MIKIAS WORKNEH GUGSSA

Civil Engineering, PhD Candidate
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Portfolio: https://mikiasgugssa.github.io/Portfolio/

SUMMARY

A civil engineering professional and researcher with over seven years of combined industry and academic experience, specializing in technology-enabled safety management. My work focuses on enhancing construction safety through deep learning, edge computing, and VR-based training systems. With a strong experience in infrastructure construction and project management, I bridge real-world challenges with academic research. Committed to student-centered teaching, emphasizing hands-on learning, technology integration, and real-world applications in construction education. I bring extensive industry experience in infrastructure improvement, project management, construction engineering, and bridging academic research with practical challenges. Currently pursuing a Ph.D. in Civil Engineering at Mississippi State University (expected to graduate in December 2025). My expertise in advanced technologies extends across the construction industry, enhancing design, safety, efficiency, and project outcomes through innovation and a forward-thinking approach.

RESEARCH INTERESTS

- Smart Construction, Technology-Enabled Safety Management, Artificial Intelligence (AI), Computer Vision & Deep Learning, Virtual Reality (VR), Building Information Modeling (BIM), Digital Twins, Electroencephalogram (EEG), and Point Cloud Data

TEACHING INTERESTS

- Construction Scheduling, Construction Cost Estimating, Heavy Construction Management, Advanced Virtual design and construction, Advanced project management, Building Information Modeling, Construction Business Operations, Cost Accounting & Control, Construction Equipment and Methods, AI in CEM

SOFT SKILLS

- Critical thinking and problem-solving, attention to detail, teamwork and collaboration, and strong written/verbal communication skills

EDUCATION

Ph.D. in Civil Engineering, Mississippi State University, Starkville, MS, USA
Expected Graduation: December 2025

M.S. in Civil Engineering, Addis Ababa University, Addis Ababa, Ethiopia
Graduation: July 2016

B.Sc. in Civil Engineering, Addis Ababa University, Addis Ababa, Ethiopia
Graduation: August 2007

RESEARCH EXPERIENCE

Research Assistant, Mississippi State University, Starkville, MS, USA
January 2021 – August 2025

PPE Detection in Near-Real-Time Using Edge-Enabled Deep Learning:

- Developed deep learning (DL) models using YOLO-v4+VGG-19 and YOLO-v4+ResNet-50 through transfer learning, achieving 89.34 mAP for detecting more than one worker in an image.
- Implemented edge computing solutions, reducing time latency by 36%–68% compared to cloud computing while enhancing privacy preservation in near-real-time safety glove detection.
- Evaluated DL models (YOLO families, VGG-19, and ResNet-50) for object detection accuracy and time efficiency in construction industry applications, providing actionable insights for improving safety monitoring systems.

User-centered VR-Based Ergonomics Safety Training with Real-Time Feedback:

- Designed and implemented a real-time feedback mechanism to enhance human-technology interactions (HTIs) within VR-based ergonomics training systems for heavy object-lifting.
- Explored and validated a comprehensive framework to assess the design quality and performance of VR-based ergonomics training systems tailored for heavy-lifting applications.
- Extended and explored the Technology Acceptance Model (TAM) to evaluate the user technology acceptance of construction workers toward a VR-based safety training system for construction.

Affiliated Research Projects:

Fostering Future Workforce Excellence in Mississippi: Promoting Trenchless Technology and Human-Robot Collaboration in Construction at K12 and University Levels
Sponsor: Mississippi State Board of Contractors (MSBoC)
Duration: May 2025 – August 2025

- Worked on developing training slides and delivering a presentation for high school students about human-robot collaboration in transportation infrastructure construction.

Assessing the Effectiveness of Blue Lights on Work Zone Safety
Sponsor: Mississippi Department of Transportation (MDOT)
Duration: October 2021- December 2025

- Assisted with field data collection in work zones.

Title: Identification and Proper Use of Personal Protective Equipment (PPE) in Utilities, Industrial, and Trenchless Construction Industries (Selected Submission)
Sponsor: U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)
Duration: December 2024- September 2025

- Participated in developing the training manual and evaluating trainees' knowledge gain assessment document.

MDOT Virtual Reality Safety Training Study.
Sponsor: Mississippi Department of Transportation (MDOT)
Duration: February 2022- December 2024

- Conducted experiments on VR-based safety training to improve training effectiveness and situational awareness for construction workers in work zones.
- Performed data analysis and participated in project reports.

Assessment of Construction Workers' Mental Fatigue to Prevent Safety Hazards.
Sponsor: Deep South Center for Occupational Health and Safety
Duration: October 2021- October 2023

- Conducted experiments to investigate the impact of task complexity on construction activities' cognitive fatigue levels.
- Employed electroencephalography (EEG) devices to capture and analyze brain signals of participants engaged in bridge-building tasks with varying complexity levels.
- Processed EEG data using EEGLAB in MATLAB to compute cognitive fatigue indices and derive actionable insights.
- Performed data analysis and participated in project reports.

eCommerce, Emerging UAS Network and Implications on NAS Integration.
Sponsor: Federal Aviation Administration (FAA)
Duration: March 2019- September 2021

- Analyzed data on the characteristics of the commercial UAS Delivery Network to forecast future demand trends.

TEACHING EXPERIENCE

Teaching Assistant (Grader), Mississippi State University, Starkville, MS, USA
August 2024 – December 2024

- CE-6703: Construction Engineering Management
- CE-6753: Construction Cost Estimating
- CE-1001: Introduction to Civil Engineering

Guest Speaker: Mississippi State University, Starkville, MS, USA
November 2024

- CE-6703: Construction Engineering Management
  Title**:** Smart VR-based Safety Training for Workzone Construction Workers

INDUSTRY EXPERIENCE

Infrastructure Improvement Specialist
Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) with Chemonics Inc., Addis Ababa, Ethiopia
September 2017 – February 2021

- Performed assessments of existing pharmaceutical warehouses to identify infrastructure upgrades to align with client needs and budgets.
- Proposed design modifications and prepared drawings and documents (concept through to construction drawings).

- Supervised warehouse and health facility renovation/repair activities, typically with over two contractors.
- Facilitated communication between stakeholders and contractors to streamline progress.
- Prepared project status reports to communicate progress alongside the Infrastructure Improvement Manager.

Regional Engineer
Engineering Services and Construction Oversight with Tetra Tech Inc., Addis Ababa, Ethiopia
October 2015 – August 2017

- Provided construction oversight and quality assurance for the construction of Four health centers and three Agricultural warehouses in the southern part of Ethiopia on behalf of USAID
- Prepared detailed, regular reports to the client; received positive feedback
- Monitored contractor compliance with schedule, cost controls, and quality controls.
- Ensured compliance with health and safety, gender, and environmental requirements.
- Developed responses to contractor requests for information (RFI) in line with contract drawings and specifications.

Senior Construction Management Engineer
Ethiopian Sugar Corporation, Addis Ababa, Ethiopia
June 2011 – March 2012

- Provided technical and engineering support to the sugar factory construction team (of over ten professionals), including project and construction managers.
- Verified contractor's as-built record drawings alongside monthly progress payments.
- Collaborated with surveying, testing, and inspection teams to ensure project compliance with required quality control specifications.
- Conducted field inspections to verify adherence to job specifications, plans, and construction standards.
- Prepared reports, correspondence, procedures, and guidelines as needed.
- Reviewed submittals for compliance with plans and specifications and supported stakeholder meetings.

Project Engineer
Addis Ababa Housing Development Project Office, Addis Ababa, Ethiopia
November 2008 – May 2011

- Led, managed, supervised, and controlled the quality of the construction of 13 five-story apartment buildings.
- Managed and supervised contractors on-site, addressing civil engineering issues and ensuring timely project completion within budget.
- Oversaw and mentored two site engineers on the construction process.
- Effectively coordinated with subcontractors, consultants, and clients to facilitate quick decision-making and reduce project costs.
- Evaluated construction materials and concrete test results.

- Approved change orders and certified contractor payments in compliance with project requirements.

PUBLICATIONS & PRESENTATIONS

Peer-Reviewed Published Journal Articles

1. **Gugssa, M**., Li, L., Pu, L., Gurbuz, A., Luo, Y., and Wang, J. (2024). Enabling near-real-time safety glove detection through edge computing and transfer learning: Comparative analysis of edge and cloud computing-based methods. *Engineering, Construction and Architectural Management*.

Peer-Reviewed Journal Articles Under Review

2. **Gugssa, M**., Assafi, M. N., Zhujun, P., Chen, J., and Wang, J. (n.d). Assessment of Mental Fatigue Using Electroencephalography to Prevent Safety Hazards in Construction: A Pilot Study. *Professionals Safety*.

3. **Gugssa, M.,** Wang, J., Ma, J., Howard, I. L., and Wang, Y. (n.d). Enhancing Human-Technology Interactions in Virtual Reality-Based Ergonomics Training for Construction Safety. *International Journal of Human-Computer Interaction*.

Peer-Reviewed Published (Including Accepted) Conference Papers

1. **Gugssa, M**., Wang, J., Ma, J., Howard, I. L., Wang, Y. and Cotton, J. (n.d.). Smart Safety Training System with Enhanced Human-Technology Interactions (HTIs) for Work Zone Safety Improvement. *Computing in Civil Engineering 2024* (Accepted, in press). **Presenter**.
2. Chen, J., Yee, J., Goodin, C, **Gugssa, M**, Wang, J., and Das, A. (n.d.). LiDAR-based Traversability Estimation for Ground Robots on Construction Sites using Self-Supervised Learning. In *Computing in Civil Engineering 2024* (Accepted, in press).
3. Chen, J, Yee, J., Goodin, C., **Gugssa, M.**, Wang, J., and Das, A. (n.d.). Object-level Temporal Change Detection on Construction Sites with 3D Deep Learning Models. In *Computing in Civil Engineering 2024* (Accepted, in press).
4. **Gugssa, M**., Li, L., Pu, L., Gurbuz, A., Luo, Y., and Wang, J. (2023). Enhancing the Time Efficiency of PPE Detection Using Edge Computing. *Computing in Civil Engineering 2023* (pp. 532-540). **Presenter**.
5. Chen, J., **Gugssa, M**., Yee, J., Wang, J., Goodin, C., and Das, A. R. (2023). Framework for Digital Twin Creation in Off-Road Environments from LiDAR Scans. *SPIE 12529: Synthetic Data for AI and ML Applications*.
6. **Gugssa, M**., Gurbuz, A., Wang, J., Ma, J., and Bourgouin, J. (2021). PPE-Glove Detection for Construction Safety Enhancement Based on Transfer Learning. *Computing in Civil Engineering 2021* (pp. 58-65). **Presenter**.

Technical Reports

1. Wang, J, Howard, I. L., Ma, J., & Gugssa, M. (2024). Mississippi DOT Virtual Reality Safety Training Study. SS327 MDOT VR Safety Training Study Report_Final.pdf

2. Wang, J, Zhujun, P., Gugssa, M., & Assafi, M. N. (2023). Assessment of Construction Workers' Mental Fatigue to Prevent Safety Hazards.

Poster Presentations

1. *Southeast Regional Research Symposium* (2024). Smart Safety Training System with Enhanced Human-Technology Interactions for Work Zone Safety Improvement. Lexington, KY, March 2024.
2. *Spring 2024 Graduate Research Symposium* (2024). Smart Safety Training System with Enhanced Human-Technology Interactions for Work Zone Safety Improvement. Starkville, MS, February 2024.

PROFESSIONAL AFFILIATIONS

- Student Member, American Society of Civil Engineers (ASCE)
- Student Member, Construction Management Association of America (CMAA)
- Member, Natural Hazards Engineering Research Infrastructure (NHERI) Graduate Student Council

TRAINING AND CERTIFICATIONS

- Preparing Future Faculty Program, Mississippi State University (2024)
- Online Teaching 101, Mississippi State University (2024)
- OSHA 30-Hour Construction Safety and Health Certification (2025)
- Golden Key International Honour Society

AWARDS

- Student Research Travel Award, Bagley College of Engineering (2024)
- James Franklin Brownlee Endowed Scholarship in Engineering, Bagley College of Engineering (2024)
- Travel Assistance Grant for Graduate Students (TAGGS), Mississippi State University (2024)
- Graduate School Professional Development Award, Mississippi State University (2021)

SERVICES

- **Evaluator:** Summer 2024 Undergraduate Research Symposium, Mississippi State University
- **Evaluator:** Spring 2025 Undergraduate Research Symposium, Mississippi State University
- **Judge:** 2025 ASCE Construction Institute Student Symposium Competition- Gulf Coast