Sungkwang Mun, Ph.D.

Research Assistant Professor
Center for Advanced Vehicular Systems
Mississippi State University, USA

PERSONAL

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CAVS Professional Profile
Google Scholar
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RESEARCH INTERESTS

Machine learning, Interatomic potential development, Surrogate Modeling and Optimzation

EDUCATION

Ph.D. in Computer Engineering Aug. '07 - Dec. '12
Mississippi State University, Starkville, MS
-Thesis: "Block Compressed Sensing of Images and Video"
-Advisor: Dr. James E. Fowler

B.S. in Computer Engineering Mar. '00 - Dec. '02, Mar. '05 - May '07
KwangWoon University, Seoul, South Korea
-Study Area: Digital Image Processing (Motion Detection)
-Advisor: Dr. Sungwon Lee

Exchange Student in Electrical & Computer Engineering Aug. '06 - May '07
Mississippi State University, Starkville, MS

PROFESSIONAL EXPERIENCE

Assistant Research Professor Jun. '18 - Present
Center for Advanced Vehicular Systems, Mississippi State, USA
-Developing molecular dynamics (parrallel) simulation code for organo-metallic composite system.
-The code is available at `https://github.com/sungkwang/MEAM-BO`

Postdoctoral Researcher Jun. '14 - May '18
Center for Advanced Vehicular Systems, Mississippi State, USA
-Developed molecular dynamics simulation code for polymeric systems
-Supervisor: Dr. Mark F. Horstemeyer

Intermittent Researcher Jan. '14 - Jun. '14
Agricultural and Biological Engineering Dept., Mississippi State, USA
-Conducted research on modeling and verifying the uncertainty of water irrigation system in Mississippi delta area.
-Supervisor: Dr. Rajkumar Prabhu

Teaching Assistant Aug. '10 - Dec. '12
Electrical and Computer Engineering Dept., Mississippi State, USA
-Taught 60 - 120 students in the Digital Device lab. Assisted instructor to develop lab materials effective for the large classroom environment by writing comprehensive lab manuals, reports, on-line quizzes, and auxiliary programming codes.
-Supervisor: Jane Moorhead

Research Assistant Aug. '08 - Jul. '10
Geo systems Research Institute, Mississippi State, USA

-Performed research on image compression/restoration, specifically compressed sensing. Developed the simulation code related to the research. The codes are available at `http://www.ece.msstate.edu/~fowler/BCSSPL/`
-Supervisor: Dr. James Fowler

Research Assistant Jan. '08 - Jul. '08
Department of Mathematics and Statistics Dept., Mississippi State, USA
-Performed research on numerical analysis
-Supervisor: Dr. Seongjai Kim

SKILLS

Programming: C/C++, Fortran, Python, Matlab, HTML/CSS, Java
Operating Systems: Windows, Linux/Unix
Language: English, Korean

SERVICES

Journal Reviewer
-Serving as a journal reviewer for Molecular Simulation, Transactions in Image Processing, KSII Transactions on Internet and Information Systems, Transactions on Geoscience and Remote Sensing, Transactions on Computational Imaging, Journal of Mathematical Imaging and Vision, Entropy, IEEE Signal Processing Letters, Journal of Selected Topics in Applied Earth Observations and Remote Sensing, Digital Signal Processing, and Telecommunication Systems Journal.

Web Administrator

- Korean Student Association, Mississippi State University Aug. '08 - Aug. '18
  -Created and maintaining the website, `http://ksa-msu.com`
- Starkville Korean Church, Starkville, Mississippi Jan. '10 - Present
  -Created and maintaining the website, `http://skpc.us`

Vice President
Korean Association of Mississippi, Aug. '20 - Present
-Organizes and hosts events and activities to promote Korean culture and help settle Korean immigrants in Mississippi.

Graduate Ambassador
Electrical and Computer Engineering, Mississippi State University Aug. '08 - Dec. '12
-Assisted the prospective international students for admission for the graduate program.

Vice President
Korean Student Association, Mississippi State University Aug. '08 - May '09, Aug. '10 - May '11
-Planned yearly plan and budget for the organization, and helped the settlement of the exchange students, transferred students, and visiting professors.

HONORS AND AWARDS

Nomiated for StudyMississippi International Student award, StudyMississippi Consortium at Mississippi State University for the year 2012.
Nomiated for Outstanding Gradutate Teaching Assistant award, Graduate Student Association at Mississippi State University for the year 2010-2011.

PUBLICATIONS

Peer-Reviewed Journal Articles

[1] Daniela F Tellkamp, Nayeon Lee, Gehendra Sharma, **Sungkwang Mun**, Daniel Johnson, and Luke Peterson, "Structural design and optimization of deployable protective wall using machine learning-based surrogate models for blast and impact resistance," *Machine Learning: Engineering*, vol. 1, no. 1, pp. 015006, 2025

[2] Nayeon Lee, **Sungkwang Mun**, Kyle L Johnson, and Mark F Horstemeyer, "The function of horn ridges for impact damping," *Biomimetics*, vol. 9, no. 8, pp. 506, 2024

[3] Ayantha Senanayaka, Philku Lee, Nayeon Lee, Charles Dickerson, Anton Netchaev, and **Sungkwang Mun**, "Enhancing the accuracy of machinery fault diagnosis through fault source isolation of complex mixture of industrial sound signals," *The International Journal of Advanced Manufacturing Technology*, pp. 1–16, 2024

[4] Kefan Chen, **Sungkwang Mun**, Michael I Baskes, Mark Horstemeyer, and Bin Li, "Atomistic study of intermetallics of fe-al-zn system and their interfacial properties," *Modelling and Simulation in Materials Science and Engineering*, 2024

[5] J. Hwang, P. Lee, **Sungkwang Mun**, I. K. Karathanassis, F. Koukouvinis, F. Tagliante, T. Nguyen, and L. Pickett, "A new pathway for prediction of gasoline sprays using machine-learning algorithms," in *SAE Technical Paper 2022-01-0492*, 2022, p. 14

[6] M. S. Nitol, **Sungkwang Mun**, D. E. Dickel, and C. D. Barrett, "Unraveling mg< c+ a> slip using neural network potential," *Philosophical Magazine*, vol. 102, no. 8, pp. 651–673, 2022

[7] K. Chen, **Sungkwang Mun**, M. Baskes, M. Horstemeyer, and Bin Li, "Development of 2nn meam potential for fe–al and atomistic investigation of surface and interface properties of the inhibition layer in galvanized fe," *Modelling and Simulation in Materials Science and Engineering*, vol. 30, no. 4, pp. 045001, 2022

[8] S. Ababtin, S. Adibi, **Sungkwang Mun**, R. L. Carinoo, D. E. Doyl, S. R. Gwaltney, M. Novotny, M. I. Baskes, and M. Horstemeyer, "Single-wall carbon nanotube mechanical behavior using the modified embedded atom method with bond order (meam-bo)," *Modelling and Simulation in Materials Science and Engineering*, 2022

[9] A. L. Bowman, **Sungkwang Mun**, B. D. Huddleston, S. R. Gwaltney, M. I. Baskes, and M. F. Horstemeyer, "A nanoscale study of size scale, strain rate, temperature, and stress state effects on damage and fracture of polyethylene," *Mechanics of Materials*, vol. 161, pp. 104008, 2021

[10] **Sungkwang Mun**, N. Lee, D. Dickel, S. Adibi, B. Huddleston, R. Prabhu, and K. Limmer, "A modified embedded atom method (meam) interatomic potential for the fe-ch system," *arXiv preprint arXiv:2109.01712*, 2021

[11] H. Zhou, D. E. Dickel, M. I. Baskes, **Sungkwang Mun**, and M. A. Zaeem, "A modified embedded-atom method interatomic potential for bismuth," *Modelling and Simulation in Materials Science and Engineering*, vol. 29, no. 6, pp. 065008, 2021

[12] J. Hwang, P. Lee, **Sungkwang Mun**, I. K. Karathanassis, P. Koukouvinis, L. M. Pickett, and M. Gavaises, "Machine-learning enabled prediction of 3d spray under engine combustion network spray g conditions," vol. 293, pp. 120444, 2021

[13] a. bakhtiarydavijani, M. Murphy, **Sungkwang Mun**, M. Jones, D. Bammann, M. LaPlaca, M. Horstemeyer, and R. Prabhu, "Damage biomechanics for neuronal membrane mechanoporation," *Modelling and Simulation in Materials Science and Engineering*, vol. 27, no. 6, pp. 065004, 2019

[14] A. L. Bowman, **Sungkwang Mun**, S. R. Gwaltney, M. I. Baskes, and M. F. Horstemeyer, "Free volume and structural evolution during creep in amorphous polyethylene by atomistic molecular dynamic simulations," *Polymer*, vol. 170, pp. 85–100, 2019

[15] D. Dickel, S. R. Gwaltney, **Sungkwang Mun**, M. I. Baskes, and M. F. Horstemeyer, "A dispersion-corrected modified embedded-atom method bond order interatomic potential for sulfur," *The Journal of Physical Chemistry A*, November 2018

[16] M. A. Murphy, **Sungkwang Mun**, M. F. Horstemeyer, M. I. Baskes, A. Bakhtiary, Michelle C. LaPlaca, Steven R. Gwaltney, Lakiesha N. Williams, and R. K. Prabhu, "Molecular dynamics simulations showing 1-palmitoyl-2-oleoyl-phosphatidylcholine (POPC) membrane mechanoporation damage under different strain paths," *Journal of Biomolecular Structure and Dynamics*, vol. 0, no. 0, pp. 1–14, 2018, PMID: 29629830

[17] Nayeon Lee, Lakiesha N. Williams, **Sungkwang Mun**, R. Prabhu, Kabindra R. Bhattarai, H. Rhee, and M.F. Horstemeyer, "Stress wave mitigation at suture interfaces," *Biomedical Physics & Engineering Express*, vol. 3, no. 3, pp. 035025, 2017

[18] **Sungkwang Mun**, Andrew L. Bowman, Sasan Nouranian, Steven R. Gwaltney, Michael I. Baskes, and Mark F. Horstemeyer, "Interatomic potential for hydrocarbons on the basis of the modified embedded-atom method with bond order (MEAM-BO)," *The Journal of Physical Chemistry A*, vol. 121, no. 7, pp. 1502–1524, 2017

[19] **Sungkwang Mun**, G. F. Sassenrath, A. M. Schmidt, Nayeon Lee, M. C. Wadsworth, B. Rice, J.Q. Corbitt, J. Pote, and R. Prabhu, "Uncertainty analysis of an irrigation scheduling model for water management in crop production," *Agricultural Water Management*, vol. 155, pp. 100–112, June 2015

[20] James E. Fowler, **Sungkwang Mun**, and Eric W. Tramel, "Block-based compressed sensing of images and video," *Foundations and Trends in Signal Processing*, vol. 4, no. 4, pp. 297–416, March 2012

Peer-Reviewed Conference Papers

[1] Joshua Bassett, Gehendra Sharma, Justin Xie, Jonathan Storey, Han-Gyu Kim, Tonya Stone, Haley Dozier, and **Sungkwang Mun**, "Thermal calibration of finite element models in wire arc directed energy deposition of er-120s-g using thermocouples and infrared cameras," in *ASME Aerospace Structures, Structural Dynamics, and Materials Conference*. American Society of Mechanical Engineers, 2025, vol. 88759, p. V001T03A010

[2] Gehendra Sharma, Joshua Bassett, Justin Xie, Jonathan Storey, Han-Gyu Kim, Tonya W Stone, Haley Dozier, and **Sungkwang Mun**, "Enhancing wire arc directed energy deposition outcomes through tailored dwell time allocation," in *ASME Aerospace Structures, Structural Dynamics, and Materials Conference*. American Society of Mechanical Engineers, 2025, vol. 88759, p. V001T03A033

[3] Haiye Xie, Joshua Bassett, Sara Adibi, Doyl Dickel, Gehendra Sharma, Jonathan Storey, Haley Dozier, and **Sungkwang Mun**, "Enhanced temperature prediction in wire arc-directed energy deposition using physics-informed neural networks," in *ASME Aerospace Structures, Structural Dynamics, and Materials Conference*. American Society of Mechanical Engineers, 2025, vol. 88759, p. V001T03A007

[4] Daniel Johnson, Luke Peterson, Gehendra Sharma, **Sungkwang Mun**, Youssef Hammi, Tonya Stone, Jesse Sherburn, and Daniel Rios-Estremera, "Finite element modeling of ballistic impact for steel plates using two constitutive models," in *ASME International Mechanical Engineering Congress and Exposition*. American Society of Mechanical Engineers, 2024, vol. 88612, p. V003T04A036

[5] Ayantha Senanayaka Mudiyanselage, Qing Liu, Nayeon Lee, **Sungkwang Mun**, Amin Amirlatifi, Joseph Jabour, Thomas Arnold, and Maria Seale, "Frequency domain tensor-based 1d-convolutional neural network and multilinear principal component analysis for machinery fault detection," in *Annual Conference of the PHM Society*, 2024, vol. 16

[6] **Sungkwang Mun**, Joonsik Hwang, Linkan Bian, TC Falls, and W Glenn Bond, "Ensemble learning for fault condition prediction and health status monitoring in military ground vehicles," in *Proceedings of the IISE Annual Conference & Expo 2023*, New Orleans, LA, May 2023, IISE, accepted

[7] D. Seely, B. Huddleston, **Sungkwang Mun**, A. Vo, N. Lee, D. Dickel, and K. Limmer, "Atomistic study on diffusion and trapping of hydrogen in nanocrystalline steel," in *TMS 2022 151st Annual Meeting & Exhibition Supplemental Proceedings*, Cham, 2022, pp. 1117–1126, Springer International Publishing

[8] **Sungkwang Mun** and James E. Fowler, "Motion compensated compressed sensing for dynamic MRI," in *Proceedings of the International Conference on Image Processing*, Melbourne, Australia, September 2013

[9] **Sungkwang Mun** and James E. Fowler, "DPCM for quantized block-based compressed sensing of images," in *Proceedings of the European Signal Processing Conference*, Bucharest, Romania, August 2012

[10] James E. Fowler, **Sungkwang Mun**, and Eric W. Tramel, "Multiscale block compressed sensing with smoother projected Landweber reconstruction," in *Proceedings of the European Signal Processing Conference*, Barcelona, Spain, August 2011, pp. 564–568

[11] **Sungkwang Mun** and James E. Fowler, "Residual reconstruction for block-based compressed sensing of video," in *Proceedings of the Data Compression Conference*, James A. Storer and Michael W. Marcellin, Eds., Snowbird, UT, March 2011, pp. 183–192

[12] **Sungkwang Mun** and James E. Fowler, "Block compressed sensing of images using directional transforms," in *Proceedings of the International Conference on Image Processing*, Cairo, Egypt, November 2009, pp. 3021–3024

Book Chapters

[1] D. Dickel, **Sungkwang Mun**, M. Baskes, S. Gwaltney, Raj K. Prabhu, and Mark F. Horstemeyer, "Chapter 3 - density functional theory and bridging to classical interatomic force fields," in *Multiscale Biomechanical Modeling of the Brain*, Raj Prabhu and Mark Horstemeyer, Eds., pp. 39–52. Academic Press, 2022

Software Manuals

[1] **Sungkwang Mun**, , S. Adibi, D. Dickel, and L. Bian, *PINN for Predicting the Thermal Evolution of WAAM Proces*, Army Research Lab, 2020, Software User Manual

Conference Presentations

[1] **Sungkwang Mun**, R. Carino, and M. Baskes, "Modified embedded atom method (meam) with bond order implementation in lammps," in *6th LAMMPS Workshop and Symposium*, Albuquerque, NM, August 2019

[2] A. Bowman and **Sungkwang Mun**, "Multi-threaded extension of meam force field in molecular dynamic simulations," in *HPCMP User Group Metting*, Vicksburg, MS, May 2019

[3] S. Ababtin, **Sungkwang Mun**, R. Carino, A. Bowman, M. Baskes, and M. Horstemeyer, "Multiscale interfacial characteristics of single wall carbon nanotube (swcnt) composites embedded within polyethylene (pe)," in *TMS 2019 Annual Meeting & Exhibition*, San Antonio, TX, March 2019

[4] M. A. Murphy, R. Prabhu, M. F. Horstemeyer, L. N. Williams, **Sungkwang Mun**, and M. I. Baskes, "Molecular dynamics simulations of neuronal membrane mechanoporation damage," in *International Mechanical Engineering Congress & Exposition*, Pheonix, AZ, November 2016

[5] **Sungkwang Mun**, G. F. Sassenrath, Nayeon Lee, M. A. Murphy, J.Q. Corbitt, and R. Prabhu, "Development of crop coefficients for scheduling irrigation of crops in humid environments," in *American Society of Agricultural and Biological Engineers Annual International Meeting*, Orlando, FL, July 2016

[6] A. Bakhtiary, A. E. Florence, M. A. Murphy, **Sungkwang Mun**, J. Liao, L. N. Williams, M. F. Horstemeyer, M. C. LaPlaca, and R. Prabhu, "The stress rate dependency of intracellular calcium ion concentration in a neuronal membrane mechanoporation during mechanical insult," in *Summer Biomechanics, Bioengineering and Biotransport Conference*, Snowbird, UT, June 2015

[7] Michael A. Murphy, **Sungkwang Mun**, M. F. Horstemeyer, Steven R. Gwaltney, Tonya W. Stone, Michelle C. LaPlaca, Jun Liao, Lakiesha N. Williams, and R. Prabhu, "Constructing rudimentary limit curves for neuronal phospholipid bilayer failure and theoretical calcium penetration," in *Summer Biomechanics, Bioengineering and Biotransport Conference*, Snowbird, UT, June 2015

Dissertation

[1] **Sungkwang Mun**, *Block Compressed Sensing of Images and Video*, Ph.D. dissertation, Mississippi State University, 2012

TEACHING EXPERIENCE

[1] Taught ECE3443-Signals and Systems, Spring 2020 (Evaluation: 4.6/5.0)

[2] Taught ECE3714-Digital Device Lab, Spring/Fall 2010-2012

STUDENT MENTORING

[1] Justin Xie, Master, Expected grauation: Fall 2025. Thesis Topic: "Physics Informed Neural Networks for Additive Manufacturing", major advisor

[2] Joshua Bassett, Master, Expected grauation: Fall 2025. Thesis Topic: "Near Realtime Monitoring of Additive Manufacturing", co-major advisor

[3] Kefan Chen, Ph.D., Graduation: Fall 2022. Thesis Topic: "Interatomic Potential Development for Si-O and Zn-Fe", Non-committee

[4] Sultana Ababtin, Ph.D., Graduation: Fall 2021. Thesis Topic: "Lower Length Scale Stuey on Carbon Nanotube Reinforced Polyethylene", Non-committee

[5] Andrew Bowman, Ph.D., Graduation: Spring 2019. Thesis Topic: "Multiscale Modeling of Polyethylene", Non-committee