Biographical Sketch: Shaoping Xiao

Department of Mechanical Engineering
Iowa Technology Institute
The University of Iowa
3131 Seamans Center, Iowa City, IA 52242
Work: (319)335-6009, FAX: (319) 335-5669
e-mail: shaoping-xiao@uiowa.edu
https://iti.uiowa.edu/people/shaoping-xiao
https://xiao.lab.uiowa.edu/

Professional Preparation

University of Science and Technology of China	Mechanical and Mechanics Engineering	BS 1995
University of Science and Technology of China	Mechanical and Mechanics Engineering	MS 1998
Northwestern University	Mechanical Engineering	PhD 2002
Northwestern University	Mechanical Engineering	Post Doctorate 2003

Appointments

Assistant Professor	Department of Mechanical and Industrial Engineering, The University of Iowa	2003-2008
Associate Professor	Department of Mechanical Engineering, The University of Iowa	2008-2023
Professor	Department of Mechanical Engineering, The University of Iowa	2023-

Publications

1. Belytschko, T., Guo, Y., Liu, W. K., and Xiao, S. P., “A unified Stability analysis of meshless particle methods”, International Journal for Numerical Methods in Engineering, Vol. 48(9), 2000, pp.1359-1400.
2. Belytschko, T., and Xiao, S. P., “Stability analysis of particle methods with corrected derivatives”, Computers and Mathematics with Applications, Vol. 43(3-5), 2002, pp.329-350.
3. Belytschko, T., Xiao, S. P., Schatz, G., and Ruoff, R., “Atomistic simulation of nanotube fracture”, Physical Review B, Vol. 65, 2002, pp.235430.
4. Belytschko, T., and Xiao, S. P., “Coupling methods for continuum model with molecular model”, Journal of Multiscale Computational Engineering, Vol. 1(1), 2003, pp.115-126.
5. Belytschko, T., Xiao, S. P., and Chandu, P., “Topological optimization with implicit functions and regularization”, International Journal for Numerical Methods in Engineering, Vol. 57(8), 2003, pp.1177-1196.
6. Rabczuk, T., Belytschko, T., and Xiao, S. P., “Stable particle methods based on Lagrangian kernels”, Computer Methods in Applied Mechanics and Engineering, Vol. 193(12-14), 2004, pp. 1035-1063.
7. Mielke, S. L., Troya, D., Zhang, S. L., Li, J. L., Xiao, S. P., Car, R., Ruoff, R. S., Schatz, G. C., Belytschko, T., “The role of vacancy defects and holes in the fracture of carbon nanotubes”, Chemical Physics Letters, Vol 390(4-6), 2004, pp 413-420

8. Xiao, S. P., and Belytschko, T., “A bridging domain method for coupling continua with molecular dynamics”, Computer Methods in Applied Mechanics and Engineering, Vol. 193(17-20), 2004, pp. 1645-1669.
9. Xiao, S. P., “An FE-FCT method with implicit functions for the study of shock wave propagation in solids”, Wave Motion, Vol 40(3), 2004, pp 263-276
10. Xiao, S. P., and Belytschko, T., “Material stability analysis of particle methods”, Advances in Computational Mathematics, Vol 23(1-2), 2005, pp 171-190
11. Xiao, S. P., and Yang, W. X., “A Nanoscale meshfree particle method with the implementation of the quasicontinuum method”, International Journal of Computational Methods, Vol. 2(3), 2005, pp. 293-313
12. Xiao, S. P., and Hou, W. Y., “Studies of Size Effects on Carbon Nanotubes' Mechanical Properties by Using Different Potential Functions”, Fullerenes, Nanotubes, and Carbon Nanostructures , Vol 14(1), 2006, pp 9-16
13. Xiao, S. P., Andersen, D. R, Han, R., and W. Y. Hou, “Studies of carbon nanotube-based oscillators using molecular dynamics”, Journal of Computational and Theoretical Nanoscience, Vol. 3(1), 2006, pp 142-147
14. Xiao, S. P., “A Non-oscillatory Method for Spallation Studies”, International Journal for Numerical Methods in Engineering, Vol 66(2), 2006, pp 364-380
15. Xiao, S. P., Han, R., and Hou, W. Y., “Spin in Carbon Nanotube-based Oscillators”, International Journal of Nanoscience, Vol 5(1), 2006, pp 47-55
16. Xiao, S. P., and Hou, W. Y., “Fracture of Vacancy-Defected Carbon Nanotubes and Their Embedded Nanocomposites”, Physical Review B, Vol 73(11), 2006, 115406
17. Xiao, S. P., and Yang W. X., “Temperature-Related Cauchy-Born Rule for Multiscale Modeling of Crystalline Solids”, Computational Materials Science, Vol 37(3), 2006, pp 374-379
18. Xiao, S. P., and Yang W. X., “A meshfree particle method with stress points and its applications at the nanoscale”, The International Journal of Computational Science and Engineering, Vol 2(3-4), 2006, pp 213-220
19. Rabczuk, T., Xiao, S. P., and Sauer, M., “Coupling of meshfree methods with finite elements: Basic concepts and test results”, Communications in Numerical Methods in Engineering, Vol 22(10), 2006, pp 1031-1065
20. Xiao, S. P., “A Lattice Boltzmann Method for Shock Wave Propagation in Solids”, Communications in Numerical Methods in Engineering, Vol 23(1), 2007, pp 71-84
21. Xiao, S. P., and Yang, W. X., “A temperature-related homogenization technique and its implementation in meshfree particle methods for nanoscale simulations”, International Journal for Numerical Methods in Engineering, Vol 69, 2007, pp 2099-2125
22. Xiao, S. P., and Hou, W. Y., “Multiscale modeling and simulation of nanotube-based torsional oscillators”, Nanoscale Research Letters, Vol 2(1), 2007, pp 54-59
23. Xiao, S. P., and Hou, W. Y., “Studies of nanotube-based resonant oscillators through multiscale modeling and simulation”, Physical Review B, Vol 75(12), 2007, 125414
24. Hou, W. Y., and Xiao, S. P., “Mechanical behaviors of nanotubes with randomly located vacancy defects”, Journal of Nanoscience and Nanotechnology, Vol 7, 2007, pp 4478-4485
25. Xiao, S. P., and Hou, W. Y., “Studies of nanotube-based composites using the bridging domain coupling method”, International Journal for Multiscale Computational Engineering, Vol 5(6), 2007, pp 447-460
26. Yang, W. X., and Xiao, S. P., “Extension of the temperature-related Cauchy-Born rule: material stability analysis and thermo-mechanical coupling”, Computational Materials Science, Vol 41, 2008, 431-439
27. Xiao, S. P., Wang, S. W., Ni, J., Briggs, R., and Rysz, M., “Reliability analysis of carbon nanotubes using molecular dynamics with the aid of Grid computing”, Journal of Computational and Theoretical Nanoscience, Vol 5, 2008, 1220-1229

28. Xiao, S. P., Ni, J., Wang, S. W., “Bridging domain multiscale methods and its high performance computing implementation”, Journal of Computational and Theoretical Nanoscience, Vol 5, 2008, 1-10
29. Xiao, S. P., Andersen, D., Yang, W. X., “Design and analysis of nanotube-based memory cell”, Nanoscale Research letters, Vol 3, 2008, 416-420
30. Wei, X. P., Xiao, S. P., Ni, J., “Studies of ice melting via molecular dynamics”, Molecular Simulations, Vol 36(11), 2010, 823-830
31. Ren, B., Qian, J., Zeng, A. K., Xiao, S., and Li, S., “Recent Developments on Thermo-Mechanical Simulations of Ductile Failure by Meshfree Method”, CMES: Computer Modeling in Engineering & Sciences, Vol 71(3), 2011, 253-278
32. Wei, X. P., Xiao, S. P., Ni, J., “Ice melting speeds at various scales”, Advanced Science Letters, Vol 17(1), 2012, 172-178
33. Xiao, S. P., "Multiscale modeling of nanotube based composites and devices", Journal of Applied Mechanical Engineering, Vol 3(3), 2014
34. Ghaffari, Mir Ali, Pahl, E., Xiao, S. P. "Three Dimensional Fatigue Crack Initiation and Propagation Analysis of a Gear Tooth Under Various Load Conditions and Fatigue Life Extension with Boron/Epoxy Patches", Engineering Fracture Mechanics, Vol 135, 2015, 126-146
35. Xiao, S.P., Yang, W. X., Zhang, Y. "Studying nanotube-based oscillators and their application as memory cells via nanoscale continuum modeling and simulation", International Journal of Engineering Research and Applications, Vol 12(2), 2015, 160-170.
36. Xiao, S.P., Ni, J, Zhang, Y. "Multiscale modeling for material phase change problems", International Journal of Nano Studies & Technology, Vol 5(1), 2016, 1-3
37. Ghaffari, M. A., Xiao, S. P. "Smoothed Particle Hydrodynamics with Stress points and Centroid Voronoi Tessellation (CVT) Topology Optimization", International Journal of Computational Methods, Vol 13(6), 2016, 1650031
38. Yamashita, H., Hart, R., Sharma, T., Samanta, A., Wang, Q. H., Xiao, S. P., Tanner, G. and Zhang, Y.“A review of multiscale methods and their applications in modeling and simulation of engineering problems”, International Journal on Recent Technologies in Mechanical and Electrical Engineering (IJRMEE), Vol 3(3), 2016, 42 – 47
39. Hart, R., Tanner, G., Xiao, S. P. "Studies of temperature effects on a Morse lattice via molecular dynamics", Journal of Computing Technologies, Vol 5(6), 2016, 26-33
40. Xiao, S., Sharma, T. and Yamashita, H. "Calculating Heat Capacities of FCC metals via Monte-Carlo Method", Journal of Applied Mechanical Engineering, Vol 5, 2016, 219-220
41. Samanta, A., Wang, Q. and Xiao, S. P. "Studies of cavity effects on graphene sheets via molecular dynamics", International Journal of Modern Studies in Mechanical Engineering, Vol 2(1), 2016, 38-45
42. Nelsen, C. and Xiao, S. P. "Modeling and Simulation of Shock Wave Propagation at Nanoscale", American Journal of Engineering Research, Vol 5(11), 2016, 310-315
43. Hickey, A. and Xiao, S. P. "Finite Element Modeling and Simulation of Car Crash", International Journal of Modern Studies in Mechanical Engineering, Vol 3(1), 2017, 1-5
44. Ghaffari, M. A., Zhang, Y., Xiao, S. P. "Molecular dynamics modeling and simulation of lubricant between sliding solids", Journal of Micromechanics and Molecular Physics, Vol 2(2), 2017, 1750009
45. Ghaffari, M. A., Zhang, Y., Xiao, S. P. "Multiscale modeling and simulation of rolling contact fatigue", International Journal of Fatigue, Vol 108, 2018, 9-17
46. Ghaffari, M. A., Gong, Y., Attarian, S. and Xiao, S. P. "Peridynamics with corrected boundary conditions and its implementation in multiscale modeling of rolling contact fatigue", Journal of Multiscale Modelling, Vol 10(1), 2019, 1841003
47. Samanta, A., Xiao, S. P., Shen, N. G., Li, J. J. and Ding, H. T. “Atomistic simulation of diffusion bonding of dissimilar materials undergoing ultrasonic welding”, The International Journal of Advanced Manufacturing Technology, 2019, 1-12

48. Attarian S, Xiao, S. P., Chung, TC, da Silva, ES, Raghavan, ML “Investigation of the observed rupture lines in abdominal aortic aneurysm using crack propagation simulations”, Journal of Biomechanical Engineering, vol 141(7), 2019, 071004
49. Xiao S. P., Hu R., Li Z., Attarian S., Björk K. and Lendasse A. “A machine-learning-enhanced hierarchical multiscale method for bridging from molecular dynamics to continua”, Neural Computing and Applications, 2019(9), 1-15
50. Attarian, S., Xiao, S. P. "Development of a 2NN-MEAM potential for boron", Journal of Micromechanics and Molecular Physics, Vol 5(3), 2020, 2050008
51. Xiao S. P., Deierling, P., Attarian, S., and El Tuhami, A. “Machine learning in multiscale modeling of spatially tailored materails with microstructure uncertainties”, Computers and Structures, 249, 2021, 106511
52. Xiao S. P., and R. Liu, “Studying COVID-19 spreading in human population via agent-based modeling”, Complex Systems, 30(3), 2021, 297-321
53. Cai, M., Hasanbeig, M., Xiao, S. P., Abate, A., and Kan, Z., “Modular deep reinforcement learning for continuous motion planning with temporal logic”, IEEE Robotics and Automation Letters, 6(4), 2021, 7973-7980
54. Xiao, S. P, She, B., Kan, Z., and Mehta, S., “Design of controllable leader-follower networks via memetic algorithms”, Advances in Complex Systems, 2021, 2150004
55. Cai, M., Xiao, S. P., and Kan, Z., “Reinforcement learning of control synthesis with soft LTL constraint using limit-deterministic generalized buchi automaton”, arXiv:2101.10284 [cs.RO]
56. Cai, M., Xiao, S. P., Li, Z. J., and Kan, Z., “Optimal probabilistic motion planning with potential infeasible LTL constraints,” IEEE transactions on Automatic Control, 2021, 3138704
57. Li, Z. L., Cai, M., Xiao, S. P., and Kan, Z., “Online motion planning with soft timed temporal logic is unknown and dynamic environment,” IEEE Control System Letters, 6, 2022, 2293-2298
58. Attarian, S., Xiao, S. P., “Development of a 2NN-MEAM potential for Ti-B system and studies of the temperature dependence of the nanohardness of TiB2”, computational materials science, 201, 2022, 110875
59. El Tuhami, A. and Xiao S. P. “Multiscale Modeling of Metal-Ceramic Spatially Tailored Materials via Gaussian Process Regression and Peridynamics”, International Journal of Computational Methods, 2022, 2250025.
60. Zhu, Y., Cai, M.Y., Schwarz, C., Li, J. C., Xiao, S. P., “Intelligent Traffic Light via Policy-based Reinforcement Learning”, International Journal of Intelligent Transportation Systems Research, 20, 2022, 734-744.
61. Attarian, S. and Xiao, S. P., “Investigating the strength of Ti/TiB interfaces at multiple scales using density functional theory, molecular dynamics, and cohesive zone modeling”, Ceramic International, 48(22), 2022, 33185-33199.
62. Cai, M., Xiao, S. P., Li, Z. J., and Kan, Z., “Optimal probabilistic motion planning with potential infeasible LTL constraints,” IEEE transactions on Automatic Control, 68(1), 2023, 301-316,
63. Cai, M., Xiao, S. P., Li, J.C., and Kan, Z., “Safe reinforcement learning under temporal logic with reward design and quantum action selection”, Scientific Reports, 13, 2023, 1925
64. Xiao, S. P., Bordas, S. P. A., and Kim, T. Y., “Editorial: Deep learning in computational materials science”, Frontier in Materials, 10, 2023
65. Li, J. C., Cai, M., Wang, Z. A., and Xiao, S. P., “Model-based motion planning in POMDPs with temporal logic specifications,” Advanced Robotics, 37(14), 2023, 871-886
66. Wang, Z., Xiao, S. P., Reuben, C., Wang, Q., and Wang, J., “Soil NOx emission prediction via recurrent neural networks,” Computers, Materials & Continua, 77(1), 2023, 285-297
67. Gurbuz, F., Mudireddy, A., Mantilla, R., and Xiao, S., “Using a physics-based hydrological model and storm transposition to investigate machine-learning algorithms for streamflow prediction,” Journal of Hydrology, 628, 2023, 130504

68. Xiao, S. P., Li, J, Bordas, S. P. A., and Kim, T. Y., "Artificial neural networks and their applications in computational materials science: A review and a case study," Advanced in Applied Mechanics, 57, 2023, 1-33
69. Motezaker, M, Xiao, S. P., Khoei, A. R., Zakeri, J. A., "Studies of friction sliding contact by molecular dynamics assisted continuum mechanics," Mechanics of Advanced Materials and Structures, 31(6), 2024, 1401-1412
70. Li, J., Cai, M., and Xiao, S. P., "Reinforcement learning-based motion planning in partially observable environments under ethical constraints," AI and Ethics (2024)
71. Li, J., Cai, M., Kan, Z., and Xiao, S. P., "Model-free reinforcement learning for motion planning of autonomous agents with complex tasks in partially observable environments," Autonomous Agents and Multi-agent Systems, 38(14), 2024

Currently Funded Project

[1] PI, "Machine Learning-Enhanced Multiscale/Multiphysics Modeling of Spatially Tailored Materials with Multiscale Experimental Validation," 08/01/21 – 07/31/24, NSF
[2] Co-PI, "Artificial Intelligence, Modeling and Simulation (AIMS) Certificate Programs", 01/01/22 – 12/31/24, DoED
[3] PI, "BRITE Pivot: Learning-based Optimal Control of Streamflow with Potentially Infeasible Time-bound Constraints for Flood Mitigation," 01/01/23-12/31/25, NSF
[4] Co-PI, "Interactive impacts of farmers' mental health well-being and climate variability", 01/15/23-06/15/24, UI-ISG

Synergistic Activities

[1] Member, ASME, ASCE, ASEE, USACM, IACM, SAE, IEEE Computer Society
[2] Reviewer, NSF & other proposals (50+), Journal & Conference publications (600+), books (2+)
[3] Guest editor of a special issue, "Deeping Learning in Computational Materials Science", for *Frontiers in Materials*, (2022)
[4] Guest editor of a special issue, "Adaptive Decision Support Systems", for *Scientific Reports*, (2024)
[5] Editorial Board of *CMC-Computers, Materials & Continua* (2023-)
[6] Editorial Board of *Scientific Reports* (2023-)
[7] Editorial Board of *Lubricants* (2018-)
[8] Director of the Division of Systems and Sensors at the Iowa Technology Institute (2020-)
[9] Faculty Advisor of oSTEM (2019-)
[10] Chair of ITI-DEI committee (2022-)
[11] Director of Undergraduate AIMS (Artificial Intellgience, Modeling & Simulation) certificate program

Others

The best DEI paper in the Ocean and Marine Engineering Division, ASEE 2022 Annual Conference
Featured article in *Journal of Micromechanics and Molecular Physics*, 2017-2022
Chemical Physics Letters most cited paper 2003-2007 award, 2007
Best subcontractor of NextGen Aeronautics, 2006
ASME Certificate of Appreciation, ASME, 2005
Second Old Gold summer fellowship, University of Iowa, 2005
Best paper award of 116th annual meeting, The Iowa Academy of Science, 2004