Joshua D. McDuffie

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Graduate Student, Department of Civil & Environmental Engineering.

Vanderbilt University

Education

Ph.D. Civil Engineering, Vanderbilt University, **Anticipated Graduation in Spring 2025**

M.S. in Civil Engineering, Vanderbilt University, 2020 – 2023, GPA: 3.5

B.S. in Civil Engineering, North Carolina A&T State University, 2016 – 2020, GPA: 3.6

Honors and Awards

Vice President, Organization for Black Graduate and Professional Students, 2022- Present

President, Vanderbilt Civil and Environmental Engineering Grad Council, 2022- Present

Peter J. Hoadley Fellowship, 2022 – Present

AI Ethics Scholar, 2022

Bill Anderson Fund Fellow, 2021 - Present

Alpha Delta Epsilon Inductee (Civil Engineering Honor Society), 2019

Thurgood Marshall College Fund Leadership Institute, 2019

Golden Key International Honor Society Member, 2018

Recognized for Undergraduate Research Excellence (NC A&T), 2017

Chancellor's List, Dean's list (NC A&T), 2016 – 2020

Memberships

American Society for Civil Engineers (ASCE),

American Society for Engineering Education (ASEE)

Society for Risk Analysis (SRA)

International Association of Emergency Managers (IAEM)

William Averette Anderson Fund (BAF)

Research Experience

Graduate Research Assistant, Vanderbilt University (8/20 - Pres.)

PI: Dr. Janey Camp

Several projects have centered around improving natural hazard risk literacy and organizational resilience in local communities through educational & procedural interventions. I was tasked with reviewing literature, developing survey instruments, and making recommendations for ways to address these tasks. I analyzed the results of surveys & validated assessments to determine the efficacy of the interventions. A risk education curriculum that targeted improvements in community resilience to natural hazards required the development of training modules & teacher guides. I worked with organizations like Tennessee DOT conducting interviews and analyzing the data before summarizing results into several reports. Other projects have required use of descriptive statistical methods, GIS modelling, and programming for data analysis.

Undergraduate Research Assistant, North Carolina A&T State University (08/17 - 01/20)

PI: Dr. Taher Abu-Lebdeh

The goal of the project is to characterize metal powders used for additive manufacturing for spreading and flow modelling on the overall density of a powder sample. Research was motivated by a need to understand the effect of particles size distribution and packing density on the formation of balling defects during laser printing. In addition to testing, I researched and presented on the effects of inter-particle forces on powder packing.

Research Assistant, Leadership Alliance Summer Research Early Identification Program (SR-EIP), VU–EDGE Program at Vanderbilt University (06/19 – 08/19)

PI: Dr. Hiba Baroud

The goal of this research is to analyze and interpret statistical data to examine trends in federal disaster spending and determine the effectiveness and equity. I was able to learn to code in R and produce data visualizations that allowed for informed observations to be made for potential stakeholders regarding mitigation spending inefficiencies.

Research Assistant, Leadership Alliance Summer Research Early Identification Program (SR-EIP), Summer Multicultural Access to Research Training (SMART) at the University of Colorado Boulder (06/18 – 08/18)

PI: Dr. Shideh Dashti

The goal of this research is to investigate the mechanisms associated with the liquefaction mitigation technique known as gravel columns. This will provide insight into the influence of the ground improvement technique on key engineering demand parameters of interest in design. It will also allow for the calibration of numerical models and advance understanding in the geotechnical field of research. I plotted data and examined for trends and differences in seismic responses of the soil with the isolated mechanisms. I also helped to set up experiments in the centrifuge laboratory at UC Boulder to simulate the effects of liquefaction on the model.

Research Assistant, Leadership Alliance Summer Research Early Identification Program (SR-EIP), First Year Research Experience (FYRE) Program at Brown University (06/17 - 08/17)

PI: Dr. Karen Fischer

The goal of this research is to understand the crystal alignment (through the fast polarization directions) in the subduction zone around the Aleutian Islands in Alaska and how it changes spatially across the region. Specifically, to this region, determining if the deformation and crystal alignment are typical or atypical of other subduction zones is one of the aims as well. Using the IRIS Earthscope Database and the SplitLab program in MatLab, I independently filtered through earthquake signals in areas around the Aleutian Island subduction zone, looking for high quality signals that could be used as splitting measurements and interpreted the quality of measurements using eigenvectors. Following this, I mapped the alignment of olivine crystals and determined the direction of mantle flow over the plate boundary.

Oral Presentations

McDuffie J. (2023, August). *Adapting Disaster Risk Education for Community Resilience at All Levels*. Presented at the Natural Hazards Center "Making Mitigation Work" Webinar Series (Research with Impact: Improving Mitigation Practice and Increasing Community Resilience) – (Virtual).

McDuffie J. (2023, July). *Adapting Disaster Risk Education for Community Resilience at All Levels*. Presented at the Natural Hazards Workshop – Broomfield, Colorado.

McDuffie J. (2022, August). *Risk Education for All: Methods and Applications for Developing a Risk Literate Society*. Presented at the Society for Risk Analysis Webinar Series – (Virtual).

McDuffie J. (2021, July). *Risk Education for Future Career Preparation*. Presented at the TN CTE Educators Institute – (Virtual).

McDuffie J., Perrucci D.V., Baroud H., (2019, July). *Evaluating the Impact of Flood Mitigation on Community Resilience: A Data Driven Analysis of Post Disaster Housing Assistance*. Presented at the Leadership Alliance National Symposium – Hartford Convention Center, Connecticut.

McDuffie J., Tiznado J.C., Dashti S., (2018, July). *Experimental study on the seismic response of embankments on liquefiable soils improved with stone columns*. Presented at the Leadership Alliance National Symposium – Hartford Convention Center, Connecticut.

McDuffie J., Fischer K., (2017, July). *Assessing Mantle Deformation in the Aleutian Island Subduction Zone Using Shear Wave Splitting Techniques*. Presented at the Leadership Alliance National Symposium – Hartford Convention Center, Connecticut.

Poster Presentation

McDuffie J. (2023, December). *Disaster Risk Literacy: An Educational Approach to build Disaster Resilient Communities*. Presented at the Society for Risk Analysis Annual Meeting – (Washington, DC).

McDuffie J. (2022, December). *Risk Education for All: Methods and Applications for Developing a Risk Literate Society*. Presented at the Society for Risk Analysis Annual Meeting – (Tampa, FL).

McDuffie J., Tiznado J.C., Dashti S., (2018, November). Experimental study on the seismic response of embankments on liquefiable soils improved with stone columns. Presented at the Undergraduate Research Symposium – Alumni Events Center, North Carolina A&T State University.

McDuffie J., Tiznado J.C., Dashti S., (2018, November). Experimental study on the seismic response of embankments on liquefiable soils improved with stone columns. Presented at the Undergraduate Research Symposium – Alumni Events Center, North Carolina A&T State University.

McDuffie J., Tiznado J.C., Dashti S., (2018, August). Experimental study on the seismic response of embankments on liquefiable soils improved with stone columns. Presented at the SMART Symposium – University Memorial Center, CU Boulder.

McDuffie J., Fischer K., (2017, October). Assessing Mantle Deformation in the Aleutian Island Subduction Zone Using Shear Wave Splitting Techniques. Presented at the Undergraduate Research Symposium – Alumni Events Center, North Carolina A&T State University.

McDuffie J., Fischer K., (2017, August). Assessing Mantle Deformation in the Aleutian Island Subduction Zone Using Shear Wave Splitting Techniques. Presented at the UTRA Symposium, Brown University.

Relevant Teaching Experience

Graduate Teaching Assistant, Construction Project Management (Sanjiv Gokhale, PhD.) (08/22–12/22)

This class is an introduction to methods and best practices for the planning, design, and construction of civil projects. I assisted with the math and physics portions for students who may need extra practice and assist in grading. I hosted two sessions at the request of the professor.

Graduate Teaching Assistant, Geotechnical Engineering (Sanjiv Gokhale, PhD.) (08/21 – 12/21)

This class is an introduction to soil mechanics and engineering practices for building on earth materials. I assisted with the math and physics portions for students who may need extra practice and assisted in grading coursework. I hosted office hours and ran the class for two lab sessions.

Supplemental Instructor, Fluid Mechanics (Manoj Jha, PhD.) (08/19 – 5/19)

This class is an introduction to studies concerning the properties of fluids and the forces that act upon them. I assist with the math and physics portions for students who may need extra practice and assist in grading.

Supplemental Instructor, Statics (Taher Abu Lebdeh, PhD.) (08/18 – 05/18)

This class is an introduction to studies concerning bodies at rest and forces in equilibrium. I assisted with the math and physics portions for students who may need extra practice and assist in grading.

Tutoring (1/17 – Present)

I volunteer and work as a tutor for students in middle school, high school, and college in my free time, using various learning techniques to assist students in their understanding of math, science, and history. Courses I've tutored include Calculus I – III, Chemistry, Physics, Algebra, and American History.

STEM+C Mentoring Program (8/22 – Present)

I host programming along with other graduate students to facilitate positive spaces for minority first year students in Vanderbilt STEM Courses. We connect students to on-campus resources, discuss resumes & CVs, promote undergraduate research opportunities, and help students with managing expectations during the first year.

Assay and Techniques

Python, RStudio, MatLab and associated applications, ArcGIS, Microsoft Office, Natural Language Processors (Prompt Engineering), Centrifuge Modelling, Google Sketchup, AutoCad, Grapher