

Abdullah Al Amin, Ph.D.

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scholar: <https://scholar.google.com/citations?user=dkLvoWwAAAAJ&hl=en&oi=sra>

RESEARCH INTERESTS

- Additive Manufacturing
 - Laser Powder Bed Fusion Process Modeling
 - AM Part Qualification and Quantification
- Magnetic Devices
 - Magnetic Resonance Imaging (MRI) background magnet
 - Bio crystal detection devices
- Energy & Materials
 - Metal Matrix Composites, Superconducting Wires, Fusion Energy
 - Organic Solar Cells
- Computational Science
 - Atomic, molecular, and continuum modeling of solar cell, medical imaging device, additively manufactured parts
 - Multi-physics Modeling (magnetic, electric, thermal, and mechanical)
 - Exa-scale High-Performance Computation, GPU Accelerated Computation
 - Scientific Machine Learning (Deep Neural Network for PDE approximation)

EDUCATION

Case Western Reserve University <u>Thesis:</u> Multiscale Multiphysics Thermo-Mechanical Modeling of an MgB ₂ Based Conduction Cooled MRI Magnet System. <u>Adviser:</u> Michael Martens and Ozan Akkus	Mechanical Engineering	Ph.D.	2018
The University of Akron <u>Thesis:</u> High throughput particle separation using differential Fermat spiral microchannel with variable channel width. <u>Adviser:</u> Jiang Zhe	Mechanical Engineering	M.S.	2014
Bangladesh University of Engineering and Technology <u>Thesis:</u> Design, Improvement, Modification & Fabrication of Mechanisms and Control Systems of Robots for ABU ROBOCON <u>Adviser:</u> Maglub Al Nur	Mechanical Engineering	B.S.	2009

APPOINTMENTS

Assistant Professor , Department of Mechanical and Aerospace Engineering, University of Dayton, OH	Aug 2023 ~ Present
Postdoctoral Fellow , Northwestern University, Evanston, IL <u>Adviser:</u> Wing Kam Liu Project: Development of an FVM based high fidelity multiphysics laser powder bed fusion solver.	Feb 2021 ~ Aug 2023
Research Engineer , Bridgestone Americas Technical Center, Akron OH. Relevant Projects:	Jan 2018 ~ Jan 2021

- Development of a hybrid analytical-FEA tire analysis framework for cornering and braking.
- Composite polymer material modeling.

Graduate Research Assistant, Case Western Reserve University, Cleveland, OH
Project: Development of a multiscale multiphysics model of a full body 1.5 T MRI main magnet.

Aug 2013 ~ Dec 2017

Graduate Research Assistant, The University of Akron, Akron, OH
Relevant Projects:

Aug 2010 ~ Jul 2013

- Characterization of a high temperature, high vacuum soft microgripper.
- Development of a high throughput microparticle separation device.

TEACHING EXPERIENCE

Assistant Professor

Fall '23 ~ Present

Department of Mechanical and Aerospace Engineering
University of Dayton

Assistant Director

Fall '22 ~ Summer '23

Predictive Science and Engineering Design (PSE&D), Northwestern University
A Northwestern University fellowship program where fellows are selected from a pool of applicants and trained with concurrent state-of-the-art computational modeling techniques through three quarters (Fall, Winter, Spring) of courses.

Guest Lecturer

Summer '22, '21
Spring '21

Northwestern university

- Summer Mechanistic Data Science
- Advance FEM II: Materials and reduced order models

Graduate Teaching Assistant

Fall '14

Case Western Reserve University

Fall '15

- Musculoskeletal Biomechanics
- Mechanical Engineering Measurements Laboratory
- Senior Design Project

Spring '16

Graduate Teaching Assistant

Aug '11 ~ Jul '13

The University of Akron

- Mechanical Engineering Drawing
- Tools for Mechanical Engineering Lab

Lecturer

Jun '10 ~ Aug '10

Green University of Bangladesh

- Introduction to Mechanical Engineering
- Machine Ergonomics
- Mechanical Engineering Drawing

Lecturer

Feb '10 ~ May '10

College of Aviation Technology, Bangladesh

- Introduction to Mechanical Engineering

Adjunct Lecturer

Oct '09 ~ May '10

Green University of Bangladesh

- Mechanical Engineering Drawing

HONORS AND AWARDS

1. Participant, NASA GPU Hackathon 2022. (September 19, 26-28). Only nine teams selected worldwide.

2. 1st Place, NIST-AMBench, CHAL-AMB2022-03-PSCR: Best modeling results predicting the cooling rate immediately following solidification at specified locations within 2D scan tracks on IN718, August 2022.
3. 1st Place for NIST-AMBench, CHAL-AMB2022-03-PMPG: Best modeling results predicting the melt pool geometry at specified locations within 2D laser scan tracks on IN718, August 2022.
4. 1st Place for NIST-AMBench, CHAL-A-AMB2022-01-Scan-MWD & ASR Scan Geometry: Best modeling results predicting the melt pool geometry for a scanned laser weld, August 2022.
5. 2nd Place for NIST-AMBench, CHAL-AMB2022-03-TTAM: Modeling results predicting the time above melting temperature for individual laser tracks on IN718 with different processing conditions, August 2022.
6. Fellow, NSF CMMI Game Changer Academies for Advancing Research Innovation, December 2021.
7. NSF Fellow, Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology (July 30, 2021).
8. Contest Runner-Up, Superconductivity News Forum (SNF), Applied Superconductivity Conference (October 2016)
9. Financial Assistance, Applied Superconductivity Conference, Denver, Colorado; USA (September 2016)
10. Fellowship, MIT Professional Education, Multiscale Material Design, Boston, USA (Summer 2016) [Covered 50% of the Registration]
11. Graduate Student Travel Award, Graduate School, Case Western Reserve University (May 2016)
12. ISMRM Educational Stipend, 23rd annual meeting of ISMRM, Singapore City, Singapore (May 2016)
13. ISMRM Educational Stipend, 22nd annual meeting of ISMRM, Toronto, Canada (May 2015)
14. Sweden Bangladesh Travel Grant, Government of Bangladesh (December 2011)
15. University Blazer, Award recognizing participation to ABU Robocon 2008, Bangladesh University of Engineering and Technology, Dhaka. (September 2008)
16. Merit Scholarship, Government of Bangladesh (2004 – 2008)

VOLUNTEER SERVICES

1. Session Chair, 'Materials 1', 49th Dayton-Cincinnati Aerospace Sciences Symposium, Dayton, OH, March 5, 2024.
2. Panelist, National Science Foundation, Communications, Circuits, and Sensing-Systems (CCSS) (November, 2023)
3. Reviewer, IEEE Transaction on Industrial Informatics [IF: 12.3] (March 2024-Present)
4. Reviewer, Journal of Manufacturing Process [IF: 6.2] (August 2023-Present)
5. Reviewer, Superconductor Science and Technology [IF: 3.6] (October 2022-Present)
6. Reviewer, Computational Mechanics [IF: 4.1] (March 2021 – Present)
7. Reviewer, Applied Superconductivity and Electromagnetic Devices [IF: 1.949] (March 2021 – Present)
8. Reviewer, Journal of Mechanical Engineering Science, [IF: 1.015] (March 2021– Present)
9. Reviewer, IEEE Transactions of Applied Superconductivity, [IF: 1.324] (November 2019 – Present)
10. Reviewer, Society of Automotive Engineering (October 2019 – October 2020)
11. Award Committee, Tire Society (August 2018 – October 2020)
12. Conference Committee, Tire Society (July 2018 – May 2022)
13. Reviewer, Composite Structures [IF: 6.3] (January 2018 – Present)

PROFESSIONAL MEMBERSHIP

- The Minerals, Metals & Materials Society (2022 - Present)
- Tire Society (2018 – 2021)
- Society of Automotive Engineering (2018)
- United States Association for Computational Mechanics (2018)
- IEEE Council of Superconductivity (2016 – 2017)
- International Society of Magnetic Resonance in Medicine (2015-2016)

JOURNAL PUBLICATIONS

- J1. Li, Y., Mojumder S., Lu Y., Amin A. A., Guo J., Xie X., Chen W., Wagner G. J., Cao J., Liu W. K., "Statistical Parameterized Physics-Based Machine Learning Digital Shadow Models for Laser Powder Bed Fusion Process" Additive Manufacturing, 5 May, 2024
- J2. Amin A. A., Li Y., Lu Y., Xie X., Gan Z., Mojumder S., Wagner G.J., Liu W. K., "Physics guided heat source for quantitative prediction of IN718 laser additive manufacturing processes" npj computational materials, 19 February, 2024.
- J3. Mojumder S., Gan Z, Amin A. A., Liu W. K., "Linking Process Parameters with Lack-of-Fusion Porosity for Metal Additive Manufacturing," Additive Manufacturing, Volume 68, April 2023.
- J4. Huang H., Mojumder S., Suarez D., Amin A. A., Fleming M., Liu W. K., "Knowledge database creation for design of polymer matrix composite" Computational Material Science, July 30, 2022.
- J5. Lu Y, Li H, Saha S, Mojumder S, Amin A. A., Suarez D, Liu Y, Qian D, Liu WK, "Reduced Order Machine Learning Finite Element Methods: Concept, Implementation, and Future Applications", Computer Modeling in Engineering & Sciences, September 14, 2021
- J6. Islam M, Thakur MSH, Mojumder S, Amin A. A., Islam MM, "Mechanical and Vibrational Characteristics of Functionally Graded Cu-Ni Nanowire: A Molecular Dynamics Study", Composite Part B: Engineering, 108212
- J7. Sultana N, Amin A. A., Metin D, Gaston N, "Unveiling the structures and electronic properties of CH₃ NH₃ PbI₃ interfaces with TiO₂, ZnO, and SnO₂: a first-principles study", Journal of Materials Science, p. 1-15, August 2019.
- J8. Poole C, Amin A. A., Baig T, Martens M, "Mechanical analysis of an MgB₂ 1.5 T MRI main magnet protected using Coupling Loss Induced Quench", Cryogenics, Volume 100, p. 18-27, June 2019.
- J9. Amin A. A., Sabri L A, Poole C R, Baig T N, Deissler R J, Rindfleisch M, Tomsic M, Doll D, Akkus O, Martens M, "Computational homogenization of the elastic and thermal properties of superconducting composite MgB₂ wire" Composite Structures, Volume 188, p. 313-329, March 2018.
- J10. Deissler R J, Baig T, Charles P, Amin A. A., Doll D, Tomsic M, and Martens, "A Computational Study to Find an Optimal RRR Value for a 1.5 T Persistent-Mode Conduction-Cooled MgB₂ MRI Magnet from a Quench Protection Point of View.", IEEE Trans. Appl. Supercond, Volume 99, Issue 4, June 2017
- J11. Baig T, Amin A. A., Deissler R J, Sabri L, Poole C, Brown R W, Tomsic M, Doll D, Rindfleisch M, Peng X and others, "Conceptual designs of conduction cooled MgB₂ magnets for 1.5 and 3.0 T full body MRI systems.", Superconductor Science and Technology, Volume 30, Issue 4, March 2017
- J12. Amin A. A., Baig T N, Deissler R J, Sabri L A, Doll D, Tomsic M, Akkus O and Martens M A, "Mechanical Analysis of MgB₂ Based Full Body MRI Coils Under Different Winding Conditions.", IEEE Trans. Appl. Supercond, Volume 27, Issue 4, June 2017
- J13. Deissler R J, Baig T, Poole C, Amin A. A., Doll D, Tomsic M and Martens M, "Numerical simulation of quench protection for a 1.5 T persistent mode MgB₂ conduction-cooled MRI magnet.", Superconductor Science and Technology, Volume 30, Issue 2, December 2016

- J14. Amin A. A., Baig T, Deissler R J, Yao Z, Tomsic M, Doll D, Akkus O and Michael Martens, "A multiscale and multiphysics model of strain development in a 1.5 T MRI magnet designed with 36 filaments composite MgB₂ superconducting wire.", Superconductor Science and Technology, Volume 29, Issue 5, March 2016.
- J15. Mojumder S, Amin A. A., and Islam M M, "Mechanical properties of stanene under uniaxial and biaxial loading: A molecular dynamics study," Journal of Applied Physics, Volume 118, Issue 12, September 2015
- J16. Amin A. A., Jagtiani A, Vasudev A, Hu J, and Zhe J, "Soft microgripping using ionic liquids for high temperature and vacuum applications.", Journal of Micromechanics and Microengineering, Volume 21, Issue 12, December 2011

JOURNAL PUBLICATIONS (Under Review)

- J1. Yangfan Li, Ye Lu, Abdullah Al Amin, and Wing Kam Liu, Stochastic additive manufacturing simulations: from experimental data to surface roughness and porosity predictions. Under review with Additive Manufacturing, (<https://arxiv.org/pdf/2208.02907.pdf>)

JOURNAL PUBLICATIONS (In Preparation)

- J1. Abdullah Al Amin, Satyajit Mojumder, Wing Kam Liu, "An open-source GPU accelerated high fidelity multiphysics FVM framework for additive manufacturing simulations." (In Preparation)
- J2. Abdullah Al Amin, Yangfan Li, Satyajit Mojumder, Wing Kam Liu, "Getting the heat source right for Laser Powder Bed fusion additive manufacturing simulations." (In Preparation)

CONFERENCE PROCEEDINGS

- C1. AA Amin, C Tanner, J. Rohmer, "Rapid Aero-Structural Design With Topological Optimization Of Tailored Fiber Placement Using Differentiable Programming" 18th US Congress on Computational Mechanics, July 20-24, 2025, Chicago, IL, USA.
- C2. AA Amin, N Sultana, R. S. Rathun, J. Guo, W. K. Liu, "A Flexible and Parallelizable Python Framework for Additive Manufacturing Process Simulation" 18th US Congress on Computational Mechanics, July 20-24, 2025, Chicago, IL, USA.
- C3. AA Amin, R Lowe, N Sultana, W Liu, "Physics-Guided Heat Source for Transient Laser Absorptance Prediction In Metal Additive Manufacturing" 16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics, July 21-26, 2024, Vancouver Convention Centre, Vancouver, British Columbia, Canada [Not presented due to CrowdStrike Outage in 2024]
- C4. AA Amin, R Lowe, N Sultana, "High-Fidelity Melt Pool Prediction with a Physics-Guided Heat Source for Accelerated Laser Powder Bed Additive Manufacturing Simulations", 49th Dayton-Cincinnati Aerospace Sciences Symposium, Dayton, OH, March 5th, 2024.
- C5. AA Amin, S Mojumder, Y Li, X Xie, W Liu, "Physics Augmented Stochastic Simulation (PASS) for Accelerated Computation of Laser Absorption in Powder Bed Fusion Additive Manufacturing", 17th USNCCM, Albuquerque, NM, July 23-27, 2023.
- C6. Y Li, Y. Lu, AA Amin, X Xie, J Guo, WK Liu, "A Stochastic Additive Manufacturing Simulation Method for Surface Roughness and Porosity Prediction", 17th USNCCM, Albuquerque, NM, July 23-27, 2023.
- C7. X Xie, AA Amin, Y Li, J Guo, N Kizer, L Mutswatiwa2, L Katch, C Kube, WK Liu, "Real-Time Keyhole Porosity Detection in Metal Additive Manufacturing With In-Situ Ultrasound and X-Ray Imaging", 17th USNCCM, Albuquerque, NM, July 23-27, 2023.
- C8. S Mojumder, H Huang, D Suarez, AA Amin, WK Liu, "Mechanistic data science approach for reinforced polymer composites design" Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology, San Diego, CA, September 26-29, 2021.
- C9. H Li, AA Amin, Y Lu, WK Liu, Advances and Applications of Mechanistic Machine Learning, Reduced-order and Data-driven Analyses, 16th USNCCM 2021, Chicago, IL July 25-29, 2021.

- C10. AA Amin, B Bhusal, TN Baig, RJ Deissler, L Sabri, O Akkus, and MA Martens, "A comparative study of coil winding techniques of a full body 1.5 T MgB₂ based MRI magnets.", ISMRM 25th annual meeting & exhibition, Hawaii, USA, April 2017
- C11. AA Amin, TN Baig, RJ Deissler, L Sabri, D Doll, M Tomsic, O Akkus and MA Marten, "Effect of Mechanical Support Conditions of Winding on the Strain Development of a Composite MgB₂ Based Full Body, MRI Coil.", Applied Superconductivity Conference, Denver, Colorado, USA, October 2016 [Superconductivity News Forum Contest Runner Up, SNF Contest for Best ASC 2016 Contributed Preprints – PART II, 2016]
- C12. RJ Deissler, TN Baig, CR Poole, AA Amin, D Doll, M Tomsic, M Martens, "A Computational Study to Find an Optimal RRR Value for a 1.5 T Persistent-Mode Conduction-Cooled MgB₂ MRI Magnet from a Quench Protection Point of View.", Applied Superconductivity Conference, Denver, Colorado, USA, October 2016
- C13. AA Amin, B Bhusal, TN Baig, RJ Deissler, L Sabri, O Akkus, and MA Martens, "Variation in strain characteristics for multiscale multiphysics models of a 1.5T conduction cooled MRI system based on a 36 filament MgB₂ composite wire.", ISMRM 24th annual meeting & exhibition, Singapore City, Singapore, May 2016
- C14. AA Amin, TN Baig, Z. Yao and MA Martens, "Stress and Strain Sensitivity Study of 1.5T Conduction Cooled MgB₂ Magnet Design.", ISMRM 23rd annual meeting & exhibition, Toronto, Canada, May 2015

DEVELOPED SOFTWARE PROGRAMS

1. AM-CFD: An FVM based Additive Manufacturing Part Modeling Program (<https://github.com/neoceph/AM-CFD>)
2. Tire F&M: Hybrid analytical-FEM tire force analysis program.
3. M S H Thakur, M Islam, A Amin, S Mojumder, M M Islam (2019), "LAMMPS Input Structure Generator for Functionally Graded Materials (FGM)," <https://nanohub.org/resources/fgmbuilder>. (DOI: 10.21981/JC41-XT92).

WORKSHOP/SHORT COURSE

1. Mechanistic Data Science for STEM students. (May 30 – August 10) Summer 2022 [Co-Instructor]
2. CMMI Game Changer Academics, NSF Division of CMMI, May 18, 2022. [Participant]
3. Mechanistic Data Science for STEM Education and Applications, Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology, Sand Diego, CA. September 26, 2021. [Co-organizer]
4. Mechanistic Data Science for STEM Education and Applications, 16th USNCCM, July 25, 2021, Chicago, IL. [Co-organizer]
5. Mechanistic Data Science for STEM students. (June 8 – August 11) Summer 2021. [Co-organizer]
6. Multiscale Material Design, Instructor: Dr. Markus Buehler, MIT Professional Education, June 2016. [Participant]

PATENTS

- P1. Deissler R J, Baig T N, Amin A A, Brown R W, Grimberg B G, "Magneto-Optical detection and discernment of biofluid crystals." February 28, 2019, US 2019/0064113 A1

GRANTS

- G1. August 2024, "Experiential Learning Innovation Fund". University of Dayton, Amount: \$750
- G2. Summer 2024, "UD-UDRI Summer Faculty Fellow", University of Dayton, Amount: \$14,500

- G3. August 11, 2022, "NASA GPU HACKATHON 2022." Three-day intensive GPU training in collaboration with NASA and NVIDIA.
- G4. November 2016, "Crystics: A biocrystal detection system," VentureWell Stage I grant, VentureWell, Boston; USA. 5000 USD.
- G5. August 2016, "Supercomputer to model MRI quench strains." Ohio Supercomputer Center, August 2016. 5000 RU≈50,000 compute hours.

INVITED TALKS

- I1. "Multiscale Multiphysics Computational Modeling: A Perspective in Additive Manufacturing, Magnetic Resonance Imaging Research, and Automotive Tire Analysis," Abdullah Al Amin, University of Wisconsin-Milwaukee, April 26, 2023.
- I2. "Multiscale Multiphysics Computational Modeling: A Perspective in Additive Manufacturing, Magnetic Resonance Imaging Research, and Automotive Tire Analysis," Abdullah Al Amin, Florida Institute of Technology, April 19, 2023.
- I3. "Large Scale System Design with Multiphysics and Multiscale Analysis: Applications in MRI Magnet and Additive Manufacturing," Abdullah Al Amin, South Dakota School of Mines, March 9, 2023.
- I4. "Winning 2022 NIST Additive Manufacturing Benchmark Challenge and Beyond", Abdullah Al Amin, University of Dayton, March 6, 2023.
- I5. "Multiscale Multiphysics Computational Modeling: A Perspective in Automotive Tire, Additive Manufacturing, and Magnetic Resonance Imaging Research," Abdullah Al Amin, University of Akron, March 3, 2023.
- I6. "Winning the NIST AM Bench Challenge by Successfully Predicting the Laser Powder Bed Fusion Process," Abdullah Al Amin, University of Houston, February 28, 2023.
- I7. "Predicting the Laser Powder Bed Fusion Process for Metal Additive Manufacturing", Abdullah Al Amin, University of Minnesota Duluth, February 6, 2023.
- I8. "AM-CFD: a Well-validated Thermal-fluid Simulator for Additive Manufacturing Part Qualification", Yangfan Li, Abdullah Al Amin, Sourav Saha, Wing Kam Liu, August 18, 2022, Additive Manufacturing Benchmarks (AM-Bench 2022), Bethesda, MD.
- I9. "Building the Next Generation Magnetic Resonance Imaging (MRI) Machines," October 2017, Intel Corporation, Oregon, USA.
- I10. "Next Generation Magnetic Resonance Imaging (MRI) Magnet," August 2017, Bridgestone Americas, Ohio, USA.
- I11. "A comparative study of coil winding techniques of a full body 1.5 T MgB₂ based MRI magnets." April 2017, ISMRM 25th annual meeting & exhibition, Hawaii, USA.
- I12. "Effect of Mechanical Support Conditions of Winding on the Strain Development of a Composite MgB₂ Based Full Body, MRI Coil." October 2016, Applied Superconductivity Conference, Denver, Colorado, USA.
- I13. "A Computational Study to Find an Optimal RRR Value for a 1.5 T Persistent-Mode Conduction-Cooled MgB₂ MRI Magnet from a Quench Protection Point of View." October 2016, Applied Superconductivity Conference, Denver, Colorado, USA.
- I14. "Variation in strain characteristics for multiscale multiphysics models of a 1.5T conduction cooled MRI system based on a 36 filament MgB₂ composite wire." May 2016, ISMRM 24th annual meeting & exhibition, Singapore City, Singapore.
- I15. "Stress and Strain Sensitivity Study of 1.5T Conduction Cooled MgB₂ Magnet Design." May 2016, ISMRM 23rd annual meeting & exhibition, Toronto, Canada.
- I16. "High throughput microparticle separation on curved microchannel based on inertial microfluidics." September 2013, Intel Corporation, Oregon USA.