

# Bohumir Jelinek

Center for Advanced Vehicular Systems  
200 Research Boulevard  
Starkville, MS 39759  
(662)325-6854  
[bj48@msstate.edu](mailto:bj48@msstate.edu)

Center for Advanced Vehicular Systems  
PO Box 5405  
Mississippi State, MS, 39759  
Google Scholar: [Bohumir Jelinek](#)  
ResearcherID: [C-4376-2008](#)  
Scopus: [Jelinek, B](#)

CURRENT RESEARCH Presented at

- 1) [Ground Vehicle Systems Engineering and Technology Symposium \(GVSETS\)](#), Novi, Michigan, Aug 2021,
- 2) [20th International and 9th Americas Conference of the International Society for Terrain-Vehicle Systems \(ISTVS\)](#), Online Event, Sept 2021,
- 3) [Machine-Ground Interaction Consortium \(MAGIC\)](#), University of Wisconsin-Madison, Sept 2019

Developed [Finite Element model of heat transfer during Direct Laser Deposition](#) additive manufacturing process using [FEniCS](#) framework

EDUCATION Doctor of Philosophy, **Engineering Physics**; Minor in **Mechanical Engineering**  
Mississippi State University, Mississippi State, MS.  
Dissertation: *Modified embedded atom method potential for Al, Si, Mg, Cu, and Fe alloys*  
Master of Science, **Computer Engineering**  
Mississippi State University, Mississippi State, MS.  
Software project: [ISIP ASR system](#): <http://www.isip.piconepress.com/projects/speech/>

**Job Offers/Scholarships**  
job offers at Purdue and Ames Lab  
research assistantship at Mississippi State University  
prestigious European Commission Socrates / Erasmus Scholarship, Ghent, Belgium

GRANTS AND AWARDS **Research Funding**  
U.S. Army Corps of Engineers ERDC, Vicksburg, MS  
U.S. Army Research Laboratory

◇ **Awards**  
Awarded Extreme Science and Engineering Discovery Environment (XSEDE/ACCESS-CI) startup allocation for *Simulations for 2D and 3D dendrite growth during alloy solidification*  
Awarded XSEDE/ACCESS-CI research allocation for *Large scale 3D modeling of microstructural evolution during alloy solidification*

RESEARCH INTERESTS Additive Manufacturing: Implemented [2D thermal model](#) of directed energy deposition additive manufacturing process ([animations](#)) in Python using [FEniCS](#) framework matching pyrometer measurement of melt pool length, presented at [FEniCS'19](#) with [article in Journal of Manufacturing Processes](#).

HPC: Parallelized [2D](#) and [3D](#) solidification codes with excellent [speed up](#) and [scale up](#).  
Molecular dynamics and ab-initio simulations: developed, [tested](#), and published the [MEAM potential for Al-Si-Mg-Cu-Fe alloys](#), second largest atomistic potential in the [National Institute of Standards and Technology \(NIST\) database](#).  
Speech recognition using hidden Markov models, AI search: [ISIP ASR C++](#) package.  
Numerical methods for electromagnetic field: [Yagi-logper](#) and [Antennavis](#) projects.

Vehicle Dynamics: Presented at [Computing in Engineering Forum, Machine-Ground Interaction Consortium](#), University of Wisconsin-Madison, participated International Symposium on Agile Ground Vehicle Dynamics, Energy Efficiency, and Performance in Severe Environments, Birmingham, AL

- RESEARCH EXPERIENCE
- ◇ **Assistant Research Professor, Center for Advanced Vehicular Systems (CAVS)**, Mississippi State University, Mississippi State, MS (May 2013 – present)
  - ◇ **Postdoctoral Fellow, Center for Advanced Vehicular Systems (CAVS)**, Mississippi State University, Mississippi State, MS (May 2011 – April 2013)  
Parallelized [3D lattice-Boltzmann code](#), coupled it with [Discrete Element method](#). The work earned a mention in [HPCwire 2016](#) and 2017 brochure of [The Coalition for Academic Scientific Computation](#), pp. 17.  
Parallelized [2D/3D lattice Boltzmann-cellular automaton alloys solidification codes](#), resulting in a [simulation](#) of 11 million [dendrites](#), in 17.28 cm × 8.64 cm domain with 165 billion grid cells utilizing 41472 cores of the Kraken supercomputer, featured in the MSU Research Windows magazine. Implemented [parallel HDF5](#) output with [XDMF](#) descriptors and dendrite tip tracking.  
Performed Ab-initio simulations of alloys and crystalline defects. Implemented and published [Python routines](#) utilizing [ASE](#) for testing of classical atomistic potentials.
  - ◇ **Postdoctoral Fellow, Geotechnical and Structures Laboratory of the Engineer Research and Development Center, U.S. Army Corps of Engineers**, Vicksburg, MS  
Modeled electro-osmotic transport in concrete. Revealed [effects of surface charge density, distribution, and related changes in viscosity on the nanochannel electro-osmotic flow](#).
  - ◇ **Research Assistant, Center for Advanced Vehicular Systems (CAVS)**, Mississippi State University, Mississippi State, MS  
Estimated elastic properties of crystals for the development of [MEAM potential for Al, Si, Mg, O, H, Cu, Fe alloys](#) using [VASP](#). Modified MEAM in [LAMMPS](#) to match [Dynamo](#) results. Contributed (1, 2, 3) to [LAMMPS](#). Implemented linked list and XML parser in Fortran 90 and XML parser in C++.
  - ◇ **Research Assistant, Institute for Signal and Information Processing (ISIP)**, Mississippi State University, Mississippi State, MS  
Developed, documented and tested [ISIP C++ public domain automatic speech recognition system](#) over two-year period. Implemented speaker adaptation, stack decoding and support vector machine class in ISIP system.
  - ◇ **Research Assistant, ELIS Speech Lab**, Ghent University, Ghent, Belgium  
Performed training and decoding of the DARPA 1000-word resource management speech database by the ISIP ASR system, sponsored by a prestigious European Commission Socrates / Erasmus Scholarship.
  - ◇ **BEST Summer Course participant, Danish Technical University**, Copenhagen, Denmark (Summer 1996)  
Completed Board of European Students of Technology (BEST) summer course Physics and electronics of cryogenic temperatures.
- JOURNAL ARTICLES
- Jelinek, B.**, Young, W. J., Dantin, M., Furr, W., Doude, H., Priddy, M. W., “Two-dimensional Thermal Finite Element Model of Directed Energy Deposition: Matching Melt Pool Temperature Profile to Pyrometer Measurement,” [Journal of Manufacturing Processes, Elsevier, 57, 187-195, September 2020](#)
- Peters, J. F., **Jelinek, B.**, Goodman, C. C., Vahedifard, F., Mason, G. L., “Large Scale Discrete Element Modeling for Engineering Analysis: A Case Study for the Mobility Cone Penetrometer,” [Journal of Geotechnical and Geoenvironmental Engineering, ASCE, 145\(12\), 2019](#)

- Johnson, D., Vahedifard, F., **Jelinek, B.**, Peters, J. F., “Micromechanics of Undrained Response of Dilative Granular Media Using a Coupled DEM-LBM Model: A Case of Biaxial Test,” *Computers and Geotechnics*, 89, 103-112, 2017
- Johnson, D. H., Vahedifard, F., **Jelinek, B.**, Peters, J. F., “Micromechanical modeling of discontinuous shear thickening in granular media-fluid suspension,” *Journal of Rheology*, AIP, 61(2), 265-277, 2017
- Eshraghi, M., **Jelinek, B.**, Felicelli, S. D., “Large-Scale Three-Dimensional Simulation of Dendritic Solidification Using Lattice Boltzmann Method,” *JOM, Springer*, 67(8), 1786-1792, May 2015
- Jelinek, B.**, Eshraghi, M., Felicelli, S. D., Peters, J. F., “Large-scale Parallel Lattice Boltzmann - Cellular Automaton Model of Two-dimensional Dendritic Growth,” *Computer Physics Communications*, 185(3), 939-947, March 2014
- Jelinek, B.**, Solanki, K., Peters, J., Felicelli, S., “Investigating Robustness of Interatomic Potentials with Universal Interface,” *Journal of Physics: Conference Series*, 402, 012006, December 2012
- Eshraghi, M., Felicelli, S. D., **Jelinek, B.**, “Three dimensional simulation of solutal dendrite growth using lattice Boltzmann and cellular automaton methods,” *Journal of Crystal Growth*, 354(1), 129-134, June 2012
- Jelinek, B.**, Groh, S., Moitra, A., Horstemeyer, M., Houze, J., Kim, S.-G., Wagner, G., Baskes, M., “Modified embedded atom method potential for Al, Si, Mg, Cu, and Fe alloys,” *Physical Review B*, 85(24), 245102, June 2012.
- Jelinek, B.**, Felicelli, S., Mlakar, P., and Peters, J., “Effects of surface charge density and distribution on the nanochannel electro-osmotic flow,” *International Journal of Theoretical and Applied Multiscale Mechanics (IJTAMM)*, 2(2), 165–183, October 2011.
- Kim, S.-G., Horstemeyer, M., Baskes, M., Rais-Rohani, M., Kim, S., **Jelinek, B.**, Houze, J., Moitra, A., and Liyanage L., “Semi-Empirical Potential Methods for Atomistic Simulations of Metals and Their Construction Procedures,” *Journal of Engineering Materials and Technology*, 131(4), 041210, October 2009.
- Moitra, A., Kim, S., Houze, J., **Jelinek, B.**, Kim, S.-G., Park, S.J., German, R., and Horstemeyer, M., “Melting tungsten nanoparticles: a molecular dynamics study,” *Journal of Physics D: Applied Physics*, 41(18), 185406, September 2008.
- Chandler, M., Horstemeyer, M., Baskes, M., Wagner, G., Gullett, P., and **Jelinek, B.**, “Hydrogen effects on nanovoid nucleation at nickel grain boundaries,” *Acta Materialia*, 56(3), 619–631, February 2008.
- Chandler, M., Horstemeyer, M., Baskes, M., Gullett, P., Wagner, G., and **Jelinek, B.**, “Hydrogen effects on nanovoid nucleation in face-centered cubic single-crystals,” *Acta Materialia*, 56(1), 95–104, January 2008.
- Jelinek, B.**, Houze, J., Kim, S., Horstemeyer, M., Baskes, M., and Kim, S.-G., “Modified embedded-atom method interatomic potentials for the Mg-Al alloy system,” *Physical Review B*, 75(5), 054106, February 2007.
- Potirniche, G., Horstemeyer, M., Gullett P., and **Jelinek, B.**, “Atomistic modelling of fatigue crack growth and dislocation structuring in FCC crystals,” *Proceedings of the Royal Society A*, 462(2076), 3707–3731, December 2006.
- Potirniche, G., Horstemeyer, M., **Jelinek, B.**, and Wagner, G., “Fatigue damage in nickel and copper single crystals at nanoscale,” *International Journal of Fatigue*, 27(10–12), 1179–1185, October–December 2005.
- CONFERENCE ARTICLES **Jelinek, B.**, Salmon, E., Mason, G., Gibson, M., Hannis, T., Pachel, N., Jarrell, W., Towne, B., “SIMULATION STUDY OF LIGHT-WEIGHTING EFFECTS ON RIDE QUALITY AND MOBILITY,” NDIA Michigan GVSETS 2021 Novi, Michigan, August 8-12, 2021.

**Jelinek, B.**, Mason, G., Peters, J., Vahedifard, F., Priddy, J., “DEM Analysis of Contact Forces and Tractive Performance of Rigid Wheel in Granular Media,” [20th International and 9th Americas Conference of the ISTVS Online Event](#), September 27-29, 2021.

Johnson, D., Vahedifard, F., **Jelinek, B.**, Peters, J. F., “Using DEM-LBM for Micro-Scale Modeling of Coupled Hydro-Mechanical Processes in Geomechanics,” [Sixth Biot Conference on Poromechanics](#). 6, 238-245 Paris, France, July 9-13, 2017.

**Jelinek, B.**, Johnson, D., Fili, J., Allen, J., Carrillo, A., Hodo, W., and Peters, J., “Coupled DEM-LBM model of loading response of saturated granular media,” [Proceedings of the 21st International Scientific Conference on Armament and Technics of Land Forces 2015](#), Liptovsky Mikulas, Slovakia, November 12–13, 2015.

**Jelinek, B.**, Felicelli, S., Mlakar, P., and Peters, J., “Molecular dynamics study of temperature effects on electrokinetic transport in Si nanochannel,” [Proceedings of the ASME International Mechanical Engineering Congress & Exposition, 10-8](#), Lake Buena Vista, USA, November 13–19, 2009.

Stone, T., **Jelinek, B.**, Kim, S.-G., Gullett, P., and Horstemeyer, M., “Molecular Dynamics Simulations of the Compressive Behavior of  $\alpha$ -Fe and Fe-Cu Nanocrystalline Materials,” [Proceedings of the 2007 International Conference On Powder Metallurgy & Particulate Materials](#), 1.15–1.24, Denver, Colorado, USA, May 13–16, 2007.

**Jelinek, B.**, Zheng, F., Parihar, N., Hamaker, J., and Picone, J., “Generalized Hierarchical Search in the ISIP ASR System,” [Proceedings of the Thirty-Fifth Asilomar Conference on Signals, Systems, and Computers](#), 2, 1553–1556, Pacific Grove, California, USA, November 2001.

**Jelinek, B.**, “Numerical Calculations of Planar Symmetric Arrays of Cylindrical Dipoles,” [RADIOELECTRONICA 99, 9th International Czech-Slovak Scientific Conference](#), 313–316, Brno, Czech Republic, April 27–28, 1999.

REPORTS Allen, J., Hodo, W., Walizer, L., McInnis, D., Carrillo, A., **Jelinek, B.**, Johnson, D., Peters, J., and Felicelli, S. D., “Comparison/Validation Study of Lattice Boltzmann and Navier-Stokes for Various Benchmark Applications,” [U.S. Army Corps of Engineers ERDC](#), September 2014.

PRESENTATIONS **Jelinek, B.**, “Experimental and Modeling Capabilities for Off-road Mobility at CAVS, Mississippi State University,” [Computing in Engineering Forum, Machine-Ground Interaction Consortium](#), University of Wisconsin-Madison, 2019.

**Jelinek, B.**, Young, W. J., II, Dantin, M., Furr, W., Doude, H., Priddy, M. W. (2019). “Two-dimensional Thermal Finite Element Model of Directed Energy Deposition,” [FEn-iCS'19](#), Washington DC, 2019

**Jelinek, B.**, “Development of a coupled LBM-DEM model for off-road mobility,” [3rd International Symposium on Advanced Vehicle Technology \(ISAVT\)](#), Illertissen, Germany, 2018.

**Jelinek, B.**, Eshraghi, M., Felicelli, S., “Large Scale Parallel Lattice Boltzmann Model of Dendritic Growth,” TMS Annual Meeting & Exhibition, [Symposium on Modeling of Multi-Scale Phenomena in Materials Processing - III](#), San Antonio, TX, 2013.

Eshraghi, M., **Jelinek, B.**, Felicelli, S., “A Three-Dimensional Lattice Boltzmann-Cellular Automaton Model for Dendritic Solidification under Convection,” TMS Annual Meeting & Exhibition, [Symposium on Frontiers in Solidification Science](#), San Antonio, TX, 2013.

**Jelinek, B.**, Felicelli, S., Peters, J., Solanki, K., “Routines for Basic Tests of Atomistic Potentials with Universal Interface,” [2011 Conference on Computational Physics](#), Gatlinburg, TN, 2011.

**Jelinek, B.**, Felicelli, S., Mlakar, P., Peters, J., “Effects of Surface Charge Density and Distribution on the Nanochannel Electro-Osmotic Flow,” [2011 LAMMPS Users' Workshop and Symposium](#), Albuquerque, NM, 2011.

**Jelinek, B.**, “The Universal Interface for Testing Atomistic Potentials,” [2011 NIST Workshop on Atomistic Simulations for Industrial Needs](#), Gaithersburg, MD, 2011.

Baskes, M., **Jelinek, B.**, Groh, S., Moitra, A., Horstemeyer, M., Houze, J., Kim, S., Wagner, G., “New MEAM potentials for the Al, Si, Mg, Cu, and Fe alloy system,” [2011 NIST Workshop on Atomistic Simulations for Industrial Needs](#), Gaithersburg, MD, 2011.

**Jelinek, B.**, Felicelli, S., Mlakar, P., Peters, J., “Temperature and Viscosity Effects on the Velocity Profile of a Nanochannel Electro-Osmotic Flow,” 63rd Annual Meeting of the APS Division of Fluid Dynamics, Long Beach, CA, 2010.

**Jelinek, B.**, Houze, J., Groh, S., Kim, S., Horstemeyer, M., Wagner, G., Baskes, M., “MEAM Potential for Al, Si, Mg, Cu, and Fe Alloys,” 77th Annual Meeting of the Southeastern Section of the APS, Baton Rouge, LA, 2010.

**Jelinek, B.**, Felicelli, S., Mlakar, P., Peters, J., “Temperature and Viscosity Effects on the Velocity Profile of a Nanochannel Electro-Osmotic Flow,” 77th Annual Meeting of the Southeastern Section of the APS, Baton Rouge, LA, 2010.

**Jelinek, B.**, Felicelli, S., Mlakar, P., “Molecular Dynamics Parametric Study of Electrokinetic Transport in Silicon Nanochannel.” USACE Research and Development Conference, Memphis, TN, 2009.

**Jelinek, B.**, Houze, J., Kim, S., Moitra, A., Liyagne, L., Horstemeyer, M., and Kim, S.-G., “Development of the EAM Potential for Fe-C Alloy Systems,” Annual APS March Meeting, New Orleans, LA, 2008.

**Jelinek, B.**, Kim, S.-G., Houze, J., Kim, S., Horstemeyer, M., and Baskes, M., “Development and Testing of MEAM Potential for Al-Mg Alloys,” TMS Annual Meeting & Exhibition, Symposium on Advances in Computational Materials Science and Engineering Methods, Orlando, FL, 2007.

**Jelinek, B.**, Houze, J., Kim, S.-G., Horstemeyer, M., and Baskes, M., “MEAM Potentials for Al-Mg Alloy: Application to Defects,” Annual APS March Meeting, Baltimore, MD, 2006.

**Jelinek, B.**, Kim, S., Houze, J., Kim, S.-G., Horstemeyer, M., and Baskes, M., “Development and Testing of MEAM Potential for Al-Mg Alloys,” 73rd Annual Meeting of the Southeastern Section of the APS, Williamsburg, VA, 2006.

**Jelinek, B.**, Houze, J., Kim, S.-G., Horstemeyer, M., “Potentials for Al and Mg Alloys and Interfaces,” 72nd Annual Meeting of the Southeastern Section of the APS, Gainesville, FL, 2005.

**Jelinek, B.**, Horstemeyer, M., Kim, S.-G., Baskes, M., Potirniche, G., “MEAM Potential Simulations of Void Formation on Al, Si, Mg, Cu and Fe Interfaces,” 8th US National Congress on Computational Mechanics, Austin, TX, 2005.

**Jelinek, B.**, Potirniche, G., Kim, S.-G., Horstemeyer, M., and Baskes, M., “Ab-initio Calculations for MEAM Potential of Al, Si, Mg, H, O and Cu Alloys,” Annual APS March Meeting, Los Angeles, CA, 2005.

**Jelinek, B.**, Potirniche, G., Kim, S.-G., Horstemeyer, M., and Baskes, M., “Ab-initio Calculations for MEAM Potential of Al, Si, Mg, H, and O Alloys,” Annual APS March Meeting, Montreal, Canada, 2004.

INVITED  
TALKS

**Jelinek, B.**, “Development and Testing of (M)EAM Potentials for Elements and Alloys,” [MIT Department of Material Science and Engineering, Boston, MA, 2008](#).

**Jelinek, B.**, “Development and Testing of (M)EAM Potentials for Elements and Alloys,” [Delft University of Technology, Delft, NL, 2008](#)

POSTERS

**Jelinek, B.**, Mason, G., Peters, J., Johnson, D., Brumfield, M., Carrillo, A., Goodman,

