CURRICULUM VITAE

Jason P. Mack

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EDUCATION

The University of Akron, Akron, Ohio (8/2021-Present)
Doctor of Philosophy, Mechanical Engineering
Certificate, Computational Data Science
Current GPA: 4.00/4.00
Ph.D. Candidacy Exam: Passed on May 3, 2024
Advisor: Dr. K.T. Tan

The University of Akron, Akron, Ohio (8/2016-12/2020)
Bachelor of Science (Cum Laude and Williams Honor Scholar)
Mechanical Engineering, Minor in Applied Mathematics
Final GPA: 3.51/4.00

RESEARCH EXPERIENCE & EMPLOYMENT

The University of Akron, Akron, OH
Instructor, Department of Mechanical Engineering (8/2024-Present)
MECE 165: Tools for Mechanical Engineering
MECE 166: ME Freshman Design
- Develop and deliver lectures and lab sessions on essential engineering tools (SolidWorks and MATLAB) to first-year mechanical engineering students.
- Create assessments and provide detailed feedback to ensure students meet course learning objectives.
- Mentor students, providing guidance on course topics, and supporting their academic success.

The University of Akron, Akron, OH
Graduate Research Assistant, Department of Mechanical Engineering (1/2022-Present)
- Perform low velocity impact tests utilizing Instron CEAST 9350 drop tower to evaluate the dynamic impact response of various composite structures.
- Conduct residual strength testing after impact to understand the effects of low velocity impact.
- Implement non-destructive techniques (NDT) to elucidate internal damage of composite structures.
- Develop analytical models and numerical methods to study crack propagation in composite laminates.
- Create machine learning models to predict impact damage and residual strength of composites.
- Support undergraduate research students on mechanical testing of additive manufactured carbon fiber reinforced thermoplastic composites.
- Support undergraduate research students on mechanical recycling of additive manufactured carbon

fiber reinforced thermoplastic composites into reusable short fiber reinforced filament.

- Support undergraduate research student on the design and manufacturing of biomimetic additive manufactured carbon fiber reinforced thermoplastic for increased impact performance.
- Perform and analyze impact testing of cranial implants (collaborator: Dr. Prabaha Sikder, Cleveland State University).
- Perform and design novel impact testing of tubular composite structures (collaborator: Lighter Than Air, LTA Galactic).

Bridgestone Americas, Akron, OH
Data Science Intern, Advanced/Sustainable Materials & Simulation (forecast: 6/2025-8/2025)
- Support product development and testing efforts by analyzing data, validating lab equipment, and maintaining process documentation.
- Assist in developing digital tools and data-driven models to accelerate material innovation and inform engineering decisions.
- Contribute to lab automation by providing scientific programming support and improving workflow efficiency.
- Collaborate on new product concepts by researching emerging technologies and proposing enhancements to existing processes.

NASA Glenn Research Center, Materials and Structures Division, Cleveland, OH
Summer NRT Research Fellow, Multiscale and Multiphysics Modeling Branch (5/2024-8/2024)
- Extraction and analysis of experimental data on composite systems undergoing uniaxial tension to build experimental dataset.
- Tuning and executing composite modeling using MAC/GMC to build virtual dataset.
- Develop custom loss function to assign higher weight to experimental data and non-linear region of material response curves to use in a surrogate neural network to improve predictions.
- Use optimization frameworks (Bayesian with gaussian process and differential evolution) to tune MMCDM damage parameters for use in MAC/GMC to reduce time resulting from manually tuning damage parameters.

The University of Akron, Akron, OH
Graduate Teaching Assistant, Department of Mechanical Engineering (8/2021-5/2023)
- Taught freshman-level engineering students important software (SolidWorks and MATLAB).
- Proctored upper classman level Measurements Lab and guided them on the use of equipment (Strain gauge, DAQ, wind tunnel) and software (LabVIEW).
- Conducted computer lab sessions for engineering students to practice what they have learned.
- Graded weekly assignments and provided feedback for students to make improvements.
- Advised students on good engineering principles so that they could be well-trained engineers.

The University of Akron, Akron, OH
Undergraduate Grader, Department of Mechanical Engineering (8/2020-12/2020)
- Evaluated and provided feedback on homework assignments for an upper-level course in Thermal System Components.

The University of Akron, Akron, OH

Undergraduate Honor's Design Project, Department of Mechanical Engineering (8/2019-5/2020)
- Developed piezoelectric energy harvester for smart tire sensor application.
- Improved measurement system for more accurate data acquisition.
- Created CAD model of new housing prototype for sensor to mount to tire.

TenPoint Crossbow Technologies, Mogadore, OH
Mechanical Engineering Co-Op (5/2018-5/2019)
- Conducted various testing on prototypes, material samples, and product performance.
- Created assembly drawings using SolidWorks to assist warranty department in repairs.
- Organized CAD models of part mold tools from company vendors.
- Analyzed data on product weight and costs to achieve financial savings.
- Updated prototype testing standards by creating new testing documents and database.

RESEARCH INTERESTS

Advanced composite materials, impact and dynamic response, fracture mechanics and material damage, nondestructive evaluation techniques, environmental effects, machine learning, data science, biomedical, additive manufacturing, sustainability, biomimetic materials, metamaterial lattice structures.

HONORS & AWARDS

- **The University of Akron, LIFE Doctoral Scholar Award** (04/2025)
- **The University of Akron, Mechanical Engineering, Grotefend Endowed Scholarship** (08/2024, 01/2025)
- **American Society for Composites (ASC)**, Sustainable Composite Design Competition (Winner) *Team Lead* (06/2024)
- **Ohio Space Grant Consortium (OSGC)** Summer Internship Award (6/2024-8/2024)
- **American Institute of Aeronautics and Astronautics (AIAA)**, 2024 Region III Student Conference (Third Place), Masters Category (04/2024)
- **American Society for Composites (ASC)**, Sustainable Composite Design Competition (Honorable Mention), *Team Lead* (06/2023)
- **National Science Foundation (NSF) Research Trainee (NRT)** Fellowship (08/2022)
- **The University of Akron,** Scholarship For Excellence (08/2016-12/2020)
- **The University of Akron,** Swagelok Engineering Merit Scholarship (08/2016-12/2020)
- **The University of Akron,** Williams Honors College Scholarship (08/2016-12/2020)
- **The University of Akron**, President's List (5/2020)
- **The University of Akron**, Dean's List (12/2016, 5/2019, 12/2019, 12/2020)

PEER REVIEWED JOURNAL PUBLICATIONS

Published Journal Articles
1. J.P. Mack and K.T. Tan (2025). Study of Equi-Energetic Effects on the Low-Velocity Impact and Compression After Impact Response of Carbon Fiber Composite Tube Structures, **Composites**

Part B: Engineering, 291:112056.
2. <u>J.P. Mack</u>, F. Mirza, A. Banik, M.H. Khan, and K.T. Tan (2024). Hybridization of Face Sheet in Sandwich Composite to Mitigate Low Temperature and Low Velocity Impact Damage, **Composite Structures**, 338:118101.
3. F. Mirza, <u>J.P. Mack</u>, A. Banik, M.H. Khan, and K.T. Tan (2024). Bending After Impact Failure of Foam-Core Hybrid Sandwich Composites in Low Temperature Conditions, **Composites Science and Technology**, 258:110897.
4. S.Y. Sonaye, <u>J.P. Mack</u>, K.T. Tan, and P. Sikder (2024). A Comprehensive Analysis of High-temperature Material Extrusion 3D Printing Parameters on Fracture Patterns and Strength of Polyetheretherketone Cranial Implants, **Progress in Additive Manufacturing**, 1-16.

Manuscripts in Preparation/Submission
5. <u>J.P. Mack</u>, A. Kovac, F. Mirza, Z.H. Duan, S. Hasebe, R. Higuchi, T. Yokozeki, and K.T. Tan (2025). Machine Learning Insights: Predicting Compression Strength After Low-Velocity Impact on Carbon Fiber Composites, *under review*.
6. <u>J.P. Mack</u>, F. Mirza, Z.H. Duan, S. Hasebe, R. Higuchi, T. Yokozeki, and K.T. Tan (2025). Deep Learning for Predicting Impact Parameters and Post-Impact Strength in Composite Materials Using C-Scan Images, *prepare for submission*.
7. <u>J.P. Mack</u> and K.T. Tan (2025). Linear Elastic Fracture Mechanics Compression-After-Impact Model for Composites with Multiple Delaminations, *prepare for submission*.
8. <u>J.P. Mack</u> and K.T. Tan (2025). Micro-CT-Informed Model for Damage Characterization in Impacted Composites, *prepare for submission*.
9. <u>J.P. Mack</u> and K.T. Tan (2025). Physics-Informed Neural Network for Predicting Impact Response in Composite Structures, *prepare for submission*.
10. F. Mirza, <u>J.P. Mack</u>, Z.H. Duan, and K.T. Tan (2025). Predicting Bending After Impact Failure Mode and Strength of Hybrid Sandwich Composites: A Machine Learning Approach, *prepare for submission*.

PEER-REVIEWED CONFERENCE PUBLICATIONS & PRESENTATIONS

1. <u>J.P. Mack</u>, A. Kovac, F. Mirza, Z.H. Duan, S. Hasebe, R. Higuchi, T. Yokozeki, and K.T. Tan (2024). Data-Driven Approaches for Assessing Compression After Low-Velocity Impact in Carbon Fiber Reinforced Composites, Conference Proceeding for **American Society for Composites 39th Technical Conference**, 21-23 Oct, San Diego, California, USA.
2. A. Holland, <u>J.P. Mack</u>, F. Mirza, V.B.C. Tan, T.E. Tay, and K.T. Tan (2024). Investigating the Low-Velocity Impact Resistance of Helicoidal and Double Double 3D Printed Carbon Fiber Reinforced Polymer Layups, Conference Proceeding for **American Society for Composites 39th Technical Conference**, 21-23 Oct, San Diego, California, USA.
3. F. Mirza, <u>J.P. Mack</u>, Z.H. Duan, and K.T. Tan (2024). A Machine Learning Approach for Predicting Bending After Impact Strength and Failure Modes in Hybrid (CFRP/GFRP) Sandwich Composites, Conference Proceeding for **American Society for Composites 39th Technical Conference**, 21-23 Oct, San Diego, California, USA.
4. <u>J.P. Mack</u> and K.T. Tan (2024). Machine Learning Applications for Compression Strength After Low Velocity Impacted Carbon Fiber Composites, Conference Proceeding for **American Institute of Aeronautics and Astronautics 2024 Region III Student Conference**, 5-6 Apr, Akron, Ohio, USA.
5. <u>J.P. Mack</u> and K.T. Tan (2023). Equi-Energetic Low-Velocity Impact Effects on the Compression

After Impact Strength of Carbon Fiber Composite Tube Structures, Conference Proceeding for **American Society for Composites 38ᵗʰ Technical Conference**, 17-20 Sept, Greater Boston, Massachusetts, USA.

6. <u>J.P. Mack</u>, F. Mirza, A. Banik, M.H. Khan and K.T. Tan (2023). Impact Damage and Failure Mechanisms of Hybrid Facesheet Sandwich Composites under Low Temperature Conditions, Conference Proceeding for **American Society for Composites 38ᵗʰ Technical Conference**, 17-20 Sept, Greater Boston, Massachusetts, USA.

7. F. Mirza, <u>J.P. Mack</u>, A. Banik, M.H. Khan and K.T. Tan (2023). Investigation of Bending After Impact Failure Behavior in Foam-Core Hybrid Sandwich Composites at Extreme Low Temperature, Conference Proceeding for **American Society for Composites 38ᵗʰ Technical Conference**, 17-20 Sept, Greater Boston, Massachusetts, USA.

POSTER PRESENTATIONS

1. <u>J.P. Mack</u>, F. Mirza, Z.H. Duan, S. Hasabe, R. Higuchi, T. Yokozeki and K.T. Tan (2025). CNN-Based Predictions from Post-Impact C-Scans, **NRT Symposium**, 21 Mar, Akron, Ohio, USA.

2. <u>J.P. Mack</u> and K.T. Tan (2024). Data-Driven Approaches for Assessing Compression After Low-Velocity Impact in Carbon Fiber Reinforced Composites, **Case Western Reserve University, Glenn Space Technology Symposium, American Astronautical Society**, 15-17 July, Cleveland, Ohio, USA.

3. <u>J.P. Mack</u>, A.Kovac, F. Mirza, Z.H. Duan, S. Hasabe, R. Higuchi, T. Yokozeki and K.T. Tan (2024). Utilizing Machine Learning to Predict Compression Strength in Carbon Fiber Composites Subjected to Low-Velocity Impact, **The University of Akron, Graduate Student Research Day**, 3 Apr, Akron, Ohio, USA.

4. <u>J.P. Mack</u>, A.Kovac, F. Mirza, Z.H. Duan, S. Hasabe, R. Higuchi, T. Yokozeki and K.T. Tan (2024). Machine Learning Applications for Compression Strength in Low-Velocity Impacted Carbon Fiber Composites, **NRT Symposium**, 1 Mar, Akron, Ohio, USA.

5. P. Cuddihy, <u>J.P. Mack</u> and A. Russel (2023). Applying Various Machine Learning Techniques to Predict Material Properties, **NSF Research Traineeship Annual Meeting,** 29-31 Oct, Tempe, Arizona, USA.

6. <u>J.P. Mack</u>, F. Mirza, A. Banik, M.H. Khan and K.T. Tan (2023). Extreme Arctic Temperature Effects on Impact Performance of Hybrid (CFRP/GFRP) Face Sheet Sandwich Composites, **The University of Akron, Graduate Student Research Day**, 17 Apr, Akron, Ohio, USA.

INVITED ADDRESSES & TALKS

1. <u>J.P. Mack</u> (2024). Surviving the Impact: A Journey Through Composites Research, **The University of Akron, Fundamentals of Composites Manufacturing and Mechanics (MECE 486/696-807)**, 18 Nov, Akron, Ohio, USA.

2. <u>J.P. Mack</u> (2024). Prediction Response Improvements for MMCDM with Surrogates and Optimization, **National Aeronautics and Space Administration (NASA), Glenn Research Center**, 26 July, Cleveland, Ohio, USA.

3. <u>J.P. Mack</u> (2023). Low Velocity Impact Effects on Various Composite Structures, **The University of Akron, Fundamentals of Composites Manufacturing and Mechanics (MECE 486/696-807)**, 1 Nov, Akron, Ohio, USA.

VOLUNTEER & OUTREACH ACTIVITIES

- **International Science and Engineering Fair - Society for Science**, Grand Judge (May 2025)
- **Department of Mechanical Engineering**, Graduate Ambassador (February 2025 – Present)
- **UA Pitch Competition**, Organizer and Host (April 2024 – April 2025)
- **State Science Day**, Judge (April 2025)
- **District 5 Science Day**, Judge (March 2023 – March 2025)
- **Department of Management Networking Night**, Organizer (February 2025)
- **69th Annual APS STEM EXPO**, Judge (January 2025)
- **ZIPS: Engineered for Success Mentoring Event**, Volunteer (September 2024)
- **MECE:166 ME Freshman Design Project**, Judge and Score Keeper (April 2024)
- **Akron Regional Science Olympiad**, Volunteer (March 2024)
- **Kids Career Day**, Group Leader (March 2024)
- **Rotaract**, Volunteer (September 2022)
- **Youth "Ninja Night"**, Volunteer (June 2021)

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

1. American Society for Composites (ASC) — 2022–Present
2. American Society of Mechanical Engineers (ASME) — 2022–Present
3. American Institute of Aeronautics and Astronautics (AIAA) — 2024-Present

MEMBERSHIP IN STUDENT ORGANIZATIONS

1. Northeast Ohio Student Venture Fund (NEOSVF), President — Summer 2024-Present
2. Northeast Ohio Student Venture Fund (NEOSVF), Member — Fall 2022-Present
3. Meta Coffee Club (MC^2), Co-founder and Vice President — Fall 2024-Present
4. Northeast Ohio Student Venture Fund (NEOSVF), Vice President — Fall 2023-Summer 2024
5. Finite Element Analysis Design Team, Vice President — Summer 2019-Fall 2020
6. Finite Element Analysis Design Team, Member — Spring 2019-Fall 2020

REVIEWING OF MANUSCRIPTS

Reviewer of manuscripts submitted to the following international journals:
- *International Journal of Lightweight Materials and Manufacture*
- *Applied Composite Materials*

Reviewer of manuscripts submitted to the following conference proceedings:
- *Springer - 2024 American Society for Composites 39th Annual Technical Conference*

RESEARCH SKILLSETS

Computer Software: Abaqus, Ansys, SolidWorks, MATLAB, LabVIEW, Python, Tensorflow, PyTorch, Pandas, Scikit Learn, Google Colab, Jupyter Notebook, VS Code, Microsoft Office, SQL, 3D Slicer.

Experimental Techniques: Instron/MTS universal testing machines, Instron CEAST 9350 Drop Tower, Additive manufacturing machines, Environmental chambers, Micro-computed tomography imaging machines, Keyence digital microscope.

FEATURED IN MEDIA

- Featured by The University of Akron's University Communications and Marketing for my team's victory in the 2024 ASC Sustainable Composite Design Competition. https://www.uakron.edu/im/news/engineering-students-win-asc-design-competition-and-nsf-travel-awards
- Recognized in the AIAA press release for the 2024 Region III Student Conference for earning third place in the master's category, also featured by The University of Akron's University Communications and Marketing. https://www.aiaa.org/news/news/2024/05/07/aiaa-announces-2024-regional-student-conference-winners
- https://www.uakron.edu/im/news/ua-student-chapter-of-the-american-institute-of-aeronautics-and-astronautics-hosts-region-iii-student-conference
- Featured in the University of Akron News for Kids' Career Day for community engagement. https://www.uakron.edu/im/news/kids-career-day-inspires-future-inventors

PROFESSIONAL REFERENCES

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