

PRUTHUL KOKKADA RAVINDRANATH

Assistant Professor, Aerospace and Mechanical Engineering Department,
Saint Louis University

• <https://www.linkedin.com/in/pruthulkokkada/>

SUMMARY

Pruthul Kokkada Ravindranath holds a Ph.D. and M.S. in Aerospace Engineering and Mechanics from the University of Alabama, an M.S. in Mechanical Engineering and Engineering Mechanics from Michigan Technological University, and a B.E. in Mechanical Engineering from Visvesvaraya Technological University, India. His research integrates computational and experimental solid mechanics, with expertise in advanced composite materials, additive manufacturing of polymers and metals, molecular dynamics, finite element analysis, non-destructive evaluation, and material characterization. He has extensive experience in teaching, mentoring, and collaborative research with industry, academia, and government laboratories. As co-PI, he has secured U.S. Army research funding and is advancing partnerships expected to bring in additional government and industry-supported projects.

RESEARCH INTERESTS

- Computational Solid Mechanics
- Multiscale modeling and analysis of aerospace/space grade composite materials using tools like atomic scale simulations (Molecular Dynamics) and Finite Element Analysis (FEA)
- Advanced manufacturing and testing of Multifunctional materials
- Material characterization using non-destructive evaluation (NDE)
- Mechanical testing and Failure Analysis (structural mechanics)

EDUCATION

University of Alabama, Tuscaloosa, AL

Doctor of Philosophy in Aerospace Engineering and Mechanics, December 2017

Dissertation: Carbon Nanotube Sheet Scrolled Fiber Composite for Enhanced Interfacial Mechanical Properties

Advisor: Dr. Samit Roy

University of Alabama, Tuscaloosa, AL

Master of Science in Aerospace Engineering and Mechanics, May 2017

Michigan Technological University, Houghton, MI

Master of Science in Mechanical Engineering and Engineering Mechanics, July 2013

Thesis: Molecular Modeling of PMR-15, Polyimide

Advisor: Dr. Gregory M Odegard

Visvesvaraya Technological University, Belgaum, India

Bachelor of Engineering in Mechanical Engineering, June 2011

PROFESSIONAL EXPERIENCE

Assistant Professor, Saint Louis University, Saint Louis, 2026 - Present

- Building a research program and work with students and collaborators to advance research in advanced aerospace composite materials through both computational and experimental investigation
- Teaching undergrad and graduate student level course on advanced materials and structures

Research Scientist, Baylor University, Waco, 2022 - 2026

- Guiding graduate students on funded research projects aiming towards the development in the multifunctional properties of aerospace grade composite materials
- Working on research efforts to advance the state of the art in nondestructive evaluation (NDE) techniques for the inspection of engineering grade materials
- Testing and characterization of materials following ASTM and internal proprietary standards in support of the testing certification efforts
- Leading teams of students and full-time staff to develop technologies towards successful patent grants and FAA certificates for commercial applications

Postdoctoral Research Associate, Baylor University, Waco, 2020 –2022

- Worked on research projects with particular interest in studying the process variation and their end effects on additive manufacturing of discontinuous fiber reinforced composite materials and their material characterization
- Developed methods of non-destructive testing of composite materials using computerized tomography (CT) scanning and ultrasonic techniques
- Research collaborations were also undertaken with Oak Ridge National Labs to improve the resistance of CFRP composites to lightning strike damage

Instructor, University of Alabama, Tuscaloosa, 2018 - 2020

- Prepared course materials and taught fundamental engineering courses: Mechanics of Materials, Statics, Dynamics, Fluid Mechanics, Aerospace Structures, C++
- Advised senior design team working on a NASA project of Short Surface Stay Mars Mission
- Developed online courses for distance learning students by creating video lectures, online exams, and assignments

PROJECTS AND RESEARCH EXPERIENCE

Ultrasonic Study of Defect Identification in a Steel Part using Multiphysics based FEA simulations of Acoustic Waves, Baylor University, 2025–2026

- A Bell Flights funded project to develop a multiphysics based FEA model of an acoustic wave to study the wave propagation during an ultrasonic scan of a steel part with defect.
- The simulation shows a very good relationship between the numerical analysis of the generated pressure wave with experimental results and the data from the simulations can be used as an operational guide for the NDI inspector for the desired inspection parameters like the transducer frequency, gains required, focal length and more.

Outcomes: journal papers under review

Exploring scalable and sustainable pathways for In-Situ Space Manufacturing, Baylor University, 2023–2026

- Investigated additive friction stir deposition (AFSD) of AA6061 reinforced with 20 wt% lunar regolith simulant, producing dense builds with minimal porosity and demonstrating the potential of in-situ resource utilization for future space infrastructure.
- Pioneered upcycling of metallic space debris into functional components via twin-rod AFSD (TR-AFSD). Developed continuous-casting feedstock from AA6061 debris, achieving significant reduction in casting defects and refined, homogenized microstructures for high-performance, sustainable in-space manufacturing.

Outcomes: 2 journal papers (2 under review)

Using non-destructive evaluation techniques to investigate defects in composite materials during manufacturing and in-service operations, Baylor University, 2020-2026

- Developing advanced non-destructive evaluation techniques like ultrasonic scanning, computed tomography, and eddy currents to detect and investigate damages incurred in aerospace grade composite materials during manufacturing or in-service operations
- Integrating the data collected from various NDE methods (data fusion) and incorporating machine learning techniques to improve the evaluation of composite materials

- Using the data collected from NDE methods into a finite element model to analyze and develop an improved predictive model
Outcomes: 7 journal papers (3 under review) and 2 approved patents, 1 under review, 3 applied

Data Analysis and Reduction from Optical Coherence Tomography for the Analysis of Blood Vessel Pathways, Baylor University, 2024 –2025

- A novel and noninvasive method of optical coherence tomography (OCT) imaging technique to investigate blood vessels under the skin was studied
- OCT imaging-based techniques were used to generate data to evaluate features of the microvasculature
- Image processing techniques were used to study the vessel density and distribution area in these data to understand the biology behind mechanically induced skin adaptation
Outcomes: journal article under review, project renewed

Federal Aviation Administration (FAA) Certification on using ultrasonic testing to detect defects, damage and bondline thickness in composite materials and metals, Baylor University, 2021-2023

- Worked on multiple projects that required developing airworthiness ultrasonic inspection methods to detect foreign object debris, low-velocity impact damage (BVID) and adhesive/bondline thickness between composite materials and bonded metals
- The goal of these projects was to develop a portable ultrasonic scanning system and receive airworthiness certification from the FAA for commercial use
- The project involved developing methods for manufacturing, testing and inspecting composite materials and validating them and preparing extensive records and project reports for FAA's designated engineering representative (DER) to approve and certify
- Led the team of undergraduate and graduate volunteer research students, staff and faculty members in my role of Project Manager and successfully received FAA certificate on "Ultrasonic Scanning System for Composite Structures – Barely Visible Impact Damage Quantification"
Outcomes: 3 FAA certificates for commercial applications, 2 journal papers

MXene Reinforced Thermosetting Composite for Lightning Strike Protection of CFRP, Baylor University, 2021

- A multi-institutional collaboration was undertaken involving researchers from Oak Ridge National Laboratory (ORNL), the University of Tennessee, Tulane University, and Mississippi State University.
- Objective of this project was to investigate the effects of MXene—a class of two-dimensional transition metal carbides and nitrides—on the electrical, mechanical, and thermal properties of divinylbenzene (DVB) thermoset resin. With emphasis on their resistance to high-voltage lightning strikes.

- This work, supported by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) through the Advanced Manufacturing Office, leveraged the resources of the Manufacturing Demonstration Facility (MDF) at ORNL.

Outcomes: 1 journal paper

Carbon Nanotube Sheet Scrolled Fiber Composite for Enhanced Interfacial Mechanical Properties, University of Alabama, 2014–2017

- A novel method of fabricating the overwrap of multiwalled carbon nanotube (MWNT) sheets around carbon fiber for embedding in a polymer resin to reinforce the interface between the carbon fiber and polymer matrix was studied
- Molecular dynamics (MD) and FEM simulations were used to implement failure analysis and compressive strength enhancement at the epoxy/carbon fiber interface with and without scrolled MWNT sheet
- MD simulations of debonding at the nanoscale based on atomistic J-integral of nano-graphene sheet was also studied as a part of future investigation for this project

Outcomes: 2 journal papers

Multiaxial Testing of Composite sheet wrapped Metals, University of Alabama, 2016

- Operations of fatigue testing were conducted on metals with and without wrapped composite sheet in support of preliminary research
- One of the tasks also involved material characterization using scanning electron microscopy (SEM) for investigating the effect of composites on metals
- FEA computational modeling and simulations using structural software such as ABAQUS were performed

Molecular Modeling of PMR-15, Polyimide, Michigan Technological University, 2011 - 2013

- A molecular model of PMR-15 was created using OPLS-All Atoms force field parameters and validation tests were performed on the stability of the model under ambient conditions
- LAMMPS was used as the primary software to crosslink the monomer chains of PMR-15 and to run the computational simulations to validate the model

SKILLS

Experiments

Universal Testing Machine (Instron, MTS)
 Manufacturing (VARTM, Compression Molding, Prepreg)
 X-ray Digital Radiography (North Star Imaging)
 X-ray Micro-computed Tomography (North Star Imaging)
 3D Printer (Ultimaker, Bambu Lab)
 Digital Image Correlation (GOM)
 Scanning Electron Microscopy (JEOL)

Ultrasonic C-scan (OLYMPUS, Baylor)
Optical Microscopes (Olympus, Zeiss)
FTIR (TA Instruments)
DSC (TA Instruments)
TGA (TA Instruments)
TMA (TA Instruments)
Machining, drilling, cutting

Programing

MATLAB, C++, RStudio,

Software

LAMMPS, ABAQUS, ANSYS, SolidWorks, MS Office, Volume Graphics

PATENTS AWARDED AND APPLIED:

- T Fleck, K Matalgah, D Pulipati, PK Ravindranath, DA Jack, “Ultrasonic system and method for detecting and characterizing contact delaminations”, **US Patent US20240044845A1**, Aug. 02 2024
- D.A. Jack, B. M. Blandford, N. J. Blackman, R. E. Nadeau, I. Gravagne, P. Kokkada Ravindranath, “Cylindrical Ultrasonic Scanning Apparatus”, **US Patent US-11933763-B2**, Mar. 19, 2024
- D.A. Jack, B. M. Blandford, P. Kokkada Ravindranath, N. J. Blackman, D. Pulipati, I. Gravagne, “Cylindrical Ultrasonic Scanning Apparatus”, **US Patent US-11835484-B2**, Dec. 5 2023

PUBLICATIONS

Journal Papers

1. Newton, M., Van Lear, R., Kokkada Ravindranath, P., Jack, D., & Gravagne, I. (2026). Data fusion approach to layup characterisation of CFRP laminates using ECT, UT, and CT. Nondestructive Testing and Evaluation, 1–22. <https://doi.org/10.1080/10589759.2026.2703271>
2. H. Tewani, V. Scheerer, M. Owens, E. Cumbajin, C. D. Leon, MD R. Hussain, P. Kokkada Ravindranath, R. Van Lear, D. Jack, D. Wallace, P. Prabhakar, “Arxi-Textile Composites: Drapable Hybrid Woven Composites for Lightning Strike Protection”, Composites Part B: Engineering, March 12, 2026, 113549. <https://doi.org/10.1016/j.compositesb.2026.113549>

3. Baker, C.R., Zhu, N., Ravindranath, P.K. et al. Sustainable in-space manufacturing by upcycling metal space debris via a vertically integrated processing paradigm. *npj Adv. Manuf.* **2**, 29 (2025). <https://doi.org/10.1038/s44334-025-00042-z>
4. Batson, M., Eisenmann, D., Ravindranath, P.K. et al., “Development of a Generalized Fatigue Assessment Approach for Steel Castings”, *J Fail. Anal. and Preven.* **25**, 699-724 (2025). <https://doi.org/10.1007/s11668-025-02137-3>
5. Kokkada Ravindranath, P., Pulipati, DP, Emerson, N, Jack, DA, “A Comprehensive study of ultrasonic detection and damage quantification of barely visible impact damages in a carbon fiber reinforced composite materials”. *Polym Compos.* 2024; 1-14. Doi: 10.1002/pc.29318
6. D. A. Jack, P. K. Ravindranath, K. Matalgah and T. Fleck, "Quantification of Drill Hole Damages in CFRP Laminates Using High-Resolution Ultrasonic Testing," in *IEEE Open Journal of Instrumentation and Measurement*, doi: 10.1109/OJIM.2024.3487238
7. Van Lear, R. E., Ravindranath, P. K., Pulipati, D. P., Fleck, T. J., & Jack, D. A. (2024). “Bridging the Gap: Correlating Ultrasonically Quantified BVID with the Compressive Strength of CFRP Composites.” *Research in Nondestructive Evaluation*, 1–18 <https://doi.org/10.1080/09349847.2024.2395585>
8. Amin, A., Jack, D.A., Ravindranath, P.K. et al. “Nondestructive quantification of internal raster path for additively manufactured components via ultrasonic testing” *Sci Rep* **14**, 11416 (2024). <https://doi.org/10.1038/s41598-024-61416-5>
9. Rahul, K., Yudhanto, A., Ravindranath, P.K., Jack, D.A., “Progressive damage modeling in open hole composite laminates with ultrasound-informed drilling-induced delamination”, *Composites Part A: Applied Science and Manufacturing*, p 108262, May 2024, doi: 10.1016/j.compositesa.2024.108262
10. J. J. Lopez, M. B. Williams, P. K. Ravindranath, et al., “Friction stir additive manufacturing of regolith metal matrix composite,” *Advances in Space Research*, Apr. 2024, doi: 10.1016/j.asr.2024.04.034.
11. Matalgah, K., Ravindranath, P.K., Pulipati, D., Fleck, T.J, "Automated Quantification of Interlaminar Delaminations in Carbon-Fiber-Reinforced Polymers via High- Resolution Ultrasonic Testing”, *Polymers* 2023, **15**, 4691. doi.org/10.3390/polym15244691
12. Pulipati, DP, Kokkada Ravindranath, P., Jack, DA, “Automated bondline thickness quantification in adhesively joined composites and metals using ultrasound”. *Polym Compos.* 2023; 1-13. doi:10.1002/pc.27922
13. Kumar, V., Yeole, P., Majed, A., Park, C., Li, K., Naguib, M., Ravindranath, P. K., Jafta, C., Spencer, R., Compton, B., Vaidya, U., Kunc, V., “MXene Reinforced Thermosetting Composite for Lightning Strike Protection of Carbon Fiber Reinforced Polymer”. *Adv. Mater. Interfaces* 2021,**8**, 2100803
14. Ravindranath, P. K., S. Roy, V. Unnikrishnan, X. Wang, T. Xu, R. Baughman, H. Lu, “A Multiscale model to study the enhancement in the compressive strength of multi-Walled CNT sheet overwrapped carbon fiber composites”, *Composite Structures*, Volume 2019, Pg 170-178

15. X. Wang, P. Kokkada et al., “Modeling the compressive buckling strain as a function of nanocomposite interphase thickness in a carbon nanotube sheet wrapped carbon fiber composite”, Journal of Applied Mechanics, Volume 86 (2019)

Conference Papers and Presentations

1. Van Lear Rachel E., Kokkada Ravindranath, P., Jack. D. A., “Automation with AI: Improving the Quantification of Barely Visible Impact Damage in CFRP Laminates from Ultrasonic Testing Data”, 25th Automotive Composites Conference and Exhibition, 3-5 September 2025, Novi, MI
2. S M Mohaimenul Islam, Pruthul Kokkada Ravindranath, Easir Papon, “Molecular Dynamics Simulation of Photo-Induced Frontal Polymerization of Rapid Curing Resins for Agile Manufacturing of Composites”, Polymer for Advanced Technology (PAT) Symposium, July 2025, Tuscaloosa, Alabama
3. Van Lear Rachel E., Kokkada Ravindranath, P., Jack. D. A., “AI: Automated Quantification of BVID in CFRP Laminates from SE UT Scans Verified with XCT Results”, 33rd ASNT Research Symposium, 23-27 June 2025, Indianapolis, IN
4. N. Smurawa, D. Jack, P. Kokkada Ravindranath, A. Yudhanto. Characterization of the Quasi-Static and Dynamic Loading Influence on the Failure Behavior of Composite Foot- Ankle Prosthetics, URSA Scholars Week 2025, Category 'Individual Research', March 31 - April 4, 2025, Baylor University, Waco, Texas, USA. (Poster) - **Outstanding Poster Presentations Award**
5. Ravindranath, P.K., Yudhanto, A., Jack, D., Smith, D. E., “Post-Multiple-Impact damage characterization in CFRP laminates using X-Ray Micro Computed Tomography”, Paper Presentation at American Society of Composites, 39th Annual Technical Conference, San Diego, CA
6. Van Lear, Rachel E., Daniel P. Pulipati, Pruthul Kokkada Ravindranath, Trevor J. Fleck, and David A. Jack. "Agility and Accuracy: Phased Array vs Single-Element Ultrasonic Testing in the Characterization of Barely Visible Impact Damage in CFRP Laminates.", Paper Presentation at SPE-ACCE (2023)
7. D. Pulipati, B. Blandford, Ravindranath, P. K., D. Jack, “Adhesive Thickness Quantification of CFRP Laminates Using Ultrasound”, Paper Presentation at NDT in Aerospace (2021)
8. Ravindranath, P. K., S. Roy, V. Unnikrishnan, H. Lu, “Predicting the enhancement in the compressive strength of Carbon Fiber Reinforced Polymer Composites by overwrapping Multiwalled Carbon Nanotubes using a Multiscale Approach” Paper Presentation at SciTech Forum (2018)
9. Ravindranath, P. K., S. Roy, H. Lu, “A Molecular Dynamics Study of MWNT Sheet Scrolled Fiber Composite for Enhanced Interfacial Mechanical Properties”, Poster Presentation at IMECE (2017)
10. Ravindranath, P. K., S. Roy, H. Lu, “Carbon Nanotube Sheet Scrolled Fiber Composite for Enhanced Interfacial Mechanical Properties”, Paper Presentation at American Society of Composites (2016)

AWARDS, REVIEWS AND CERTIFICATIONS

RESEARCH GRANT

Co-Principal Investigator (Co-PI), Data Analysis and Reduction from Optical Coherence Tomography for the Analysis of Blood Vessel Pathways, BU

Awarding Agency - U.S. Army Medical Research Acquisition Activity (Awarded sum: \$100,000 2024-2025)

TECHNICAL REVIEW ACTIVITIES

- Session Organizer, Design, Modelling and Simulations of Composites Session Conference – SPE-ACCE -2023-2024
- Journal reviewer for Composite Structures, Advanced Materials Interfaces, IEEE

CERTIFICATION

Level-I & II, Advanced Computed Tomography (CT) Certificates

INSTRUCTOR OF RECORD

- MENG 3501X Materials Science: Materials Science is a multidisciplinary field requiring knowledge of chemistry, physics, and mechanics. In this first course we examine effect of chemistry on molecular structure and physical and mechanical properties of materials, and we examine methods of controlling those properties. Examples from the various engineering disciplines are used.
- AEM 201 Statics: This course explores the fundamentals of engineering statics, focusing on the analysis of force systems, including forces, couples, and their resultants. Students learn to construct and interpret free-body diagrams, solve equilibrium problems in both two and three dimensions, and analyze scenarios involving friction. The course also covers the determination of centroids, centers of gravity, and the effects of distributed forces (*Spring-'18, Fall-'18, Spring-'19, Summer-'19, Fall-'19, Spring-'20, Fall-'20*).
- AEM 249 Algorithm Development Implementation: This course introduces students to the fundamentals of programming, with an emphasis on syntax, data structures, algorithm development, and data visualization using modern technical computing languages. It is designed for beginners with no prior coding experience, while still offering meaningful challenges for students who already have some programming background (*Fall-'20*).

- AEM 250 Mechanics of Materials: This course covers the fundamental concepts of stress and strain, and examines how materials respond to various loading conditions, including axial, torsional, and bending forces. Topics include combined loading scenarios, analysis of statically indeterminate structures, thermal stresses, behavior of columns under load, and stress analysis in thin-walled pressure vessels (*Spring-'18, Summer-'18, Fall-'18, Spring-'19, Summer-'19, Fall-'19*).
- AEM 264 Dynamics: This course focuses on the kinematics and dynamics of particles and rigid bodies. It includes the application of Newton's laws of motion, as well as the principles of work and energy, and impulse and momentum, to analyze the motion and forces acting on mechanical systems (*Fall-'18, Summer-'19, Fall-'19, Spring-'20, Fall-'20*).
- AEM 311 Fluid Mechanics: This course introduces the principles of fluid mechanics, including fluid statics, and the application of conservation laws to fundamental fluid systems. Topics also include dimensional analysis, similitude, and the analysis of fluid flow in both open channels and closed conduits (*online course development, Spring-'19*).
- AEM 341 Aerospace Structures: This course focuses on the analysis of stressed-skin structures commonly used in aircraft, missiles, and space vehicles. Topics include unsymmetrical bending, as well as the bending and torsional behavior of multi-cell structural configurations (*Spring-'20, Summer-'20*).

COMMITTEE AND SUPERVISION

Thesis/Dissertation Committee

1. S M Mohaimenul Islam, PhD Dissertation (*Study of Photo-Induced Frontal Polymerization of Rapid Curing Resins for Agile Manufacturing of Composites*), The University of Alabama, Tuscaloosa, AL, December 2028
2. Rachel Van Lear, PhD Dissertation (*The Advancement of Ultrasonic Inspection of Barely Visible Impact Damage in Carbon Fiber Reinforced Polymer Laminates: Scanning Methods, Automated Analysis, and Correlated Residual Properties*), Baylor University, Waco, TX, May 2026
3. G Gokulakannan, PhD Thesis (*Experimental Investigation of Mechanical Properties and Machining Characteristics of Al-MMC In WEDM*), Visvesvaraya Technological University, Belgavi, Karnataka, India, June 2023

Supervised/Co-supervised Students

1. Khaled Matalgah, PhD in Mechanical Engineering, Baylor University, Waco, TX. 2021-present (Co-supervision with Dr. Trevor Fleck)

2. Kirtunia Rahul, PhD in Mechanical Engineering, Baylor University, Waco, TX. 2021-2025 (Co-supervision with Dr. David Jack)
3. Atik Amin, PhD in Mechanical Engineering, Baylor University, Waco, TX. 2021-2025 (Co-supervision with Dr. David Jack and Dr. Trevor Fleck)
4. Matthew Batson, MS in Mechanical Engineering, Baylor University, Waco, TX. 2022-2024 (Co-supervision with Dr. Brian Jordon and Dr. Paul Allison)
5. Noelle Smurawa, BS in Bioengineering (Pre-Med), Baylor University, USA, 2024-2025 (Co-supervision with Dr. David Jack)