Mehdi Morovati

Education

- Doctor of Philosophy, Mechanical Engineering, UNC Charlotte, Charlotte, NC, December 2024 (GPA: 4.0)
- Master of Science, Mechanical Engineering (Dynamics and Control), UNC Charlotte, Charlotte, NC, May 2023 (GPA: 4.0)
- Master of Science, Automotive Engineering, Iran University of Science and Technology (IUST), Tehran, Iran (GPA: 3.7)

Teaching & Academic Experience

Instructor of Record – Mechanical Engineering, UNC Charlotte, 2020 – 2024

- Independently taught Dynamic Systems I (7 semesters, 50+ students each).
- Developed syllabi, projects, and ABET-aligned assessments using Canvas & Blackboard.
- Supervised undergraduate projects; mentored students in dynamics, vibrations, and system modeling.
- Collaborated on curriculum design to strengthen experiential instruction.

Graduate Teaching Assistant – Mechanical Engineering, UNC Charlotte, 2020 – 2024

- Led lab sessions in Thermal Fluid and HVAC systems, Introduction to Control Systems.
- Provided individualized academic support and mentoring, contributing to student retention.
- Supported grading, advising, and student progression processes.

High School Instructor/Teacher – Automotive & Mechanical Systems, Tehran, Iran, 2013 – 2019

- Taught hands-on courses in engine assembly, troubleshooting, and automotive systems.
- Counseled students on academic goals, career pathways, and skills development.
- Maintained a supportive classroom environment fostering student confidence and achievement.
- Coordinated with parents and administrators to monitor and support student progress.

Testing Facilitator – Central Piedmont Community College, Charlotte, NC, March 2025 – Present

- Administer and monitor exams for students, faculty, and community members, ensuring compliance with institutional testing policies.
- Prepare testing facilities, maintain equipment, and ensure availability of required materials and handouts.
- Enforce testing regulations, monitor activities, and create a secure and supportive environment.
- Maintain accurate testing records, enter scores into databases, and generate weekly reports for supervisors.
- Provide guidance and support to ESL and ABE students through pre-test presentations, demonstrating ability to communicate with diverse learners.
- Monitor part-time staff, track inventory, and recommend improvements in testing equipment and processes.

Research Experience

Statistical mechanics and statistical thermodynamic modeling of crack in materials especially in rocks, PhD Thesis, Advisor: Dr. Russell Keanini, 2020 – 2024, University of North Carolina at Charlotte, NC

- Developed thermodynamic models to predict material performance under varying thermal stress.
- Designed and optimized systems for enhanced reliability and durability, focusing on structural components.
- Developed an analytical model that accounts for the required energy to open a single crack in materials.
- Coordinated efforts to ensure alignment across teams, driving innovation in system reliability and performance.
- Conducted experiments and reliability testing to validate designs, contributing to high-impact publications and industry-relevant insights.

Dynamics and Control project – Segway two-wheeled autonomous vehicle, Capstone Course, Advisor: Dr. Stuart Smith, Dec 2022 – May 2023, University of North Carolina at Charlotte, NC

- Improved the stability and functionality of a Segway-style two-wheeled autonomous vehicle by redesigning structural components such as rewiring the entire harness and increased the motor driver output.
- Implemented wireless communication upgrade from Wi-Fi to Bluetooth using LabView and optimized the mass center to increase the autonomous vehicle stability.

- Conducted experimental tests and system optimization using MATLAB and LabView.
- Incorporated technical requirements into design, focusing on form, fit, function, and lifecycle performance.
- Refined the PID controller to improve its performance using LabView.

Automotive engineering Lab, Iran University of Science and Technology, Master Dissertation, Tehran, Iran, Sep 2010 – Dec 2012

- Designed a Torsional Vibrational Damper (TVD) parameters for a specific crankshaft and engine.
- Designed CAD model of both crankshaft and TVD using CATIA and SOLIDWORKS.
- Simulated different vibrational mode of TVD and crankshaft and calculated their bending stress using ABAQUS.
- Developed a comprehensive mathematical formula that models nonlinear vibration of both crankshaft and TVD.
- Developed a semi-analytical method for solving the comprehensive generated nonlinear vibration formula and validated results by solving the generated formula numerically using generated codes on MATLAB.

Mechanical Engineer Intern, Iran University of Science and Technology, Tehran, Iran, May 2010 – Aug 2012

- Modeled and analyzed suspension systems using Simulink to evaluate performance under dynamic conditions.
- Conducted mechanical testing and validated design criteria against engineering standards.
- Resolved manufacturing challenges by recommending design improvements, focusing on producibility and cost.

Skills & Competencies

- Teaching & Curriculum Development: Dynamics, Vibrations, Control, Thermal Systems, Experiential Learning.
- Technical Tools: MATLAB, Simulink, SolidWorks, CATIA, ABAQUS, LabView.
- Instructional Strengths: Student advising, ABET assessment, inclusive learning environments.
- Leadership & Service: Journal editor, ASME presenter.

Honors and Awards

- Editor, *Journal of VibroEngineering*, 2022–Present — reviewed 13+ technical manuscripts.
- Presenter, ASME International Mechanical Engineering Congress & Exposition, 2024.
- Published multiple peer-reviewed articles in applied mechanics and engineering educational journals.

Selected Publications

- Rasmussen, M., M. C. Eppes, A. Mushkin, P. G. Meredith, T. M. Mitchell, R. Keanini, J. Aldred et al. "Field observations of decreasing rock fracturing rates over geologic time." *Journal of Geophysical Research: Earth Surface* 131, no. 1 (2026): e2025JF008288.
- Morovati M. Grain-Scale Subcritical Fracture in Rock: Statistical Mechanical Modeling and Discovery of Two Physically Distinct Subcritical Fracture Modes (Doctoral dissertation, The University of North Carolina at Charlotte).
- Morovati. Mehdi, Eppes. Martha C, Rinehart. Alex, Fichera. Marissa, Rasmussen. Monica, Meredith. Philip, Nara. Yoshitaka, Dahlquist. Maxwell, and Keanini. Russell. "Investigating Thermal Microcracking in Rocks: Insights Into Equilibrium Statistical and Simultaneous Fracture Mechanisms." In ASME International Mechanical Engineering Congress and Exposition. American Society of Mechanical Engineers, 2024.
- Rinehart A, Dewers T, Dewers T, Fichera M, Fichera M, Rasmussen M, Rasmussen M, Morovati M, Morovati M, Keanini R, Keanini R. Role of Progressive Rock Fatigue and Failure in Fluid Flow Self-Focusing and Associated Weathering in the Critical Zone. InGeological Society of America Abstracts 2024 (Vol. 56, p. 405215).
- Keanini RG, Dahlberg J, Brown P, Morovati M, Moradi H, Jacobs D, Tkacik PT. Stochastic estimation of Green's functions with application to diffusion and advection-diffusion-reaction problems. Applied Mathematics and Computation. 2023 Nov 15;457:128186.
- Eppes MC, Aldred J, Berberich S, Dahlquist MP, Evans SG, Keanini R, Moser F, Morovati M, Porson S, Rasmussen M, Rinehart A. Standardized field methods for fracture-focused surface processes research. Earth Surface Dynamics Discussions. 2022 Dec 12:1-41.
- Eppes MC, Berberich S, Dahlquist M, Keanini R, Morovati M, Moser F, Porson S, Rasmussen M, Shaanan U. Standardized Field Methods for the Characterization of Fractures in Subaerially Exposed Natural Rock Studied in the Context of Surface Processes. InGeological Society of America Abstracts 2022 (Vol. 54, p. 376073).

- Izadi V, Morovati M, Ranjbaran G, Homayounmajd S. An Empirical Study of Nail Fungus Classification Using Deep and Traditional Machine Learning Methods. Journal of Bioengineering Research. 2021 Sep 1;3(3):16-23.
- Adami A, Morovati M, Ahani H. DESIGN A GAIN SCHEDULED FUZZY CONTROLLER FOR DISTRIBUTED PARABOLIC SOLAR COLLECTORS. Annals of the Faculty of Engineering Hunedoara-International Journal of Engineering. 2021 Feb 1(1).
- Adnani AA, Dokami A, Morovati M. Fault detection in high speed helical gears considering signal processing method in real simulation. Latin American Journal of Solids and Structures. 2016 Nov;13(11):2113-40.
- Adnani AA, Talebitooti R, Morovati M. Three dimensional wave propagation in axially loaded pressurized FG cylindrical shells using Frobenius power series and Rayleigh-Ritz methods. Journal of Vibroengineering. 2015 May 15;17(3):1424-35.
- Talebitooti RO, Morovati ME. Study on TVD parameters sensitivity of a crankshaft using multiple scale and state space method considering quadratic and cubic non-linearities. Latin American Journal of Solids and Structures. 2014;11(14):2672-95.