

Bohumir Jelinek

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Scopus: [Jelinek, B](#)

CURRENT RESEARCH

Presentations at

- 1) **Ground Vehicle Systems Engineering & Technology Symposium (GVSETS) & Modernization Update**, Novi, Michigan, Aug 2024, *Vehicle-Level Control Systems Framework for Use in CREATE-GV Mercury Simulations*
- 2) **16th European-African Regional Conference of the ISTVS**, Oct 2023, *Tractive Performance of Rigid Wheel in Granular Media Using Coarse-Scale DEM models*
- 3) **Ground Vehicle Systems Engineering and Technology Symposium (GVSETS)**, Novi, Michigan, Aug 2021, *Simulation Study of Light-Weighting Effects on Ride Quality and Mobility*
- 4) **20th International and 9th Americas Conference of the International Society for Terrain-Vehicle Systems (ISTVS)**, Online Event, Sept 2021, *DEM Analysis of Contact Forces and Tractive Performance of Rigid Wheel in Granular Media*
- 5) **Machine-Ground Interaction Consortium (MAGIC)**, University of Wisconsin-Madison, Sept 2019, *Experimental and modeling capabilities for off-road mobility at the Center for Advanced Vehicular Systems, MSU*

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 in 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.

- 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, C., Vahedifard, F., “Large Scale MPI-Parallelization of LBM and DEM Systems: Accelerating Research by Using HPC,” SC18, The International Conference for High Performance Computing, Networking, Storage, and Analysis, Dallas, TX, 2018.

Johnson, D., **Jelinek, B.**, Felicelli, S. D., Walizer, L., Hodo, W. “Loading Response of Densely Packed Particle Assemblies in Fluid,” National Center for Intermodal Transportation for Economic Competitiveness Annual Conference, Mississippi State University, 2013.

SOFTWARE PRODUCTS **2d-heat-ded**, 2D thermal model of LENS® process in Python using **FEniCS** Python routines using **ASE** for testing of classical atomistic potentials.

Program to calculate directivity and gain of Yagi-Uda antennas: *Numerical Calculations of Planar Symmetric Arrays of Cylindrical Dipoles*

AFFILIATIONS American Physical Society

EXPERTISE

- ◇ **FEniCS** (2D thermal model of LENS® process **2d-heat-ded**)
- ◇ **HPCToolkit**, **TAU**, **PerfExpert**
- ◇ **ASE** (contributed 1, 2, 3), **LAMMPS** (contributed 1, 2, 3), **VASP**, **GROMACS**, **Antennavis**
- ◇ Matlab, Simulink, Modelica
- ◇ C, C++, Fortran 77, 95, Pascal, MPI, **Maxima** (contributed)
- ◇ Gnuplot, Grace, **libX11**, **OpenDX**, CEI Ensignt, HDF5, **dxhdf5**, IDL/gdl, ParaView, VisIt, **Moose**, **FEniCS**
- ◇ Bash, Python, Perl, AWK, GIT, CVS, Subversion, MySQL, HTML, XML, **XDMF**, HTML
- ◇ Emacs, Jupyter Notebook, **L^AT_EX**, Microsoft Word, PowerPoint, Excel
- ◇ GNU/Linux (Gentoo), Ubuntu, Microsoft Windows
- ◇ fluent in English, Slovak, Czech