

Babak Shotorban

Professor

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EDUCATION

- 09/2001 – 12/2004 Ph.D., Mechanical Engineering
University of Illinois at Chicago
Dissertation Title: *Modeling of subgrid-scale effects on particles in large-eddy simulation of turbulent two-phase flows*
- 09/1996 – 10/1998 M.S., Mechanical Engineering
Sharif University of Technology
Thesis Title: *Heat transfer in flow freezing over isothermal cylinders*
- 09/1992 – 08/1996 B.S., Mechanical Engineering
Sharif University of Technology

EMPLOYMENT

- 08/2019 – present Professor
- 08/2014 – 07/2019 Associate Professor
- 08/2008 – 07/2014 Assistant Professor, Department of Mechanical & Aerospace Engineering
The University of Alabama in Huntsville, Huntsville, Alabama
- 10/2007 – 08/2008 Software Development Engineer, ESI Group, Inc., Huntsville, Alabama
- 01/2005 – 09/2007 Postdoctoral Research Associate, Computational Science and Engineering / Center
for Simulation of Advanced Rockets
University of Illinois at Urbana-Champaign, Urbana, Illinois
- 08/2001 – 12/2004 Teaching / Research Assistant, Mechanical & Industrial Engineering Department
University of Illinois at Chicago, Chicago, Illinois

HONORS AND AWARDS

- Associate Fellow of American Institute of Aeronautics and Astronautics (AIAA)
- University Distinguished Research Award, UAH, 2018
- Outstanding Junior Faculty Award of College of Engineering, UAH, 2013
- Provost's Award for Graduate Research, University of Illinois at Chicago, 2004
- University Graduate Fellowship, University of Illinois at Chicago, 2003

COURSES TAUGHT (in-person, online and hybrid)

- MAE 310: Fluid Mechanics I
- MAE 343 (formerly 420): Compressible Aerodynamics
- MAE 488: Analysis of Engineering Systems (System Dynamics)

- MAE 623: Computational Fluid Dynamics I
- MAE 651: Viscous Fluid Mechanics
- MAE 723: Computational Fluid Dynamics II

PH.D. DISSERTATIONS SUPERVISED

- Ambarish R. Dahale, graduated 2014, now with Convergent Science
Dissertation Title: *Dynamics of shrub fires investigated via physics based modeling*
- Bangalore Yashwanth, graduated 2015, now with American Axle and Manufacturing
Dissertation Title: *Computational investigation of the influence of heating modes and moisture content on pyrolysis and ignition of live fuel*
- Satyajeet Padhi, graduated 2016, now with ANSYS
Dissertation Title: *A computational investigation of shrub fire dynamics under the influence of wind*
- Chandana Anand, graduated 2018, now with DuPont
Dissertation Title: *Computational investigations of ignition of live fuel and deposition of firebrands in a turbulent boundary layer*
- Althea Wilson, graduated 2020, now with Torch Technologies
Dissertation Title: *Computational study of dust crystals in RF plasmas*
- Peyman Rahimi Borujerdi, expected 2021
- Aditya Mankame, expected 2022
- Patrick Damiani, expected 2023

M.S. THESES SUPERVISED

- Matthew C. Dunn, graduated 2011
Thesis Title: *A methodology for the uncertainty quantification and sensitivity analysis of turbulence model coefficients*
- Carolyn C. Horn, graduated 2011
Thesis Title: *The effects of radiofrequency on dust particle dynamics in a low pressure plasma reactor*
- Octavio Ortiz, M.S., graduated 2011, co-supervisor
Thesis Title: *Eulerian-Eulerian model of 1-D compressible particle-laden flow: Running shock impinging on a cloud of particles*
- Quang T. Truong, M.S., graduated 2012, co-supervisor
Thesis Title: *Eulerian-Eulerian model for computation of a 2-D compressible particle-laden flow*
- William Shannon, graduated 2020, co-supervisor
Thesis Title: *An investigation of fire behavior in multiple burning shrubs*

INVITED TALKS

1. "CFD modeling of pyrolysis and combustion of leaves subject to heating," USDA Forest Product Laboratory, Madison, WI, May 2019.
2. "Physical modeling of leaf scale and shrub scale fires," Engineering Forum – 2018 Southeast Symposium on Contemporary Engineering Topics, Huntsville, AL, August 2018.
3. "High fidelity modeling of wildland fires," Department of Atmospheric Science, The University of Alabama in Huntsville, Huntsville, AL, March 2014.

4. "Markovian description of dust grain charging in dusty plasmas," Department of Mathematical Sciences, The University of Alabama in Huntsville, Huntsville, AL, August 2013.
5. "Description of multiphase flow phenomena in physics-based modeling of wildland fires," Fire Research Division, National Institute of Standards and Technology, Gaithersburg, MD, March 2013.
6. "Stochastic modeling in dusty plasmas and dusty turbulent flows," Center for Astrophysics, Space Physics & Engineering Research, Department of Physics, Baylor University, Waco, TX, September 2012.
7. "Transport of particulates in turbulence, fire and plasma," Department of Aerospace Engineering & Engineering Mechanic, San Diego State University, San Diego, CA, October 2011.
8. "Multiphase flow simulation in solid rocket motors," Department of Mechanical and Aerospace Engineering, The University of Alabama in Huntsville, Huntsville, AL, February 2008.
9. "Large-eddy simulation of disperse multiphase turbulent flows," Department of Mechanical Engineering, The University of Utah, Salt Lake City, UT, March 2007.
10. "Large-eddy simulation of disperse multiphase turbulent flows," Department of Mechanical Engineering and Engineering Sciences, University of North Carolina at Charlotte, Charlotte, NC, March 2007.
11. "Modeling of subgrid-scale effects on particles in large-eddy simulation," Department of Theoretical and Applied Mechanics, University of Illinois at Urbana-Champaign, Urbana, IL, February 2005.
12. "Large-eddy simulation of practical two-phase flows," Center for Simulation of Advanced Rockets, University of Illinois at Urbana-Champaign, Urbana, IL, September 2004.

RESEARCH GRANTS AND CONTRACTS

- PI, "Development of methodology for determination of ignition propensity by firebrands in wildland-urban interface," National Institute of Standards and Technology, Department of Commerce, \$563,277, August 2017 – July 2021.
- PI, "Transport and combustion behavior of embers in flow around an isolated structure," UAH-COE Mid-Career Research Award, \$25,000, August 2017 – July 2018.
- Co-PI, "Collaborative Research: Merging of horizontally and vertically separated flames in wildland fires," National Science Foundation, \$180,000, August 2016 – July 2020.
- PI, "High-fidelity physics-based modeling of pyrolysis in support of project RC2640," United States Department of Agriculture – Forrest Service, \$398,287, March 2016 – February 2020.
- PI, "Collaborative Research: Fundamental charging processes of dust in complex plasmas," National Science Foundation, \$135,000, August 2014 – August 2017.
- PI, "Physics-based modeling of lofting of firebrands in wildfires," Individual Investigator Distinguished Research (IIDR) Program, The University of Alabama in Huntsville, \$43,507, May 2013 – April 2014.
- PI, "Simulation of the effects of convection and radiation on pyrolysis and ignition of moist live fuels," United States Department of Agriculture – Forrest Service, \$236,870, August 2011 – August 2015.
- PI, "Collaborative Research: Higher-order two-fluid methods for simulations of particle-laden flow," National Science Foundation, \$30,103, August 2011 – August 2014.
- PI, "Stochastic charge fluctuations of dust particles with time-varying currents in plasmas," Junior Faculty Distinguished Research (JFDR) Program, The University of Alabama in Huntsville, \$10,314, December 2011 - November 2012.
- Co-PI, "Collaborative Research: A fundamental investigation of fire initiation and fire behavior in sparse vegetation," National Science Foundation, \$292,134, August 2010 – September 2013.

- PI, "Uncertainty quantification of turbulence models with high-performance computing," Junior Faculty Distinguished Research (JFDR) Program, The University of Alabama in Huntsville, \$10,396, December 2010 - November 2011.
- PI, "High-fidelity modeling of transport of oil-derived particulates using an equilibrium Eulerian method," Gulf of Mexico Research Initiative Fund, \$54,050, January 2011– May 2012.
- Co-PI, "Development of high-fidelity Lagrangian tracking module for oceanic dispersion/ sedimentation predictions," Gulf of Mexico Research Initiative Fund, \$74,750, January 2011 – December 2011.
- Co-PI, "Exploring the role of fuel moisture on pyrolysis gas flame structure and its influence on fire behavior," United States Department of Agriculture – Forrest Service, \$40,000, August 2010 – August 2012.
- PI, "Nonisothermal large-eddy simulation of particle-laden turbulent flows through equilibrium Eulerian approach," Research Mini-Grant, The University of Alabama in Huntsville, \$8,180, December 2009 - November 2010.
- PI, "A robust two-fluid approach for direct simulation of particle-laden flows," Research Mini-Grant, The University of Alabama in Huntsville, \$9,785, December 2008 - November 2009.

PUBLICATIONS

Symbol ‡ indicates articles with Babak Shotorban as the corresponding coauthor

Book Chapters

1. Shotorban, B., Smoke transport, Manzello, S. L., editor, Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires, Springer, Cham, 2018.
2. Jacobs, G. B., Pandya, R. V. R., Shotorban, B., Gao, Z., and Mashayek, F., Deterministic and probabilistic approaches for prediction of two-phase turbulent flow in liquid-fuel combustors, Roy, G. D., editor, Combustion Processes in Propulsion, Chapter 3, 21-30, Elsevier, 2006.

Refereed Journal Papers

1. ‡ Rahimi Borujerdi, P., and Shotorban, B., "Pyrolysis and combustion characteristics of leaf-like fuel under convection and radiation heating," *Combustion Science and Technology*, in press.
2. Shannon, W., Anand, C., Shotorban, B., and Mahalingam, S., "Fire behavior in multiple burning shrubs separated horizontally and vertically," *Fire Safety Journal*, **118**, 103236, 2020.
3. ‡ Rahimi Borujerdi, P., Shotorban, B., and Mahalingam, S., "A computational study of burning of vertically oriented leaves with various fuel moisture contents by upward convective heating," *Fuel*, **276**, 118030, 2020.
4. Shotorban, B., "First passage time in multi-step stochastic processes with applications to dust charging," *Physical Review E*, **101**, 012113, 2020.
5. ‡ Rahimi Borujerdi, P., Shotorban, B., Mahalingam, S., and Weise, D. R., "Modeling of water evaporation from a shrinking moist biomass slab subject to heating: Arrhenius approach versus equilibrium approach," *International Journal of Heat and Mass Transfer*, **145**, 118672, 2019.
6. Zhang, J., Shotorban, B., Bayyuk, S., and Zhang, S., "Computational fluid dynamics flow simulations in discrete element method-resolved packed beds," *Journal of Fluids Engineering - Transactions of The ASME*, **141**, 031304, 2019.
7. ‡ Anand, C., Shotorban, B., and Mahalingam, S., "Dispersion and deposition of firebrands in a turbulent boundary layer," *International Journal of Multiphase Flow*, **109**, 98–113, 2018.
8. ‡ Wilson, A., and Shotorban, B., "Investigation of surface boundary conditions for continuum modeling of RF plasmas," *Physics of Plasmas*, **25**, 053509, 2018.

9. Matthews, L. S., Shotorban, B., and Hyde, T. W., "Discrete stochastic charging of aggregate grains," *Physical Review E*, **97**, 053207, 2018.
10. ‡ Shotorban, B., Yashwanth, B. L., Mahalingam, S., and Haring, D. J., "An investigation of pyrolysis and ignition of moist leaf-like fuel subject to convective heating," *Combustion and Flame*, **190**, 25–35, 2018.
11. ‡ Padhi, S., Shotorban, B., and Mahalingam, S., "A computational study of the interactions of three adjacent burning shrubs subjected to wind," *Fire Safety Journal*, **91**, 749–757, 2017 (Special issue of *The 12th International Symposium on Fire Safety Science*, Lund, Sweden, June 2017).
12. Zhang, J. A., Shotorban, B., and Zhang, S., "Numerical experiment of aero-elastic stability for a rocket nozzle," *Journal of Aerospace Engineering*, **30**(5), 04017041, 2017.
13. ‡ Anand, C., Shotorban, B., Mahalingam, S., McAllister, S., and Weise, D. R., "Physics-based modeling of live wildland fuel ignition experiments in the Forced Ignition and Flame Spread Test apparatus," *Combustion Science and Technology*, **189**, 1551–1570, 2017.
14. ‡ Padhi, S., Shotorban, B., and Mahalingam, S., "Computational investigation of flame characteristics of a non-propagating shrub fire," *Fire Safety Journal*, **81**, 64–73, 2016.
15. ‡ Yashwanth, B. L., Shotorban, B., Mahalingam, S., Lautenberger, C. W., and Weise, D. R., "A numerical investigation of the influence of radiation and moisture on the pyrolysis and ignition of a leaf-like fuel element," *Combustion and Flame*, **163**, 301–316, 2016.
16. Shotorban, B., "Bistable intrinsic charge fluctuations of a dust grain subject to secondary electron emission in a plasma," *Physical Review E*, **92**, 043101, 2015.
17. ‡ Dahale, A., Shotorban, B., and Mahalingam, S., "Interactions of fires of neighboring shrubs in two- and three-shrub arrangements," *International Journal of Wildland Fire*, **24**, 624–639, 2015.
18. ‡ Yashwanth, B. L., Shotorban, B., Mahalingam, S., and Weise, D. R., "An investigation of the influence of heating modes on ignition and pyrolysis of woody wildland fuel," *Combustion Science and Technology*, **187**, 780–796, 2015.
19. Shotorban, B., "Intrinsic fluctuations of dust grain charge in multi-component plasmas," *Physics of Plasmas*, **22**, 033702, 2014.
20. Yilmazoglu, M. Z., Amirabedin, E., and Shotorban, B., "Waste heat utilization in natural gas pipeline compression stations by an organic Rankine cycle," *Energy Exploration and Exploitation*, **32**, 317–328, 2014.
21. ‡ Dahale, A., Ferguson, S., Shotorban, B., and Mahalingam, S., "Effects of distribution of bulk density and moisture content on shrub fires," *International Journal of Wildland Fire*, **22**, 625–641, 2013.
22. ‡ Ferguson, S., Dahale, A., Shotorban, B., Mahalingam, S., and Weise, D. R., "The role of moisture on combustion of pyrolysis gases in wildland fires," *Combustion Science and Technology*, **185**, 435–453, 2013.
23. Matthews, L. S., Shotorban, B., and Hyde, T. W., "Cosmic dust aggregation with stochastic charging," *The Astrophysical Journal*, **776**, 103, 2013.
24. ‡ Shotorban, B., Jacobs, G. B., Ortiz, O., and Truong, Q., "An Eulerian model for particles nonisothermally carried by a compressible fluid," *International Journal of Heat and Mass Transfer*, **65**, 845–854, 2013.
25. Shotorban, B., "Stochastic fluctuations of dust particle charge in RF discharges," *Physics of Plasmas*, **19**, 053702, 2012.
26. ‡ Horn, C., Davoudabadi, M., and Shotorban, B., "Effects of radiofrequency on dust particle dynamics in a plasma reactor," *Journal of Applied Physics*, **110**, 113305, 2011.
27. Shotorban, B., "Nonstationary stochastic charge fluctuations of a dust particle in plasmas," *Physical Review E*, **83**, 066403, 2011.

28. ‡ Dunn, M. C., Shotorban, B., and Frendi, A., "Uncertainty quantification of turbulence model coefficients via Latin hypercube sampling method," *Journal of Fluids Engineering - Transactions of The ASME*, **133**, 041402, 2011.
29. Shotorban, B., "Preliminary assessment of two-fluid model for direct numerical simulation of particle-laden flows," *AIAA Journal*, **49**, 438-443, 2011.
30. Shotorban, B., "Dynamic least-squares kernel density modeling of Fokker-Planck equations with application to neural population," *Physical Review E*, **81**, 046706, 2010.
31. Zhang, K. K. Q., Shotorban, B., Minkowycz, W. J., and Mashayek, F., "A comprehensive approach for simulation of capillary jet breakup," *International Journal of Heat and Mass Transfer*, **53**, 3057-3066, 2010.
32. ‡ Shotorban, B., and Balachandar, S., "Two-fluid approach for direct numerical simulation of particle-laden turbulent flows at small Stokes numbers," *Physical Review E*, **79**, 056703, 2009.
33. Sengupta, K., Shotorban, B., Jacobs, G. B., and Mashayek, F., "Spectral-based simulations of particle-laden turbulent flows," *International Journal of Multiphase Flow*, **35**, 811-826, 2009.
34. ‡ Shotorban, B., and Balachandar, S., "A Eulerian model for large-eddy simulation of concentration of particles with small Stokes numbers," *Physics of Fluids*, **19**, 118107, 2007.
35. Shotorban, B., Zhang, K. K. Q., and Mashayek, F., "Improvement of prediction of particle concentration in large-eddy simulation through defiltering," *International Journal of Heat and Mass Transfer*, **50**, 3728-3739, 2007.
36. Pantano, C., and Shotorban, B., "A least-squares dynamic approximation method for evolution of uncertainty in initial conditions of dynamical systems," *Physical Review E*, **76**, 066705, 2007.
37. ‡ Shotorban, B., and Balachandar, S., "Particle concentration in homogeneous shear turbulence simulated via Lagrangian and equilibrium Eulerian approaches," *Physics of Fluids*, **18**, 065105, 2006.
38. Shotorban, B., and Mashayek, F., "A stochastic model for particle motion in large-eddy simulation," *Journal of Turbulence*, **7**(18), 1-13, 2006.
39. Zhang, K. K. Q., Shotorban, B., Minkowycz, W. J., and Mashayek, F., "A compact finite difference method on staggered grid for Navier-Stokes flows," *International Journal for Numerical Methods in Fluids*, **52**(8), 867-881, 2006.
40. ‡ Shotorban, B., and Mashayek, F., "Modeling of subgrid-scale effects on particles by approximate deconvolution," *Physics of Fluids*, **17**, 081701, 2005.
41. Shotorban, B., Mashayek, F., and Pandya, R. V. R., "Temperature statistics in particle-laden turbulent homogeneous shear flow," *International Journal of Multiphase Flow*, **29**(8), 1333-1353, 2003.
42. Mashayek, F., Ashgriz, N., Minkowycz, W. J., and Shotorban, B., "Coalescence collision of liquid drops," *International Journal of Heat and Mass Transfer*, **46**(1), 77-89, 2003.

Conference Papers

1. Diertenberger, M., Boardman, C., Shotorban, B., Mell, W. E., and Weise, D. R., "Thermal degradation modeling of live vegetation for fire dynamic simulator," *The 2020 Spring Technical Meeting of the Central States Section of the Combustion Institute*, Huntsville, AL, May 2020.
2. ‡ Anand, C., Shotorban, B., and Mahalingam, S., "Deposition characteristics of firebrands released from an elevated point in a turbulent boundary layer," *The 2020 Spring Technical Meeting of the Central States Section of the Combustion Institute*, Huntsville, AL, May 2020.
3. ‡ Mankame, A., Anand, C., and Shotorban, B., "Deposition pattern of firebrands on top and vicinity of an isolated cubic structure in wildland urban interface fires," *The 2020 Spring Technical Meeting of the Central States Section of the Combustion Institute*, Huntsville, AL, May 2020.

4. ‡ Shannon, W., Anand, C., Mahalingam, S., and Shotorban, B., "An investigation of fire behavior in multiple burning shrubs," *The 2020 Spring Technical Meeting of the Central States Section of the Combustion Institute*, Huntsville, AL, May 2020.
5. ‡ Habib, M. A., Anand, C., Mahalingam, S., and Shotorban, B., "A computational study on the fire merging of burning chamise shrubs," *The 11th U.S. National Meeting on Combustion*, Pasadena, CA, April 2019.
6. ‡ Rahimi Borujerdi, P., Shotorban, B., Mahalingam, S., and Weise, D. R., "A comparative study of moisture evaporation models in the drying and pyrolysis of moist solid fuels," *The 11th U.S. National Meeting on Combustion*, Pasadena, CA, April 2019.
7. Weise, D. R., Fletcher, T. H., Johnson, T. J., Hao, W., Diertenberger, M., Princevac, M., Butler, B., McAllister, S., O'Brien, J., Loudermilk, L., Ottmar, R., Hudak, A., Kato, A., Shotorban, B., Mahalingam, S., and Mell, W.E., "A project to measure and model pyrolysis to improve prediction of prescribed fire behavior," Viegas, X.D. (ed) in *Advances in Forest Fire Research*, pp. 308-218, 2018 (*8th International Conference on Forest Fire Research*, Coimbra, Portugal, November 2018).
8. ‡ Shotorban, B., Yashwanth, B. L., Mahalingam, S., Haring, D. J., and Rahimi Borujerdi, P., "Pyrolysis and burning of leaf-like fuel by convective heating: A computational study," *The 10th U.S. National Meeting on Combustion*, College Park, Maryland, April 2017.
9. ‡ Shotorban, B., Anand, C., and Mahalingam, S., "Statistical description of transport and deposition of firebrands in a turbulent atmospheric boundary layer," *The 10th U.S. National Meeting on Combustion*, College Park, Maryland, April 2017.
10. ‡ Anand, C., Shotorban, B., and Mahalingam, S., "Modeling the deposition of firebrands in a spatially developing turbulent boundary layer," *2016 Spring Technical Meeting of Central States Section of The Combustion Institute*, Knoxville, TN, May 2016.
11. ‡ Anand, C., McAllister, S., Shotorban, B., Mahalingam, S., and Weise, D. R., "Physics-based modeling of live wildland fuel ignition experiments in the FIST apparatus," *2016 Spring Technical Meeting of Central States Section of the Combustion Institute*, Knoxville, TN, May 2016.
12. Zhang, S., Shotorban, B., Pohly J., and Zhang, J. A., "Aeroelastic response of rocket nozzles subjected to combined thrust and side loads," *22nd AIAA Computational Fluid Dynamics Conference*, Dallas, Texas, June 2015.
13. ‡ Padhi, S., Shotorban, B., and Mahalingam, S., "A computational investigation of interactions of shrub fires under the influence of wind," *9th U.S. National Combustion Meeting*, Cincinnati, Ohio, May 2015.
14. ‡ Anand, C., Yashwanth, B. L., Shotorban, and Mahalingam, S., "Modeling dynamical and thermal behavior of firebrands in WFDS," *9th U.S. National Combustion Meeting*, Cincinnati, Ohio, May 2015.
15. ‡ Yashwanth, B. L., Gallacher, J., Shotorban, B., and Mahalingam, S., Fletcher, T.H., and Weise, D. R., "Experimental and numerical investigation of the effect of heating modes and moisture content on pyrolysis and ignition of live fuels," *9th U.S. National Combustion Meeting*, Cincinnati, Ohio, May 2015.
16. ‡ Yashwanth, B. L., Shotorban, B., and Mahalingam, S., "A computational investigation of the role of moisture in live fuels subject to pyrolysis and ignition through convective heat transfer," *9th U.S. National Combustion Meeting*, Cincinnati, Ohio, May 2015.
17. ‡ Yashwanth, B. L., Shotorban, B., and Mahalingam, S., "Understanding the role of moisture in live fuels subject to pyrolysis and ignition through radiation heat transfer," *9th U.S. National Combustion Meeting*, Cincinnati, Ohio, May 2015.
18. ‡ Yashwanth, B. L., Shotorban, B., Mahalingam, S., and Weise, D. R., "Numerical investigation of the effect of moisture content on pyrolysis and combustion of live fuels," *Central States Combustion Meeting*, Tulsa, Oklahoma, March 2014.

19. ‡ Dahale, A., Padhi, S., Shotorban, B., and Mahalingam, S., "Flame merging in two neighboring shrub fires," *The 8th US National Combustion Meeting*, Park City, Utah, May 2013.
20. ‡ Ferguson, S., Yashwanth, B. L., Shotorban, B., Mahalingam, S., and Weise, D. R., "Numerical investigation of influence of initial moisture content on thermal behavior of heated wood," *The 8th US National Combustion Meeting*, Park City, Utah, May 2013.
21. ‡ Padhi, S., Dahale, A., Shotorban, B., and Mahalingam, S., "Numerical investigation of a shrub fire in crosswind," *The 8th US National Combustion Meeting*, Park City, Utah, May 2013.
22. Truong, Q., Shotorban, B., and Jacobs, G.B., "Eulerian-Eulerian description of the interaction of a shock with particles through Godunov's scheme," *Proceedings of ASME 2013 Fluids Engineering Division Summer Meeting*, Incline Village, NV, July 2013.
23. ‡ Padhi, S., Dahale, A., Shotorban, B., and Mahalingam, S., "Effects of crown separation and wind on crown fuel ignition in sparse vegetation," *Central States Combustion Meeting*, Dayton, OH, April 2012.
24. ‡ Dover, S., Dahale, A., Shotorban, B., Mahalingam, S., and Weise, D. R., "Influence of vegetation moisture on combustion of pyrolysis gases in wildland fires," *Proceedings of ASME 2011 International Mechanical Engineering Congress and Exposition*, **Vol. 4**, 1491-1497, 2011.†
25. ‡ Dahale, A., Dover, S., Shotorban, B., and Mahalingam, S., "Effects of crown fuel bulk density distribution and thermophoresis forces of soot particles on wildland fires," *Proceedings of ASME 2011 International Mechanical Engineering Congress and Exposition*, **Vol. 4**, 1531-1540, 2011.
26. ‡ Dunn, M. C., Shotorban, B., and Frendi, A., "Uncertainty quantification of turbulence model coefficients via Latin hypercube sampling method," *Proceedings of ASME 2010 3rd Joint U.S.-European Fluids Engineering Summer Meeting*, **Vol. 1**, 2913-2921, 2010.
27. ‡ Shotorban, B., and Balachandar, S., "Direct numerical simulation of particle-laden turbulent flows in two-way coupling using equilibrium assumption," *Proceedings of ASME International Mechanical Engineering Congress and Exposition*, **Vol. 262**, 641-648, 2006.
28. ‡ Shotorban, B., and Balachandar, S., "Two-fluid large-eddy simulation approach for gas-particle turbulent flows using equilibrium assumption," *Proceedings of ASME 2nd Joint U.S.-European Fluids Engineering Summer Meeting*, **Vol. 1B**, 1611-1620, 2006.
29. Shotorban, B., and Mashayek, F., "On stochastic modeling of heavy particle dispersion in large-eddy simulation of two-phase turbulent flows," *Fluid Mechanics and Its Applications*, **Vol. 81**, IUTAM Symposium on Computational Approaches to Multiphase Flow, 373-380, 2006.
30. Shotorban, B., Afshari, A., Jaber, F. A., and Mashayek, F., "A particle tracking algorithm for LES of two-phase flow," *AIAA Paper 2004-0332*, 42nd AIAA Aerospace Sciences Meeting & Exhibit, Reno, NV, January 2004.
31. Afshari, A., Shotorban, B., Mashayek, F., Shih, T. I-P., and Jaber, F. A., "Development and validation of a multi-block flow solver for large eddy simulation of turbulent flows in complex geometries," *AIAA Paper 2004-0657*, 42nd AIAA Aerospace Sciences Meeting & Exhibit, Reno, NV, January 2004.
32. Jacobs, G. B., Gao, Z., Pandya, R. V. R., Shotorban, B., and Mashayek, F., "Numerical simulation of two-phase flows prediction/control of combustion in liquid-fuel combustors," *International Colloquium on Combustion Control*, Cranfield, UK, August 2003.
33. Jacobs, G. B., Shotorban, B., Gao, Z., Pandya, R. V. R., and Mashayek, F., "Numerical simulation of controlled liquid-fuel combustors," *Proceedings of the 16th ONR Propulsion Meeting*, Los Angeles, CA, 214-219, June 2003.
34. Gao, Z., Pandya, R. V. R., Shotorban, B., and Mashayek, F., "Current issues in analytical description of particle/droplet-laden turbulent flows," *Proceedings of the 4th ASME/JSME Joint Fluids Engineering Conference*, **Vol. 1**, 1307-1310, 2003.

35. Jacobs, G. B., Pandya, R. V. R., Shotorban, B., Gao, Z., and Mashayek, F., "Deterministic and probabilistic approaches for prediction of two-phase turbulent flow in liquid-fuel combustors," *Proceedings of the 15th ONR Propulsion Meeting*, Washington, DC, 47-52, August 2002.
36. Sadeghipour, M. S., and Shotorban, B. B., "Heat transfer in flow freezing over the isothermal cylinders," *Proceedings of ASME International Mechanical Engineering Congress and Exposition, Heat Transfer Division, HTD-Vol. 364-2*, 237-244, 1999.

OTHER PUBLISHED PAPERS

1. Shotorban, B., "Markovian-based description of intrinsic fluctuations of dust grain charge in plasmas," *UAHuntsville 2012 Young Faculty Distinguished Research Proceedings*, 2012.
2. Shotorban, B., and Dunn, M. C., "Uncertainty quantification and sensitivity analysis of turbulence model coefficients with Latin hypercube sampling method," *UAHuntsville 2011 Young Faculty Distinguished Research Proceedings*, 2011.
3. Shotorban, B., "Large-eddy simulation of nonisothermal particle-laden turbulent flows through Eulerian description," *UAHuntsville 2010 Young Faculty Research Proceedings*, 104-110, 2010.
4. Shotorban, B., "A robust two-fluid approach for direct simulation of particle-laden flows," *UAHuntsville 2009 Young Faculty Research Proceedings*, 103-109, 2009.
5. Mashayek, F., Pandya, R. V. R., Jacobs, G. B., and Shotorban, B., "A review of state-of-the-art computational techniques to study heterogeneous mixing relevant to deflagration and detonation," *Khimicheskaya Fizika*, 22(8), 14-23, 2003. (also in Roy, G., Frolov, S., Santoro, R., and Tsyganov, S., editors, *Advances in Confined Detonations*, Torus Press, Moscow, Russia, 123-126, 2002.)

Abstracts / Conference Presentations with no Associated Papers

1. Mahalingam, S., and Shotorban, B., "A computational and experimental investigation of fire behavior within and around isolated and groups of shrubs," *The 2020 ASME Fluids Engineering Division Summer Meeting*, July 2020.
2. Dietenberger, M., Boardman, C., Shotorban, B., and Weise, D. R., "Analytical kinetics solutions with derived parameters for moisture desorption, pyrolysis, and char combustion for fresh leaves relative to compositions and moisture content," *6th International Fire Behavior & Fuels Conference*, Albuquerque, NM, May 2019.
3. Rahimi Borujerdi, P., Shotorban, B., Mahalingam, S., and Weise, D. R., "Physics based modeling of moisture evaporation in living leaves," *6th International Fire Behavior & Fuels Conference*, Albuquerque, NM, May 2019.
4. Shotorban, B., Blunck, D.L., Mankame, A., Bean, D., and Anand, C., "Development of Methodology for Determination of Ignition Propensity by Firebrands in Wildland-Urban Interface," *NIST Disaster Resilience Symposium*, Gaithersburg, MC, August 2019.
5. Matthews, L., Hyde, T., Carballido, A., Shotorban, B., Ashrafi, K. and Xiang, C., "Effect of discrete charge fluctuations on aggregate grain growth," *42nd COSPAR Scientific Assembly*, Pasadena, CA, July 2018.
6. Shotorban, B., and Blunck, D. L. "Development of Methodology for Determination of Ignition Propensity by Firebrands in Wildland-Urban Interface," *NIST Disaster Resilience Symposium*, Gaithersburg, MC, August 2018.
7. Ashrafi, K. S., Xiang, C., Matthews, L., Carballido, A., Shotorban, B., and Hyde, T., "Effects of discrete stochastic charging on the non-spherical growth of water-ice grains in a dusty plasma," *15th Dusty Plasma Workshop*, Baltimore, MD, June 2018.

8. Anand, C., Shotorban, B., and Mahalingam, S., "Dynamical and thermal behavior of depositing firebrands in a turbulent boundary layer," *The 59th Annual Meeting of the APS Division of Fluid Dynamics*, Atlanta, GA, November 2018.
9. Rahimi Borujerdi, P., Shotorban, B., and Mahalingam, S., "Comparison of two evaporation models for drying dynamics in a biomass slab," 2018 Princeton University Summer School on Combustion, Princeton, NJ, June 2018.
10. Shotorban, B., and Mahalingam, S., "Modeling the role of fuel moisture on ignition in thin fuels," *The Fire Continuum Conference*, Missoula, MT, May 2018.
11. Anand, C., Shotorban, B., and Mahalingam, S., "Influence of thermal degradation in dispersion and deposition of firebrands in a turbulent boundary layer," *The Fire Continuum Conference*, Missoula, MT, May 2018.
12. Shotorban, B., "Influence of the boundary layer turbulence in the distribution of landed firebrands," *NIST Wildland-Urban Interface (WUI) Fire Day*, January 2018.
13. Ashrafi, K. S., Esparzal, S., Xiang, C., Matthews, L., Carballido, A., Hyde, T., and Shotorban, B., "Effects of discrete stochastic charging of dust grains in protoplanetary disks," *The 59th Annual Meeting of the APS Division of Plasma Physics*, Milwaukee, WI, November 2017.
14. Matthews, L., Shotorban, B., and Hyde, T., "Effect of stochastic charge fluctuations on dust dynamics," *The 59th Annual Meeting of the APS Division of Plasma Physics*, Milwaukee, WI, November 2017.
15. Ashrafi, K. S., Esparzal, S., Xiang, C., Matthews, L., Carballido, A., Hyde, T., and Shotorban, B., "Effects of stochastic charging on micron sized grains in protoplanetary disks," *Building New Worlds Conference*, Houston, TX, August 2017.
16. Anand, C., Shotorban, B., and Mahalingam, S., "Physics-based modeling of the transport and deposition of firebrands in a spatially developing atmospheric boundary layer," *The 12th International Symposium on Fire Safety Science*, Lund, Sweden, June 2017.
17. Weise, D. R., Fletcher, T. H., Shotorban, B., et al. "Measuring and modeling pyrolysis to improve prediction of prescribed fire behavior," *The 10th U.S. National Meeting on Combustion*, College Park, Maryland, April 2017.
18. Shotorban, B., "First passage time problem of dust charge fluctuations," *58th Annual Meeting of the APS Division of Plasma Physics*, San Jose, CA, November 2016.
19. Yashwanth, B., Shotorban, B., and Mahalingam, S., "Full physics computational study of pyrolysis and ignition of a leaf-like fuel element exposed to convective heating," *The 6th International Fire Ecology and Management Congress*, San Antonio, TX, November 2015.
20. Wilson, A., and Shotorban, B., "Boundary conditions in hydrodynamic modeling of the plasma in a dusty RF plasma reactor," *57th Annual Meeting of the APS Division of Plasma Physics*, Savannah, GA, November 2015.
21. Shotorban, B., "Metastability of intrinsic fluctuations of grain charge caused by secondary electron emission," *57th Annual Meeting of the APS Division of Plasma Physics*, Savannah, GA, November 2015.
22. Shotorban, B., "Prominent deviation of dust charge distribution from Gaussianity caused by secondary electron emission," *14th Workshop on the Physics of Dusty Plasmas*, Auburn, AL, May 2015.
23. Wilson, A., Davoudabadi, M., and Shotorban, B., "A comparative study of dust behavior in plasmas modeled by local-field and local-mean-energy approximations," *14th Workshop on the Physics of Dusty Plasmas*, Auburn, AL, May 2015.
24. Shotorban, B., "An Eulerian model for particles nonisothermally carried by a compressible fluid," *AMS Spring Southeastern Sectional Meeting*, Huntsville, AL, March 2015.
25. Shotorban, B., "Intrinsic charge fluctuations of dust in plasmas containing multiply charged ions," *Bulletin of the American Physical Society*, **59**(15), p. 29, 2015 (presented at the *56th Annual Meeting of the APS Division of Plasma Physics*, New Orleans, LA, November 2014).

26. Haines, A., Matthews, L., Shotorban, B., and Hyde, T., "Discrete stochastic charging of dust aggregates immersed in plasma," *Bulletin of the American Physical Society*, **59**(15), p. 95, 2015 (presented at the 56th Annual Meeting of the APS Division of Plasma Physics, New Orleans, LA, November 2014).
27. Wilson, A., Davoudabadi, M., and Shotorban, B., "A comparison of the local field approximation and the local mean energy approximation in a dusty plasma," *Bulletin of the American Physical Society*, **59**(15), p. 95, 2015 (presented at the 56th Annual Meeting of the APS Division of Plasma Physics, New Orleans, LA, November 2014).
28. Wilson, A., Davoudabadi, M., and Shotorban, B., "Modeling dust crystal in a cylindrical rf plasma reactor," the 55th Annual Meeting of the APS Division of Plasma Physics, Denver, CO, November 2013.
29. Matthews, L. S., Shotorban, B., and Hyde, T. W., "Cosmic dust aggregation with stochastic charging," the 55th Annual Meeting of the APS Division of Plasma Physics, Denver, CO, November 2013.
30. Matthews, L. S., Shotorban, B., and Hyde, T. W., "Effects of stochastic charging on cosmic dust aggregation," 44th Lunar and Planetary Science Conference, The Woodlands, TX, March 2013.
31. Dahale, A., Shotorban, B., and Mahalingam, S., "Physics-based modeling of shrub fires: Study of distribution of bulk density and moisture content," *Bulletin of the American Physical Society*, **57**(9), 2012 (presented at the 66th Annual Meeting of the APS Division of Fluid Dynamics, San Diego, CA, November 2012.)
32. Jacobs, G., Shotorban, B., and Don, W.-S., "Eulerian-Eulerian and Eulerian-Lagrangian methods for shocked, turbulent, particle-laden flows," *The Fourth International Conference on Scientific Computing and Partial Differential Equations*, Hong Kong Baptist University, Hong Kong, December 2011.
33. Shotorban, B., "Nonstationary stochastic process of dust particle charging in plasmas," *Bulletin of the American Physical Society*, **56**(12), pp. 190-191, 2011 (presented at the 53rd Annual Meeting of the APS Division of Plasma Physics, Salt Lake City, UT, November 2011).
34. Horn, C., Davoudabadi, M., and Shotorban, B., "Influence of rf oscillations on the dust particle dynamics in an rf plasma discharge," *Bulletin of the American Physical Society*, **56**(12), p. 191, 2011 (presented at the 53rd Annual Meeting of the APS Division of Plasma Physics, Salt Lake City, UT, November 2011).
35. Shotorban, B., "Description of transport of oil-derived particulates through equilibrium Eulerian method," presented at *Oil Spill Symposium*, Jacksonville State University, Jacksonville, AL, March 2011.
36. Shotorban, B., "A two fluid algorithm for incompressible flows laden with low Stokes number particles," *Bulletin of the American Physical Society*, **53**(9), 2008 (presented at the 62nd Annual Meeting of the APS Division of Fluid Dynamics, San Antonio, TX, November 2008.)
37. Pantano, C., and Shotorban, B., "Evaluation of uncertainty evolution in initial conditions by the least square kernel density function method," *Bulletin of the American Physical Society*, **52**(9), 2007 (presented at the 61st Annual Meeting of the APS Division of Fluid Dynamics, Salt Lake City, UT, November 2007.)
38. Shotorban, B., and Balachandar, S., "Large-eddy simulation of particle concentration by equilibrium Eulerian approach," *Bulletin of the American Physical Society*, **51**(9), p. 225, 2006 (presented at the 59th Annual Meeting of the APS Division of Fluid Dynamics, Tampa Bay, FL, November 2006.)
39. Shotorban, B., "Large-eddy Simulation of particle-laden homogeneous shear turbulence with the modeling of subgrid-scale effects on particles," *The 7th World Congress on Computational Mechanics*, Los Angeles, CA, July 2006.
40. Shotorban, B., and Mashayek, F., "Implementation of defiltering techniques in large-eddy simulation of particle-laden turbulent flows," *Bulletin of the American Physical Society*, **50**(9), p. 133, 2005

(presented at the 58th Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL, November 2005.)

41. Balachandar, S., and Shotorban, B., "Two-way coupled direct simulation of particle-laden turbulent flows using equilibrium Eulerian approximation," *Bulletin of the American Physical Society*, **50**(9), p. 65, 2005 (presented at the 58th Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL, November 2005.)

PROFESSIONAL ACTIVITIES

- Academic Editor: *Mathematical Problems in Engineering* (2015 - present)
- Host: Spring Technical Meeting of Central States Section of The Combustion Institute, Huntsville, May 2020 (cancelled in April due to Covid-19 pandemic)
- Panelist: Research proposals
 - National Science Foundation (NSF), 2017, 2018, 2019, 2020
 - National Aeronautics and Space Administration (NASA), 2016, 2017, 2019
- Ad hoc Reviewer: Research proposals
 - Air Force Office of Scientific Research (AFOSR)
 - US Department of Agriculture (USDA)
 - NASA
 - NSF
- Member, Board of Advisors, Central States Section of The Combustion Institute (2018 – 2020)
- Program Committee Member: 14th Workshop on the Physics of Dusty Plasma, 2015
- Chair: Conference Sessions
 - American Physical Society 65th Annual DFD Meeting, 2012
 - American Physical Society 66th Annual DFD Meeting, 2013
 - American Physical Society 71st Annual DFD Meeting, 2018
- Reviewer: Book Proposal: *Cambridge University Press*
- Reviewer: Journals
 - *Advances in Engineering Software*
 - *Aerosol Science and Technology*
 - *AIAA Journal*
 - *Applied Thermal Engineering*
 - *The Astrophysical Journal*
 - *Chemical Engineering Science*
 - *Energy and Fuels*
 - *Fire*
 - *Fire Safety Journal*
 - *Flow, Turbulence and Combustion*
 - *Fuel*
 - *IEEE Transactions on Plasma Science*
 - *Industrial & Engineering Chemistry Research*
 - *International Journal of Heat and Mass Transfer*
 - *International Journal of Multiphase Flow*

- *International Journal of Wildland Fire*
- *Journal of Applied Physics*
- *Journal of Computational Physics*
- *Journal of Fire Sciences*
- *Journal of Materials Research*
- *Journal of Plasma Physics*
- *Journal of Thermophysics and Heat Transfer*
- *Journal of Verification, Validation and Uncertainty Quantification*
- *Physics of Fluids*
- *Physics of Plasmas*
- *Plasma Chemistry and Plasma Processing*
- *Plasma Sources Science and Technology*
- *Powder Technology*
- *Proceedings of the Combustion Institute*
- *Proceedings of the Royal Society A*
- *Theoretical and Computational Fluid Dynamics*
- *Thermochimica Acta*
- Judge: High-school Student Projects
 - Alabama Science and Engineering Fair, Spring 2014; Spring 2015
 - North Alabama Regional Science and Engineering Fair, Spring 2013
 - IPT/InSPIRESS program, Spring 2012

UNIVERSITY SERVICES

- Chair: Graduate Committee, Department of Mechanical and Aerospace Engineering, Fall 2018 – present
- Chair: Promotion and Tenure Advisory Committee (PTAC), College of Engineering, 2019, 2020
- Member: Committee of Faculty Authorship and Textbook Selection Policy, Spring 2019
- Member: Committee of Faculty Awards for Excellence, 2019, 2020
- Member: Faculty Senate, Fall 2014 – Summer 2017
- Member: Graduate Committee, Department of Mechanical and Aerospace Engineering, Fall 2014 – Spring 2018; Fall 2009 – Spring 2010
- Member: Faculty Reappointment Committees
 - Department of Civil and Environmental Engineering, 2015, 2017, 2018
 - Department of Electrical and Computer Engineering, 2016, 2017
 - Department of Mechanical and Aerospace Engineering, 2014 – present
- Member: Student Affairs Advisory Board, Fall 2014 – Summer 2017
- Member: High Performance Technical Computing Committee, College of Engineering, Spring 2012 – Fall 2013
- Member: Faculty Search Committees
 - Department of Electrical and Computer Engineering, Fall 2016 – 2018

- Department of Mechanical and Aerospace Engineering, Fall 2016 – Spring 2017; Fall 2012 – Spring 2014; Fall 2010 – Spring 2011
- Undergraduate Research Advisor: Mechanical and Aerospace Engineering Assistance for Transfer Improvement and Excellence (MATRIX) program, Fall 2019 – Spring 2020
- Member: Graduate Student Supervisory Committees
 - Phillip V. Hahn, Ph.D., graduated 2012, advised by Kader Frendi
 - Ricky Brown, Ph.D., graduated 2012, advised by Kader Frendi
 - Milos Stanic, Ph.D., graduated 2013, advised by Jason T. Cassibry
 - Adetunji Oduyela, Ph.D., graduated 2013, advised by Nathan J. Slegers
 - Udara Senanayake, Ph.D., graduated 2015, advised by Vladimir Florinski
 - Man Zhang, Ph.D., graduated 2015, advised by Kader Frendi
 - Seyi Olatoyinbo, Ph.D., graduated 2015, advised by Kader Frendi
 - Rohit Dhariwal, Ph.D., graduated 2016, advised by Sarma L. Rani
 - Vijay K. Rani, Ph.D., graduated 2017, advised by Sarma L. Rani
 - Zhong Ren, Ph.D., graduated 2018, advised by Phillip M. Ligrani
 - Kevin Schillo, Ph.D., graduated 2019, advised by Jason T. Cassibry
 - Annette S. Fisher, Ph.D., graduated 2019, advised by Sarma L. Rani
 - Mengying Su, Ph.D., graduated 2019, advised by Phillip M. Ligrani
 - Seth Thompson, Ph.D., graduated 2019, advised by Jason T. Cassibry
 - Keyvan Ghanbari, Ph.D., in progress, advised by Vladimir Florinski
 - Behzad Bahrami Babamiri, Ph.D., in progress, advised by Kavan Hazeli
 - Nathan Schilling, Ph.D., in progress, advised by Jason T. Cassibry
 - Miles Owen, M.S., graduated 2009, advised by Kader Frendi
 - Douglass Casey, M.S., graduated 2011, advised by Kader Frendi
 - Eric Becnel, M.S., graduated 2013, advised by Francis C. Wessling
 - Abraham Kunin, M.S., graduated 2013, advised by Q. H. Ken Zuo
- Panelist: Research Proposals
 - New Faculty Research (NFR) Program
 - Research Infrastructure Fund Program (RIF)
- Organizer: University Distinguished Speaker Series Seminar by Lorin S. Matthews, Baylor University, 2018
- Organizer: Invited Seminars
 - David R. Weise, USDA Forest Service, 2018
 - Mark Dietenberger, USDA Forest Service, 2016
 - Thomas H. Fletcher, Brigham Young University, 2015
 - Sara McAllister, USDA Forest Service, 2015
 - Nikolai Pogorelov, The University of Alabama in Huntsville, 2015
 - Vladimir Florinski, The University of Alabama in Huntsville, 2014
 - Udaysankar Nair, The University of Alabama in Huntsville, 2013
 - Gustaaf Jacobs, San Diego State University, 2013
 - Reza Abedi, University of Tennessee Space Institute, 2013

- David R. Weise, USDA Forest Service, 2012
- Mohammad Davoudabadi, ANSYS, 2011
- Instructor: Fluid dynamics in the summer camp BEST Experience (Be an Engineering Student) of the College of Engineering for high-school students, Summer 2014

FACULTY DEVELOPMENT

- Online Quality Education Practices Online (QEPO), 2020, certified to teach online
- Online teaching tools: Canvas, Panopto, and Screencast-o-Matic (2020)