

Daniel Cho

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SUMMARY

Mechanical engineering researcher specializing in structural dynamics, noise and vibration (N&V) testing, and vibro-acoustic signal processing.

Experience includes structural vibration testing, experimental modal analysis, frequency response function (FRF) extraction, root cause analysis, and test-simulation correlation across foam material characterization, guitar acoustics research, and embedded audio hardware. Hands-on with Laser Doppler Vibrometry (LDV), DAQ system design, and MATLAB/Python data analysis. Music Technology minor bridges engineering rigor with audio production.

EDUCATION

B.S./M.S. Mechanical Engineering, Music Minor | Worcester Polytechnic Institute | Aug 2023-May 2027

Overall GPA: 3.79/4.00 | Relevant Coursework: Intro to Finite Element Method, Analysis of Deterministic Signals and Systems, Modeling & Analysis of Mechatronic Systems, Control of Nonlinear Dynamical Systems, Stress Analysis

EXPERIENCE

LADSS Fellow | *Los Alamos National Laboratory, Los Alamos, NM*

Jun 2026-Aug 2026

- Characterized nonlinear foam dynamic behavior under impact excitation using stereo Digital Image Correlation (Vic-3D, Photron PFV4) for full-field strain measurement, diagnosing and resolving camera-sync calibration drift to bring residual scores back under target threshold.
- Designed an end-to-end DAQ and hardware trigger chain (NI PXIe, custom Python/NI-DAQmx scripts) to synchronously acquire load-cell and accelerometer data and trigger high-speed DIC cameras on hammer impact, eliminating analog trigger jitter.
- Built MATLAB/Python signal-processing pipelines converting raw compression test data into stress-strain curves with compliance correction, generating datasets used to calibrate a HYPERFOAM material model in Abaqus and validate test-simulation correlation for finite-element modeling.

Researcher | *Vibration & Acoustics Research Group, Worcester, MA*

May 2025-Jul 2025

- Led structural vibration testing and experimental modal analysis on guitar bodies: configured impact hammer, modal shaker, accelerometers, and Laser Doppler Vibrometer (LDV) to characterize structural vibrational response across body shapes, bracing, and tonewoods.
- Extracted natural frequencies, damping ratios, and mode shapes from frequency response functions (FRF) using a Crystal Instruments DAQ and MATLAB (pwelch): vibro-acoustic techniques directly applicable to sound quality optimization and speaker/enclosure characterization.

Undergraduate Research Assistant | *Saint-Gobain Industry Collaboration, Worcester, MA*

Dec 2024-May 2025

- Characterized vibration damping in polymer foams (Norseal, silicone, polyurethane) for Saint-Gobain's railway vibration-isolation product line via shaker testing and FFT analysis, supporting root cause identification of damping performance gaps.
- Processed vibration data with a Crystal Instruments DAQ and MATLAB signal processing (pwelch) to identify modal frequencies and damping characteristics across multiple competitor materials.

PROJECTS

Project Leader | *Air Piano – Senior Capstone Project, Worcester, MA*

Aug 2025-May 2026

- Led mechanical and PCB design of a gesture-controlled MIDI instrument: engineered a parametric enclosure in Onshape across multiple prototype revisions and authored complete KiCad schematics covering analog (SPI), digital (GPIO), and power-distribution networks for a Raspberry Pi Pico W, MCP3008 ADC, and USB-C MIDI interface.
- Served as systems integrator across mechanical, electrical, firmware, and computer-vision domains, developing real-time motion-to-MIDI mapping firmware with MediaPipe hand tracking (~14 FPS) and low-latency USB MIDI signal generation for responsive, latency-sensitive embedded audio hardware.
- Resolved 12+ hardware/firmware failures (SPI timing, MIDI routing, vision-pipeline bottlenecks) through iterative, DFM-driven enclosure revisions and instrumented debugging.

SKILLS AND INTERESTS

- **Acoustic & Signal Processing:** Structural Dynamics, Experimental Modal Analysis, Frequency Response Functions (FRF), FFT, MATLAB (pwelch), Signal Processing, Test-Simulation Correlation, Digital Image Correlation (DIC/Vic-3D)
- **Test & Instrumentation:** Structural Vibration Testing, Noise and Vibration (N&V) Testing, Root Cause Analysis, Impact Hammer, Modal Shakers, Accelerometers, Strain Gauges, Laser Doppler Vibrometer (LDV), Crystal Instruments DAQ, NI PXIe/NI-DAQmx
- **CAD & Simulation:** Onshape, SolidWorks, KiCad, ANSYS, Abaqus (HYPERFOAM), Mastercam
- **Programming & Tools:** Python, MATLAB, LoggerPro, Microsoft Office, Laser Cutter, Mill, Lathe, Soldering, FDM 3D Printing

LEADERSHIP

Senator | Student Government Association of WPI

Jan 2025-Present

Philanthropy Chair | Tau Kappa Epsilon / IFC of WPI

Feb 2024-Present

Performance Manager | Pan Asian Association of WPI

Sep 2024-Present