

# SHASHWAT MAHARJAN, E.I.T.

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**CliftonStrengths:**    Developer | Includer | Positivity | Harmony | Analytical

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## PROFILE SUMMARY

Shashwat is a PhD candidate at Villanova University, specializing in the application of machine learning to design biologically inspired composite materials. With a strong background in machine learning and structural monitoring, he has authored multiple publications in esteemed peer-reviewed journals and conferences. His academic excellence has been recognized through several prestigious awards, including the Undergraduate President’s Award for Research at Central Michigan University and the Outstanding Undergraduate Student of the Year 2022 by the Engineering Society of Detroit. Additionally, Shashwat was selected for a Department of Energy research internship at Geologica Geothermal Group, where he helped pioneer a machine learning technique to estimate static formation temperature within sub-surface geothermal reservoirs.

## EDUCATION

<b>PhD in Mechanical Engineering</b>	Villanova University	GPA: 3.9	2024 - 2028
<b>Masters of Engineering</b>	Central Michigan University	GPA: 3.8	2022 - 2024
<b>Bachelors of Mechanical Engineering</b>	Central Michigan University	GPA: 3.8	2018 - 2022

## SKILLS

**CAD/Analysis:** ABAQUS, ANSYS, SolidWorks, Fusion360, NX Siemens, and Volsung.

**Software:** Python, Julia, MATLAB, C, Linux, TensorFlow, PyTorch, and LabView.

**Courses Taken:** Advanced Engineering Analysis, Machine Learning, Finite Element Analysis, Biomimicry.

## PROFESSIONAL EXPERIENCE

**Research Assistant**  
Villanova University

August 2024 - Present  
*Villanova, PA*

- Supported interdisciplinary research in computational modeling and advanced biomaterials aimed at improving healthcare and structural applications.
- Applied ANSYS, Abaqus, Python, MATLAB, and Julia to develop models, streamline workflows, and integrate machine learning (ML) into research methods.
- Delivered scalable insights that improved prediction accuracy, reduced experimentation time, and guided innovations with potential impact in injury prevention and bio-inspired material design.

**Geothermal Research Intern**  
Geologica Geothermal Group

July 2023 - May 2024  
*San Diego, CA*

- Optimized Volsung automation with Python, reducing processing time by 70% and enabling faster decision-making for geothermal field assessments.
- Built TensorFlow ML models for static formation temperature estimation, boosting accuracy by 35% to improve drilling safety and lower exploration costs.
- Modeled a generalized geothermal well to simulate subsurface heat transfer and fluid flow, creating a scalable framework that accelerates geothermal project evaluation across diverse sites.

**Research Assistant**  
Central Michigan University

August 2020 - May 2024  
*Mount Pleasant, MI*

- Applied Python ML techniques to reduce simulation runtimes from days to 1 second, enabling real-time structural analysis and freeing researchers to test more designs.
- Automated workflows in ANSYS, increasing throughput by 50% and allowing larger, more complex structural models to be tested with the same resources.
- Built MATLAB FE abstractions for seismic/structural modeling, cutting design-test cycles by 30% and helping researchers evaluate earthquake resilience more efficiently.

- Led a team of three to improve employee workflow and facilitate promotions in a startup.
- Focused on addressing the developer code activity logging issue by coordinating with diverse stakeholders.
- Effectively collaborated with a global team across to perform root cause analysis.

- Automated data analysis by developing MATLAB and Python scripts, reducing manual processing time by 80%.
- Applied advanced signal processing on high-resolution sensor data, doubling data throughput and accuracy.
- Achieved 1ms verification accuracy for neurophysiological results, boosting experimental reliability by 25%.

## CONFERENCE PRESENTATIONS

Poster at American Society for Bone and Mineral Research (ASBMR) 2025. [Poster Link](#).

Poster at Society of Biomaterials (SFB) Conference 2025. [Poster Link](#).

Short Paper at Engineering Mechanics Institute (EMI) Conference 2024. [Poster Link](#).

Poster at International Mechanical Engineering Congress & Exposition (IMECE) 2022. [Poster Link](#).

Short Paper at Engineering Mechanics Institute (EMI) Conference 2022. [Paper Link](#).

## PUBLICATIONS

Kim, B., **Maharjan, S.**, Guidio, B., Thomas, J., Pranto, F. M., Schaal, C., & Jeong, C. (2026). Elastodynamic imaging of voids in a PML-truncated layered solid using a deep convolutional neural network. *Engineering Geology*, 108545. <https://doi.org/10.1016/j.enggeo.2026.108545>. [Journal Paper Link](#).

Kim, B., **Maharjan, S.**, Pranto, F. M., Guidio, B., Schaal, C., & Jeong, C. (2024). Convolutional neural network and level-set spectral element method for ultrasonic imaging of delamination cavities in an anisotropic composite structure. *Ultrasonics*, 107254. <https://doi.org/10.1016/j.ultras.2024.107254>. [Journal Paper Link](#).

**Maharjan, S.**, Guidio, B., & Jeong, C. (2024). Convolutional neural network for identifying effective seismic force at a DRM layer for rapid reconstruction of SH ground motions. *Earthquake Engineering & Structural Dynamics*, 53(2), 894-923. <https://doi.org/10.1002/eqe.4049>. [Journal Paper Link](#).

Pranto, F. M., **Maharjan, S.**, & Jeong, C. (2023). Level-Set and Learn: Convolutional Neural Network for Classification of Elements to Identify an Arbitrary Number of Voids in a 2D Solid Using Elastic Waves. *Journal of Engineering Mechanics*, 149(6), 04023035. <https://doi.org/10.1061/jenmdt.emeng-6840>. [Journal Paper Link](#).

**Maharjan, S.**, Guidio, B., Fathi, A., & Jeong, C. (2022). Deep and Convolutional Neural Networks for Identifying Vertically Propagating Incoming Seismic Wave Motion into a Heterogeneous, Damped Soil Column. *Soil Dynamics and Earthquake Engineering*, 162, 107510. <https://doi.org/10.1016/j.soildyn.2022.107510>. [Journal Paper Link](#).

## PROJECTS

**Accelerating SH Ground Motion Reconstruction via Convolutional Neural Networks for Evaluating Domain Reduction Method Layer Seismic Force Efficacy** June 2023

Developed a Convolutional Neural Network (CNN)-based method to accurately detect seismic forces in a 2D area with sparse ground motion data and shear waves, showing faster processing than traditional PDE-based methods in numerical experiments, confirming its effectiveness in identifying forces at a DRM layer.

**Convolutional Neural Network for the identification of structural defects in a bridge** December 2022

Applied CNN to identify the material profile of a bridge structure using an unknown moving wave source (e.g. a vehicle) and its measured vibration displacement data. Reduced the computational prediction time from 10 hours to 1 second using Convolutional Neural Network compared to Genetic Algorithm with an average error of less than 5%.

### **Convolutional Neural Network for Void Detection in Surfaces**

November 2022

Implemented CNN architecture to detect random number of voids with 90% accuracy within 1 second. Traditional optimization methods are limited to one-dimensional settings or take several hours for inaccurate prediction. Existing Machine Learning approaches only predict the presence of a void and cannot reconstruct the shape of the void.

### **Developmental stimulation of pyramidal neurons during a defined temporal window alters single unit activity in adult mice**

August 2022

Performed extensive data filtering, analysis, and feature extraction on the electrophysiology recordings recorded after optogenetic stimulation of the pyramidal neurons of the barrel cortex in adult mice. Verified the result of [Medendorp et al. \(2021\)](#) paper with highly temporal recordings with a precision of 1 millisecond.

### **Prototype for Foreign Metal Detection in Trees**

May 2022

Prototyped a metal-detector to prevent foreign-metallic objects destroying Bandit Industries \$500,000 machines.

### **Machine Learning for Seismic-Wave Reconstruction**

April 2022

Designed Deep and Convolutional Neural Network architectures to reconstruct the incoming seismic-wave motion with less than 3% error in under 1 second based on measurements made at the ground surface. Traditional optimization methods take several hours for seismic-wave reconstruction with higher error percentages.

## **CERTIFICATIONS**

- Passed the Fundamentals of Engineering (FE) Exam issued by the Michigan Board of PE.
- FANUC Handling Tool Operation and Programming Software in Robotics Control from FANUC America.

## **AWARDS AND HONORS**

- **\$110,000 grant** by the **US Department of Energy** for geothermal research internship at Geologica.
- Exclusive **Google Computer Science Research Mentorship Program**.
- **Outstanding Undergraduate Student of the Year 2022** by the Engineering Society of Detroit.
- **Most Enthusiastic Presenter** at IMECE-22 Conference by the **American Society of Mechanical Engineers**.
- **National Science Foundation Student Poster Competition Travel Grant** for the IMECE-22.
- **Undergraduate President's Award** for research excellence at Central Michigan University.
- **Richtmeyer-Foust Award** for outstanding Mathematics senior at Central Michigan University.
- **Best Undergraduate Poster** at the IMECE-21 Conference by the National Science Foundation.
- **Undergraduate Summer Scholars 2021** to pursue machine learning research in structural health monitoring.
- **Runner Up** in the **Integration Bee 2019** hosted by the American Mathematical Society.
- **Winner** of the **Integration Bee 2018** hosted by the American Mathematical Society.
- **World Prestige Award** for a full scholarship at Central Michigan University, covering tuition, housing, and food for four years.

## **IN THE PRESS**

[Graduate student receives internship from National Science Foundation](#)

January 2024

Central Michigan University - Office of Research and Graduate Studies

[Passion, Challenge, and Inspiration: How the First Geothermal INTERN Cohort Came to Geothermal](#)

October 2023

U.S. Department of Energy - Geothermal Technologies Office

[National Science Foundation INTERN Program](#)

September 2023

U.S. Department of Energy - Geothermal Technologies Office

[Hackathon: Reimagine sparks ideas for the future](#)

March 2023

The Morning Sun

[Undergraduate Summer Scholars Award](#)

February 2023

## REFERENCES

**David Cereceda, Ph.D.**

Assistant Professor

Villanova University

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Academic Research Adviser

**Chanseok Jeong, Ph.D.**

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Central Michigan University

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Academic Research Adviser

**Bruno Guidio, Ph.D.**

Assistant Professor

Catholic University of America

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Research Adviser