V Sundararaghavan, Atomistic Modeling of Thermal Conductivity of Epoxy Nanotube Composites, JOM, 68(5), pp 1396-1410, 2016.
72. A. Kumar, V. Sundararaghavan, M. DeGraef, L. Nguyen, A Markov Random Field Approach for Microstructure Synthesis, Modelling Simul. Mater. Sci. Eng. 24 035015(1-13), 2016
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74. P. Acar, V. Sundararaghavan, Utilization of a Linear Solver for Multiscale Design and Optimization of Microstructures, AIAA Journal, Vol. 54, No. 5 (2016), pp. 1751-1759. ..
75. S. Sun, V. Sundararaghavan, Modeling Crack Propagation in Polycrystalline Microstructure Using Variational Multiscale Method, Mathematical Problems in Engineering, Vol. 2016, Article ID 4715696, 14 pages, 2016. .
76. P. Acar, A. Vijayachandran, V. Sundararaghavan, A.M. Waas, M. Rassaian, Optimization of Spatially Varying Fiber Paths for a Symmetric Laminate with a Circular Cutout under Remote Uniaxial Tension, SAE Int. J Materials and Manufacturing, v.9 (2015-01-2609), 2015.
77. N. Fasanella, V. Sundararaghavan, Atomistic modeling of thermomechanical properties of SWNT/Epoxy nanocomposites, Modelling and Simulation in Materials Science, 23, 065003 (16pp) 2015.
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79. V. Sundararaghavan, A. Kumar, S. Sun, Crystal plasticity simulations using nearest neighbor orientation correlation function, Acta Materialia, 93, p. 12-23, 2015 .

80. S. Ganesan, V. Sundararaghavan, An Atomistically-informed Energy Based Theory of Environmentally Assisted Failure, Corrosion Reviews, 33(6), p. 455-466, 2015. .
81. A.V. Duran, N.Fasanella, V. Sundararaghavan, A.M. Waas, Thermal buckling of composite plates with spatial varying fiber orientations, Composite structures, 124, p. 228--235, 2015. .
82. S. Sun and V. Sundararaghavan, A Peridynamic Implementation of Crystal Plasticity, International Journal of Solids and Structures, International Journal of Solids and Structures 51, p. 3350-3360, 2014.
83. V. Sundararaghavan, Reconstruction of three-dimensional anisotropic microstructures from two-dimensional micrographs imaged on orthogonal planes, Integrating Materials and Manufacturing Innovation, 3:19, p.1-11, 2014.
84. S. Ghosh, V. Sundararaghavan and A.M. Waas, "Construction of multi-dimensional isotropic kernels for nonlocal elasticity based on phonon dispersion data", Int J Solids and Structures, vol 51(2), 392-401, 2014.
85. A. Kumar and V Sundararaghavan and A R Browning, Study of temperature dependence of thermal conductivity in cross-linked epoxies using molecular dynamics simulations with long range interactions, Modelling and Simulation in Materials Science and Engineering, 22(2), 025013 (pp.1-15), , 2014
86. S. Ghosh, A. Kumar, V. Sundararaghavan, A. M. Waas, Non-local modeling of epoxy using an atomistically-informed kernel, International Journal of Solids and Structures, 50(19), pp. 2837-2845, , 2013
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88. S. Sun and V. Sundararaghavan, A probabilistic crystal plasticity model for modeling grain shape effects based on slip geometry, Acta Materialia, Vol 60, p. 5233-5244 , 2012.
89. V. Sundararaghavan and A. Kumar, "Probabilistic modeling of microstructure evolution using finite element representation of statistical correlation functions", Int J Plasticity, Vol 30-31, pp. 62-80, 2012.
90. V. Sundararaghavan and A. Waas, "Non-local continuum modeling of carbon nanotubes: physical interpretation of non-local kernels using atomistic simulations", Journal of Mechanics and Physics of Solids,Vol 59(6), pp. 1191-1203, 2011.
91. A. Rangarajan, R. J. D'Mello, V. Sundararaghavan and A. M. Waas, Minimization of thermal expansion of symmetric, balanced, angle ply laminates by optimization of fiber path configurations, Composites Science and Technology, Vol. 71(8), pp. 1105-1109, 2011.
92. S. Lee and V. Sundararaghavan, "Multi-scale modeling of moving interface problems with flux and field jumps: Application to oxidative degradation of ceramic matrix composites", Int J Numerical Methods in Engineering, Vol 85(6), pp. 784--804, 2011
93. V. Sundararaghavan and K Balasubramaniam, "On the conversion of multifrequency apparent conductivity data to actual conductivity gradients on peened samples", Journal of non destructive testing and evaluation, Vol 10(2), pp. 57--64, 2011
94. S. Lee and V. Sundararaghavan, "Calibration of Nanocrystal Grain Boundary Model Based on Polycrystal Plasticity Using Molecular Dynamics Simulations", Int J Multiscale Comput Engg, Vol 8(5), pp. 509-522, 2010.
95. S. Lee and V. Sundararaghavan, "Multiscale modeling of moving interface problems with flux jumps: Application to solidification", Computational Mechanics, vol. 44(3), pp. 297-307, 2009.
96. V. Sundararaghavan and N. Zabaras, "A statistical learning approach for the design of polycrystalline materials", Statistical Analysis and Data Mining, Vol. 1, Issue 5, pp. 306--321, 2009 (invited paper for the special issue on `Materials Informatics: Data-Driven Discovery in Materials Science', Krishna Rajan and Patricio Mendez, edts.). .
97. V. Sundararaghavan and N. Zabaras, "A multi-length scale sensitivity analysis for the control of texture-dependent properties in deformation processing", International Journal of Plasticity, Vol. 24, pp. 1581-1605, 2008
98. V. Sundararaghavan and N. Zabaras, "Weighted multi-body expansions for computing stable structures of multi-atom systems", Physical Review B, Vol. 77 (6) pp. 064101-1--064101-10, 2008.
99. V. Sundararaghavan and N. Zabaras, "Linear analysis of texture-property relationships using process-based representations of Rodrigues space" Acta Materialia, Vol. 55, Issue 5, pp. 1573-1587, 2007.
100. V. Sundararaghavan and N. Zabaras, "Design of microstructure-sensitive properties in elasto-viscoplastic polycrystals using multi-scale homogenization" International Journal of Plasticity, Vol. 22, pp. 1799-1824, 2006.(Figured in TOP25 articles in ScienceDirect)
101. N. Zabaras, V. Sundararaghavan, S Sankaran, "An information theoretic approach for obtaining property PDFs from macro specifications of microstructural uncertainty" TMS letters, Vol 3 , Issue 1, pp.1, 2006.
102. V. Sundararaghavan and N. Zabaras, "On the synergy between texture classification and deformation process sequence selection for the control of texture-dependent properties" Acta Materialia, Vol. 53(4), pp.1015-1027, 2005.
103. V. Sundararaghavan, N. Zabaras, "Classification and reconstruction of three-dimensional microstructures using support vector machines", Computational Materials Science, Vol. 32, pp. 223-239, 2005.
104. V. Sundararaghavan, K. Balasubramaniam, NR. Babu, N. Rajesh," A multi-frequency eddy current inversion method for characterizing conductivity gradients on water jet peened components." NDT&E International Journal. Vol. 38(7), 541-547, 2005. (Figured in TOP25 articles in ScienceDirect)
105. V. Sundararaghavan, N. Zabaras, "A dynamic material library for the representation of single phase polyhedral microstructures", Acta Materialia, Vol. 52/14, pp. 4111-4119, 2004.

106. N. Rajesh, V Sundararaghavan, NR. Babu, A novel method for modeling water jet peening, International Journal for Machine tools and Manufacture, International Journal of Machine Tools and Manufacture, Vol 44(7-8), 855-863, 2004.

Chapters in books:
V. Sundararaghavan, Markov random fields for microstructure simulation, Book Chapter: Statistical Methods for Materials Science: The Data Science of Microstructure Characterization, Edts. Simmons, De Graef, Drummy, Bouman, 2019. https://www.amazon.com/Statistical-Methods-Materials-Science-Characterization/dp/1498738206

Conferences: 150+ conference presentations and invited talks in TMS, AIAA, ASME, MS&T and other forums (not individually listed).

c. Grants and contracts
Total PI share: $8M (2009-present)

1. Boeing Company, "Structural Technologies Development, Subtask: Matrix Cracking (Emergent) Modeled Using Non-local Atomistically Informed Methods", $475,000, Nov 2010-Nov 2011.
2. TRW Automotive research award, "Visually active technologies for collision avoidance", $30,000, Jan 2010-December 2010, $30,000, PI, 0 GSRA
3. National Aeronautics and Space Administration (NASA), "Constellation University Institutes Program (CUIP): Physics and chemistry based multi-scale modeling of oxidation of high temperature ceramic-matrix composites", $1,305,000, October 2007-October 2009, PI W Shyy, candidate's share $165,000, 1 GSRA.
4. Boeing Company, "Structural Technologies Development Year 2, Subtask:: Matrix Cracking (Emergent) Modeled Using Non-local Atomistically Informed Methods", $322,500, January 2012-December 2012, PI Anthony M Waas, candidate's share $80,000, 1 Post-Doc
5. Office of Naval Research (ONR), "Investigation of texture synthesis approaches for generation of metallic microstructures", $27,755, April 2012 - December 2012, PI, 0.5 GSRA
6. Scientific Forming Technologies Corporation, "Integrated Computational Materials Engineering in Multiphysics Software", $48000, August 2014-February 2015, PI, 0.5 GSRA
7. NASA NSTRF (Kier), Modeling Failure of 3D Fiber Reinforced Foam Core Sandwich Structures with Defects Using a Multi-Scale Finite Element Method, $66000 per year, Jan 2015-May 2015.
8. National Science Foundation (NSF), "CAREER: Computational Approaches for Multi-scale Design of Magnetostrictive Alloys", Feb 2010-Jan 2016, $400,000, PI, 1 GSRA
9. NASA NSTRF (Kosztowny), Unitized Textile Composite Stiffened Panels for Space Structures; Manufacturing, Characterization, Modeling, and Analysis, Jan 2015-Jan 2016, $66000 per year.
10. DoE - USAMP, "Validation of Material Models for Automotive Carbon-Fiber Composite Structures via Physical Testing (Including Crash)", $28000, PI, December 2014 – April 2015
11. DoD (Army), "Advanced 3D printers for Cellular Solids", $191174, PI, August 2014– July 2015
12. Defense, Department of-Air Force, Department of the-Subcontracts sourced funding through Lockheed Martin Corporation, "Assess and Quantify the Benefits of Applying Damage Tolerant Design Principles to Advanced Composite Aircraft Structure" PI: $70000, 1/14 - 4/15.
13. Defense Threat Reduction Agency (DTRA), "Computational Homogenization Approach For Scale Linking And Multiscale Modeling Of Energetic Solid State Composites", Jan 2013-Mar 2017, $400,000, PI., 1 GSRA
14. Office of Naval Research (ONR), "Nano-scale identification of origin of tensile stress states under various loading modes", September 2012-Aug 2016, $240,000, PI, 1 GSRA
15. Office of Naval Research (ONR), "Integration of Advanced Analysis and Materials Research: Capturing Process Sensitive Materials Information in Compact, Computationally Efficient Models", $3,350,000, October 2011-December 2016, PI: John Allison (MSE), candidate's share: $455,000, 1 GSRA
16. Air Force Office of Scientific Research, "Experimentally Validated Computational Modeling of Mechanical Response of Woven Ceramic Matrix Composites under Elevated Temperature", $368560, PI, University of Michigan, 2014-10/2016.
17. Boeing Project - 2015: Structural Technologies Development Boeing Company, The sourced funding through University of Washington, PI, $146204, 1/1/15 → 12/31/16
18. Department of Energy (DoE), "Software Center for Predictive Theory and Modeling", $12,347,127, September 2012 – August 2017, PI: John Allison (MSE), candidate's share: $562,367, 1 GSRA
19. Toyota Motor Company, "A Survey Of The Effect Of Residual Stresses From Curing Processes On Fatigue Performance Of Carbon Fiber Epoxy Composites"$16321 (PI), Dec 2017-Feb 2018.
20. Air Force Office of Scientific Research (AFOSR), "MURI: Managing the mosaic of microstructure: image analysis, data structures, mathematical theory of microstructure, and hardware for the structure-property relationship", $7,328,223, September 2012-Nov 2018, PI: Marc De Graef (MSE, Carnegie Mellon Univ), candidate's share: $598,231, 1.5 GSRA

21. DoD (Army), "Progressive Failure Modeling of Multi-Layered Textile Composites", PI, $ 374044, July 2013 – April 2018.
22. US DoE ALMMII (American Lightweight Materials Manufacturing Innovation Institute), PI Alan Taub (University of Michigan), "Processing for Assured Properties in Al-Li Forgings by Development, Application and Validation of a Localized Physics-Based Viscoplastic Model: Application to Mechanical and Lifting Properties of Forged Al-Li Alloys", $2,600,000 (total, candidate share: $260000, 1 postdoc), 11/ 2015-8/ 2018.
23. Department of Energy (DoE), "Software Center for Predictive Theory and Modeling Phase II", $2,000,000, September 2017 – August 2020, PI: John Allison (MSE), candidate's share: $450,000, 1.5 GSRA
24. DoD (AFOSR), "LEGOMAT: Locally Extracted Globally Organized Microstructure Models using Markov Random Fields", sole PI, $398000, Jan 2018 – Dec 2020, 1.5 GSRA
25. USRA, Quantum Artificial Intelligence Laboratory Research Opportunity Award, March 2018– February 2020, PI: V Sundararaghavan, $0 (use of quantum computer time).
26. Collins Inc, ICME modeling of advanced Titanium alloys, March 2020-September 2020, PI Sundararaghavan, $68000.
27. DLA SBIR (phase II), ICME modeling in additive manufacturing, with AlphaStar Inc., Sundararaghavan (PI), $100,000, 2021-23.
28. Department of Energy (DoE), "Software Center for Predictive Theory and Modeling (Phase III)", $2,000,000, September 2020 – August 2023, PI: John Allison (MSE), share 450,000.
29. START grant (internal grant), Vitrimers: characterization and modeling, 75000$ (share $15,000), 2023
30. Department of Energy, Center for PRedictive Integrated Structural Materials Science (PRISMS Center), $7,445,602, Share: 450,000, Sep 2023-26
31. National Science Foundation, MRSEC: Center for Materials Innovations at Michigan, $18,000,000, 2023-27, Share: 450000
32. AFOSR, Advancing graph models for quantification of transparent ceramic microstructures, PI, $390,000,share: $240,000, Sep 2022-25.
33. DoD, ACCELERATE: Accelerating Control and Certification: Enhancing Laser-PBF and Electron Beam-PBF Operation Quality via Real-time Analytics, Technological Integration, and Experimental, Texas A&M, share: $315,000, Nov 2023-25
34. DoD, Center for Scientific Machine learning for Materials Sciences, $2.4M, share: $375,000, 2024-26
35. Collins Aerospace, ICME modeling of Titanium alloys, $59,393, 2023-24

d. Teaching

New courses introduced at U of M

- ***Aero 714. Atomistic modeling of materials***

The course targets students with interests in atomistic simulations using academic and commercial software. Specific topics include: Molecular statics, Monte Carlo and molecular dynamics simulations, density functional theory and the total-energy pseudopotential method and dynamical Monte Carlo models. The course includes lectures covering theoretical aspects followed by computational lab sessions at the CAEN Windows training rooms (Duderstadt center) where students get hands-on with a number of academic and commercial (parallel) computational tools (incl. LAMMPS, PWSCF, TOWHEE, GULP) to compute various thermo-physical properties of materials. (Course rating 4.5/5.0)

Courses taught at U of M and ratings

Course #	Course title	Term	Enrollment/ Rating Responses	Instructor rating given by students, Scale 1-5, 5-best
AE 513	*Foundations of solid mechanics*	*Fall 23*	*20/13*	*5.00*
AE 215	*Intro to Solid Mech*	*Winter 23*	*88/33*	*4.70*
AE 315	*Aerospace Structures*	*Fall 22*	*74/24*	*4.30*
AE 510	*Finite element analysis*	*Fall 21*	*35/13*	*4.70*
AE 513	*Foundations of solid mechanics*	*Fall 21*	*19/9*	*4.80*
AE 510	*Finite element analysis*	*Winter 21*	*45/17*	*4.70*
AE 315	*Aerospace Structures*	*Fall 20*	*96/24*	*4.50*
AE 510	*Finite element analysis*	*Winter 19*	*34/11*	*4.70*
AE 513	*Foundations of solid mechanics*	*Fall 18*	*17/7*	*5.00*
AE 510	*Finite element analysis*	*Winter 18*	*27/12*	*4.95*
AE 513	*Foundations of solid mechanics*	*Fall 17*	*16/12*	*4.95*
AE 510	*Finite element analysis*	*Fall 16*	*44/17*	*4.38*

AE 315	*Aerospace Structures*	*Winter 16*	*65/24*	*4.75*
AE 215	*Intro to Solid Mech*	*Fall 15*	*49/27*	*4.66*
AE 513	*Foundations of solid mechanics*	*Fall 14*	*31/16*	*4.50*
AE 510	*Finite element analysis*	*Winter 14*	*33/16*	*4.81*
AE 513	*Foundations of solid mechanics*	*Fall 13*	*35/24*	*4.39*
AE 416	*Plates and Shells*	*Winter 13*	*6/2*	*4.50*
AE 513	*Foundations of solid mechanics*	*Fall 12*	*31/17*	*4.89*
AE 510	*Finite element analysis*	*Winter 12*	*40/27*	*4.54*
AE 513	*Foundations of solid mechanics*	*Fall 11*	*34/27*	*4.54*
AE 215	*Intro to Solid Mech.*	*Winter 11*	*75/33*	*4.27*
AE 510	*Finite element analysis*	*Fall 10*	*31/19*	*3.86*
AE 714	*Atomistic modeling*	*Winter 10*	*16/14*	*4.21*
AE 215	*Intro to Solid Mech.*	*Fall 09*	*59/21*	*4.38*
AE 215	*Intro to Solid Mech.*	*Winter 09*	*41/12*	*4.64*
AE 714	*Atomistic modeling*	*Fall 08*	*9/6*	*4.75*
AE 510	*Finite Element Analysis*	*Winter 08*	*26 /23*	*4.73*
AE 315	*Aerospace Structures*	*Fall 07*	*54/37*	*3.92*
Guest Lecture	*ME 599 (Siegel), MSE 540 (Allison), Aero 201 (Atkins), Aero 215(Goulbourne), Aero 285/585 seminars*			

e. Service

Major committee assignments in the Department, College, and/or University

Department

- Undergraduate committee chair
- Committee member for Faculty reappointment casebooks
- Committee member for Faculty Promotion casebooks
- Faculty search committee member
- ABET Coordinator

College

- College Faculty committee on Discipline, Co-Chair
- Faculty Reader for undergraduate admissions
- Student Poster Judge for Engineering Graduate symposium, UM CyberInfrastruture Days
- Panelist for CAREER proposal workshop and NextProf workshops.
- Reviewer for TRW endowed automotive research award proposals.
- College of Engineering Representative for Faculty search candidates
- College Faculty Launch committee convener
- Committee member for Faculty reappointment casebooks in MSE
- Program committee member for Manufacturing Engineering program

Ph.D. Committees chaired

1. Sangmin Lee, "Multi-scale Homogenization of Moving Interface Problems with Flux and Field Jumps". PhD (Mechanical Engineering), Graduated December 2010. Current Position: Simulation Manager, Microvast Inc.
2. Shang Sun, "Multiscale modeling of fracture in polycrystalline materials", PhD (Naval Architecture and Marine Engineering), Graduated May 2014, Current Position: Engineer, Microsoft Inc, Seattle.
3. Abhishek Kumar, "Probabilistic Modeling of Polycrystalline Alloys for Optimized Properties", PhD (Aerospace Engineering), Graduated July 2014, chair. (recipient of Richard and Eleanor Towner Prize for Distinguished Academic Achievement, Ivor McIvor Prize for scholarship in Applied Mechanics, Best student

presentation award at the 5th Ablation Workshop held at Lexington, KY, 2012) Current Position: Assistant Professor at Wentworth Institute of Technology.

4. Nicholas Fasanella, "Multiscale Modeling of Carbon Nanotube-Epoxy Nanocomposites", PhD (Aerospace Engineering), Graduated May 2016, Chair (recipient of Arnold M. Kuethe Fellowship, SGT honor society) Current Position: Engineer, Northrop Grumman.
5. Adam Duran, "Multiscale Modeling of Shock Wave Propagation through High Energetic Composites", PhD candidate (Aerospace Engineering), Graduated July 2017, chair. (Rackham Merit Fellow and NSF Graduate research fellow 2013), Current Position: Research Engineer at NASA-JPL.
6. Sriram Ganesan, "Microstructural Response of Magnesium Alloys: 3D Crystal Plasticity and Experimental Validation", PhD candidate (Aerospace Engineering), Graduated June 2017, Chair.(Recipient of First Prize in student poster competition in EGS 2013, recipient of Richard and Eleanor Towner Prize for Distinguished Academic Achievement) Current Position: Engineer at Intel, Portland OR.
7. Pinar Acar, "Multi-Scale Design and Optimization of Microstructures under Uncertainties", PhD candidate (Aerospace Engineering), Graduated June 2017, Chair.(Recipient of Amelia Earhart Fellowship 2016), Current Position: Assistant Professor at Virginia Tech.
8. Shardul Panwar, "Numerical and Analytical Multiscale Modeling of High Cycle Fatigue in Advanced Materials", PhD (Aerospace Engineering), Graduated April 2018, Chair. Current Position: Principal Systems Engineer, Sierra Space.
9. Jiangyi Luo, "Peridynamic Modeling of Crystal Plasticity with an Adaptive Dynamic Relaxation Solver", PhD candidate (Mechanical Engineering), Graduated Winter 2019, Current: Research Fellow (SJTU).
10. Siddharth Srivastava, Graph theoretic methods for materials modeling and applications to quantum computing, PhD-candidate (Aerospace Engineering), Graduated 2021. Current: Asst Research Scientist (UM), PhD work featured in news article: https://www.nextplatform.com/2020/02/10/where-will-quantum-systems-succeed-in-ai-training/
11. Aaditya Lakshmanan, Multiscale modeling of pattern formation in materials, PhD-candidate (Aerospace Engineering), Graduated 2021, Senior Engineer, Novellis. Co-Recipient of Robert M. Caddell Memorial Award for Research
12. Iman Javaheri, Markov Random Fields for microstructure reconstruction, PhD (Aerospace Engineering) 2022, (Beyster Fellow 2021 and NSF Graduate Research Fellow 2018).Currently: Engineer, Northrop Grumman.
13. Gurmeet Singh(PhD 2022, Computational Studies of Vitrimers, Semicrystalline Polymers and Metals: Deformation, Actuation and Fabrication, Currently: Engineer, Toyota R&D
14. Michael Pilipchuk(PhD candidate), Gradient Crystal Plasticity theory (current)
15. Anindya Karmakar(PhD candidate), Multiscale Mechanics of Vitrimers, (current)
16. Vignesh Iyer(PhD precandidate), Multiscale modeling of Additive manufacturing, (current)

- **Member of thesis committees**

Mohsen Andani, Marco Mangano, Cyrus Kocztowny (co-chair), Solver Thorsson (co-chair), Jiawen Xie (co-chair), Bilal Sharqi, James Finlay, Duncan Greeley, Minh Hoang, Avinkrishnan Vijayachandran, Shiyao Lin, Jalal Nasser, Lori Ann Groo, Andrew Lee, Brittany Essink, Taylor Bramlett, Corin Bowen, Caleb Reese, Krystal Acosta, Zhihua Huang, Samuel Chen, Alireza Nafari, Aeriel Murphy-Leonard,Armanj Hasanyan, Timothy Brooks, Jacob Adams, Katherine Reichl, Ellen Solomon, Deepak Kumar Patel, Yali Li, Ryan Klock, Daniel Biggs, Anna Trump, Erin Deda, Fuzuli Ackay, Riddhiman Bhattacharya, Brian Justusson, Lucas Hansen, Katherine Sebeck, Zachary Kier, Pascal Meyer, Royan D'Mello Dianyun Zhang, Balachandran Radhakrishnan, Chen Shao, Nhung Nguyen, Wenbo Du, Jacob Davidson, Paul Davidson, Pavana Prabhakar, Adam Lobbestael, Scott Stapleton, Christian Heinrich, Evan Pineda, Sungmin Lee, Hsengji-Huang, Wooseok Ji, Alan Githens (MS).

- **Post doctoral mentoring and faculty sabbatical hosting**

Susanta Ghosh, 2011- 2013 (Currently: Associate Professor at Michigan Tech (MTU)), Christian Heinrich, 2015-2016. (Currently Technical Leader and Expert in the Analytical and Numerical Simulation Department at Sogeti Germany in Munich), Ali Ramazani, 2016-18, Currently JHU-Applied physics Lab, Arunabha Roy, 2017-2019, currently Research Fellow at Texas A&M, Prof. Jafar Albinmousa, Associate Professor, King Fahd University, 2021-22.

Service to government or professional organizations, and service on review board/study panels

Membership in Professional Societies

- American Institute of Aeronautics and Astronautics (AIAA) –Associate Fellow
- The Minerals, Metals and Materials Society (TMS)
- American Society of Mechanical Engineers (ASME)

Other Service

- Editor of Computers, Mechanics and Continua (Tech Science Press)
- Editor of Scientific reports (Springer-Nature)
- Member of Technical Committee, AIAA Materials division from Jan 2013.
- Organized various Mini-symposiums on "Multi-scale Modeling" in the ASME, AIAA, WCCM conferences, 2011-23
- Session chair, at various conferences including AIAA Scitech, ASME IMECE, United State National Congress in computational mechanics, International Symposium on Plasticity, ICME World congress.
- Panelist on lightweight materials, Workshop on Building the Materials Innovation Infrastructure: Data and Standards, at the U.S. Department of Commerce organized by the National Institute for Standards and Technology, Herbert Hoover building, Washington, DC, May 14-15, 2012.
- Panelist, Materials Genome Initiative Materials Data Workshop to discuss community-led priorities for digital materials data, 2014, Dayton, Ohio.
- Panelist on future of stress corrosion cracking research, Other Panel members: Dr. A.K. Vasudevan, Dr. Roger C Newman, Dr. Vivekanand Kain, EDSA2015 conference, Indian Institute of Technology, Madras.
- Plenary Speaker, State of the Art in Microstructure Synthesis, AFOSR/NSF joint workshop: Materials Avatars: A Workshop on Rapid and Robust Generation of Virtual Synthetic Materials, July 7-8, 2016, Arlington VA, USA.
- Co-Chair for the NSF-supported workshop, "Core Knowledge and Skills for Effective Use of Advanced Computation and Data in Materials and Manufacturing." At TMS Meeting 2018
- Planning team for the NSF-supported workshop, "Verification and Validation (V&V) of Predictive Computational Models Associated with the Mechanics of Materials" At WCCM Meeting 2018
- Instructor, PRISMS Plasticity training, PRedictive Integrated Structural Materials Science (PRISMS) Workshop, 4th World Congress in Integrated Computational Materials Engineering, May 25–26, 2017.
- Invited Participant, Army Science Planning and Strategy meeting on "Materials Data & Design Science for Materiel on-Demand and by-Design". (Organized by Dr. William Benard (ARL)), 2018, Adelphi, Maryland, USA.
- Guest Editor, Special Issue on Microstructure-Based Modeling of Metallic Materials, in Metals Journal, Guest Editor, Special Issue on Machine learning for materials characterization (Scientific Reports).

Journal/Proposal Review Activities

- Reviewer of abstracts for conferences: AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, ASME IMECE conference, World Congress in computational mechanics/Asia-Pacific Congress on computational mechanics (WCCM/APCOM).
- Reviewer for various journals: AIAA Journal, Acta Materialia, Acta Astronautica, ASME Journal of Applied Mechanics, Computational Materials Science, Computers Materials, & Continua, Corrosion reviews, Diamonds and Related Materials, Engineering fracture mechanics, Fatigue & Fracture of Engineering Materials & Structures, Finite elements in analysis and design, International Journal of Fracture, International Journal of Plasticity, International Journal of Multi-scale Computational Engineering, International Journal of Numerical Methods in Engineering, Ceramic International, International Journal of Fracture, Metallurgical and Materials Transactions, Materials Science and Engineering A, Theoretical and applied mechanics letters, The open aerospace engineering journal.
- Reviewed grant proposals and white papers: Department of Energy (Basic Energy Science), Air Force Office of Scientific Research, Office of Naval Research, National Science Foundation (Panelist, Mechanics of materials (Multiphysics, Deformation, Fatigue and Fracture, Computational mechanics), Advanced Cyberinfrastructure panels), NSF-PIRE, NSF Graduate research fellowship program (GRFP), NSF CAREER, Department of Energy computational sciences graduate fellowships (DoE-CSGF), Department of Energy technology commercialization fund (DoE-TCF), SUNY 4E Network of Excellence, Natural Environment Research Council- NERC (UK), Hong Kong Research Grants Council, Agency for Science, Technology and Research (ASTAR) Singapore, National Science Center (Narodowe Centrum Nauki – NCN), Poland, Natural Sciences and Engineering Research Council of Canada, Swiss National Science Foundation (SNSF).