Mahdi Masmoudi

Third-Year Ph.D. Student in Computer Science & Civil Engineering
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Executive Summary

I am a third-year Ph.D. student at Michigan State University working at the interface of Civil Engineering and Computer Science. My research focuses on physics-informed machine learning and inverse problems for partial differential equations (PDEs), bridging data-driven approaches with mechanistic modeling. I am currently extending this work beyond benchmark and civil engineering applications toward biomedical problems, including tissue and cardiovascular mechanics, as well as electrophysiology, aiming to develop predictive, mechanistic models for complex biological systems.

Education

Michigan State University, East Lansing, MI
Ph.D. in Computer Science & Civil Engineering — Sep 2023 – Present

Ecole Polytechnique de Tunisie, La Marsa, Tunisia
B.S. in Complex Systems — Sep 2020 – Jun 2023

Preparatory Institute for Engineering Studies, Sfax, Tunisia
Physics & Mathematics — Sep 2018 – Aug 2020

• Admitted in National Exam (National Rank: 71/2500)

Teaching Experience

Graduate Teaching Assistant, Michigan State University

CE221 Statics Fall 2023, Summer 2024, Fall 2024, Spring 2025, Fall 2025, Spring 2026
Vector description of forces and moments; equilibrium of particles and rigid bodies in 2D and 3D; truss, frame, and machine analysis; Coulomb friction.

CE461 Computational Methods in Civil Engineering Spring 2024, Spring 2025, Spring 2026
Numerical analysis fundamentals including linear systems, differentiation/integration, and ODEs; applied data processing in Civil Engineering. • Advised student projects on fine-tuning Large Language Models (LLMs) to solve *Fundamentals of Engineering (FE) Exam* problems.

Publications

1. *Mechanics-informed autoencoder enables automated detection and localization of unforeseen structural damage*, Nature Communications, 2024.

2. *Estimating Parameter Fields in Multi-Physics PDEs from Scarce Measurements*, under review at Nature Communications Physics.

3. *The impact of temperature gradient and JPCP design features on surface roughness and curvature*, International Journal of Pavement Engineering, 2026.

4. *UNED: One-shot Uncertainty-aware Neural Experimental Design for Transient PDEs.* AI & PDE: ICLR 2026 Workshop on AI and Partial Differential Equations.

5. *Neural-VSI: Variational System Identification of Structural Parameter Fields in High-Order PDEs.* AI & PDE: ICLR 2026 Workshop on AI and Partial Differential Equations.

6. *Estimating field parameters from multiphysics governing equations with scarce data*, ICLR 2024 Workshop.

7. *ParaFIND: Parameter Field Inference on Non-uniform Domains using Neural Network*, NeurIPS 2024 Workshop.

8. *Physics-based modeling of contaminant leaching in road construction materials*, Advances in Materials and Pavement Performance Prediction, 2025.

Other Research Projects

Self-Powered Wireless Sensing Platform for Vehicle Attitude Control – MSU
Designed and validated a self-powered wireless sensing system deployed on an electric ground vehicle, integrating strain, stress, and humidity sensors to estimate terrain bearing capacity and shear strength. Applied neural networks to learn correlations between sensor inputs and geomechanical properties; validated system performance through both lab and field testing with a functional first prototype.

Consulting Experience

Islamic Development Bank (IsDB) 2023 – Present
Advising on the Smart Stabilization System, designed to reduce asset price volatility (e.g., shares, digital currencies) by managing excess supply and demand, leveraging blockchain technology to improve market stability.

Core Skills

Physics-Informed Deep Learning, Neural Operators, Machine Learning, Finite Element Methods, Diffusion Models, JAX, PyTorch, Julia, FEniCS, C++; numerical PDE solvers.

Languages

Arabic (Native), French (Fluent), English (Fluent)

Service & Community Involvement

Journal & Conference Reviewing
Nature Communications 2026
AI & PDE: ICLR 2026 Workshop on AI and Partial Differential Equations 2026
Inverse Problems Symposium
Session Co-Chair: Geometry and Topological Mapping 2025