Abinash Patro

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https://abinashpatro.github.io/

SKILLS

Specialties: Finite Element Analysis (Static, Dynamic, Structural, Thermal, Multiphysics, and Electromechanical), Discrete Element Method (DEM), Fatigue and Durability Analysis, Material Modeling (Adhesives, Polymers, Composites, Glass), Impact/Drop Simulation, Nonlinear Dynamics, Root-Cause & Failure Analysis, Cohesive Zone Modeling, Multiphysics Coupling, Reduced Order Modeling, Machine Learning–assisted predictive modeling

Software: LS-DYNA(UMAT), ANSYS (Mechanical, Rocky, Multiphysics), Abaqus (UMAT, VUMAT), COMSOL, HyperMesh, Siemens Simcenter, OptiStruct, 3DEXPERIENCE, NX, SolidWorks

Programming Languages: Parallel Programming, C++, Python (automation, optimization, HPC pipelines), FORTRAN, Matlab

WORK EXPERIENCE

Procter & Gamble Digital Accelerator — Cincinnati, OH
Graduate Research Assistant — Aug 2021 – Present

- Designed and executed large-scale DEM/FEA simulations for manufacturing and packaging processes, driving improved system-level efficiency and reducing defect rates.
- Generated FEA models for structural and thermal-mechanical analysis of non-woven fabrics under compression bonding, characterizing material behavior to optimize integration and uncover root causes of mechanical issues.
- Developed custom user material models (UMATs) and nonlinear FEA methods to simulate structural–thermal–dynamic behavior in fabrics and polymers.
- Developed HPC-enabled Python frameworks for automated modeling, batch job submission, and postprocessing, reducing simulation time by 40% and supporting physics-informed modeling library for product development.

University of Cincinnati — Cincinnati, OH
Doctoral Researcher — Aug 2019 – Present

- Developed a Bilinear Traction-Separation Law model for fiber-reinforced (FRF) composites under variable fatigue loading, enhancing fatigue failure prediction with 10x error reduction over traditional models.
- Developed an elastic-plastic traction-separation law using fatigue crack growth propagation (FCGR) law for ductile adhesive joints, reducing low-cycle fatigue prediction error from 67% to ~1% across three models.
- Created a method to introduce artificial compliance in cohesive elements, eliminating upto 90% of spurious cohesive element failure during crack propagation in high-speed impact simulations.
- Drove root cause efforts and designed experiments to resolve mesh regularization challenges in composite materials, developing energy-based scaling factors for quasi-static and dynamic scenarios.

Siemens Simulation Center — Cincinnati, OH
Graduate Research Assistant — Aug 2018 – July 2021

- Generated multiphysics FEA models for thermal-mechanical analysis of solder joints in electronic microchip, optimizing designs through material characterization, testing, and root cause analysis to extend life cycles by ~2x.
- Performed structural, dynamic, and vibro-acoustic analysis on speaker systems (consumer electronics modules), integrating models into larger system assemblies and brainstorming data-driven solutions with cross-functional teams.
- Communicated analysis results to management and peers, while developing 12 training modules for Siemens Simcenter FEA Suites covering solid mechanics, multiphysics, and NVH to support consistent early validation processes.

University of Cincinnati — Cincinnati, OH
Graduate Researcher — Aug 2016 – July 2019

- Investigated mesh regularization effects in isotropic materials via non-linear FEA for quasi-static and dynamic simulations, developing strain energy and crack propagation models to reduce errors from 88% to under 5% in impact and metal-forming tests.
- Applied structural and thermal-mechanical modeling across programs, generating specifications and collaborating on failure analysis to resolve complex mechanical problems.

EDUCATION

University of Cincinnati — Cincinnati, OH
Ph.D. Candidate in Mechanical Engineering — December 2025 (Expected)

University of Cincinnati — Cincinnati, OH
M.S. in Mechanical Engineering — July 2019

Central Institute of Petrochemicals Engineering and Technology — Bhubaneswar, India
B.S. in Manufacturing Engineering — MAY 2015

HONOURS And AWARDS

- Customized 3D Printable Face Mask through face scan via phone camera was featured as the Spotlight in Multiple News Media groups as well as headlined Journal of Engineering Education, 2021.
- Research Mentor for Graduate Student Award. University of Cincinnati, Cincinnati, OH, 2021.
- University Graduate Scholarship (UGS)/ Graduate Incentive Award (GIA). University of Cincinnati, Cincinnati, OH, 2016-2024.
- Gold Medal, Poster Presentation, International Conference on "Advancements in Polymeric Materials" (APM), Bhubaneswar, India, 2014

PUBLICATIONS

P1. **Patro, A.**, & Tabiei, A. (2024). Fatigue Failure of Adhesive Joints in Fiber-Reinforced Composite Material Under Step/Variable Amplitude Loading—A Critical Literature Review. Journal of Composites Science, 8(11), 477. https://doi.org/10.3390/jcs8110477.

P2. **Patro, A.**, & Tabiei, A. (2025). A Novel Bilinear Traction-Separation Law for Fatigue Damage Accumulation of Adhesive Joints in Fiber-Reinforced Composite Material Under Step/Variable-Amplitude Loading. Journal of Composites Science, 9(3), 112. https://doi.org/10.3390/jcs9030112

P3. **Patro, A.**, & Tabiei, A. (2025). Elastic-Plastic Bilinear Traction Separation Law Through Fatigue Crack Growth Rate (FCGR) for Adhesive Joint in Low Cycle Fatigue. Composites Part B: Engineering (Under Review)

P4. **Patro, A.**, & Tabiei, A. (2025). Mesh regularization through predictive scaling factors based on material model parameter estimation for debris impact tests on a titanium alloy (TI-6Al-4V) plate. Journal of Dynamic Behavior of Material (Under Review)

P5. **Patro**, A., & Tabiei, A. (2025). Effect of Ply Orientation and Triaxiality on Mesh Regularization for Composite Material. Journal of Composites Science (Under Review)