AKASH YADAV

8181 Fannin ST, 77054, Houston, Texas, United States
ayadav4@uh.edu ◇ akashyadav0210.github.io

INTERESTS

Uncertainty Quantification, Scientific Machine Learning, Deep Learning, Digital Twins, System Identification

EDUCATION

Doctor of Philosophy in Civil Engineering (CGPA: 4.0/4.0) *08/2023 - 05/2027*
Thesis: Quantifying and Reducing Model-form Uncertainty using Stochastic Representations
University of Houston - Houston, USA

Master of Technology (Research) in Civil Engineering (CGPA: 8.3/10) *10/2020 - 06/2023*
Thesis: SHM accounting for Thermal Variability and Damage using ABC
Indian Institute of Science - Bangalore, India

Bachelor of Technology in Civil Engineering (First Division, CGPA: 8.75/10) *07/2014 - 05/2018*
Thesis: Design of Hydro Power Project
Indian Institute of Technology - Roorkee, India

SKILLS

Programming/Computing	Python (PyTorch, NumPy, SciPy), MATLAB, Julia, Git, SLURM
CAE	ABAQUS, LS-DYNA, Midas Civil, STAAD.Pro
ML/Stats	Transformers, LoRA, CNN, PINNs, GANs, Gaussian Processes

ACADEMIC PROJECTS

Model Error Correction and Characterization - Mentor: Dr. Ruda Zhang *08/2023 - present*

- Developing methods for scientific foundation models by analyzing transformer attention mechanisms and probabilistic low-rank adaptation (LoRA) techniques to capture predictive uncertainty.
- Developing a stochastic reduced-order model (SROM) framework for model error correction in computational mechanics to improve predictive performance.
- Developed probabilistic subspace models using probabilistic principal component analysis (SS-PPCA) and bootstrap resampling (SS-Bootstrap) to characterize model error in computational mechanics.
- Developed a Bayesian optimization under uncertainty framework to train scale parameters in stochastic models, reducing data requirements and accelerating hyperparameter optimization by a factor of 40.

Uncertainty Quantification in PINNs - Rice University *10/2024 - 12/2024*
Explored a GAN-augmented Physics-Informed Neural Networks (PINNs) framework for uncertainty quantification, inspired by Yang et al. (2019).

Structural Health Monitoring using ABC - Mentor: Dr. Ananth Ramaswamy *07/2021 - 06/2023*
Developed a method based on Approximate Bayesian Computation (ABC) for damage detection under varying temperature conditions, and extended it to capture damage-induced nonlinearity.

Design of Hydro Power Project - IIT Roorkee *07/2017 - 05/2018*
Designed key structural components of a dam, including the cofferdam, spillway, sluiceway, and radial gates. Performed Finite Element Analysis using ABAQUS, evaluated slope stability with Geo5, and verified dam stability in accordance with IS 6512:1984 standards.

RESEARCH PUBLICATIONS

1. **Yadav, A.** & Zhang, R. (2025). "Stochastic Subspace via Probabilistic Principal Component Analysis for Characterizing Model Error." Computational Mechanics. doi:10.1007/s00466-025-02701-6.
2. **Yadav, A.** & Zhang, R. (2025). "Bayesian Optimization under Uncertainty for Training a Scale Parameter in Stochastic Models." arXiv preprint. doi:10.48550/arXiv.2510.06439. (under review)
3. **Yadav, A.** & Zhang, R. (2025) "Nonparametric Stochastic Subspaces via the Bootstrap for Characterizing Model Error." arXiv preprint. doi.org/10.48550/arXiv.2512.15624. (under review)
4. **Yadav, A.** & Zhang, R. "Model Error Correction via Stochastic Reduced-order Modeling Framework." (under preparation).

ACADEMIC PRESENTATIONS

SROM for Model Error Characterization and Correction — Chicago, IL, USA
18^{th} *United States National Congress on Computational Mechanics (USNCCM)* — July 20-24, 2025

Stochastic Subspace via Bootstrap for Model-form Uncertainty — Bangalore, India
International Conference on Applied AI & Scientific Machine Learning (CASML) — December 14-18, 2024

Stochastic Subspace via PPCA for Model-form Uncertainty — Vancouver, Canada
16^{th} *World Congress on Computational Mechanics (WCCM)* — July 21-26, 2024

Stochastic Subspace via PPCA for Model-form Uncertainty — *Chicago, USA*
Engineering Mechanics Institute Conference (EMI/PMC) — *May 28-31, 2024*

Structural Health Monitoring of Steel Truss Bridges — Indore, India
8^{th} *International Congress on Computational Mechanics & Simulation (ICCMS)* — December 9-11, 2022

RELEVANT WORK EXPERIENCE

Senior Project Engineer - Indian Oil Corporation Limited — *07/2018 - 09/2020*
Oversaw the execution of an energy-efficient green building, a bridge over a green belt canal, and civil works for a new catalytic de-waxing unit.

Industrial Internship - Rites Limited — *Summer 2017, 2016*
Designed highway bridge components, including superstructures and substructures, and performed finite element analysis of box culverts using Midas Civil. Designed retaining walls using both working stress and limit state methods, and applied IRC codes for culvert design using STAAD.Pro.

TEACHING EXPERIENCE

Reciter Mechanics-I Statics, University of Houston — *08/2024 - 12/2024*
Teaching assistant Mechanics-I Statics, University of Houston — *08/2023 - 12/2023*

RELEVANT COURSEWORK

A Practical Introduction to Deep Learning, Learning with Data, Data-Driven Engineering, Structural System Identification, Structural Dynamics, Numerical Methods, Optimization Methods, Finite Element Method

POSITION OF RESPONSIBILITY

Joint Secretary, Taekwondo, Institute Sports Council, IIT Roorkee — *07/2016 - 05/2017*
Secretary, Taekwondo, Institute Sports Council, IIT Roorkee — *07/2017 - 05/2018*
Organized and led training sessions for over 50 students, fostering discipline and teamwork, and coordinated participation in state and national-level competitions.

HONORS AND AWARDS

Jimmie A. Schindewolf Academic Scholarship by University of Houston *08/2024 - 05/2025*
Future Faculty Program, University of Houston *08/2024 - 05/2025*
Presidential Fellowship by University of Houston *08/2023 - 05/2025*
Finalist, UQ-TTA Student Paper Competition at WCCM/PANACM, Vancouver *07/2024*
Cullen Fellowship Travel Grant for EMI/PMC by University of Houston *05/2024*
Finalist, Grants in Aid of Research, SIGMA-XI *03/2024*
Secured All India Rank in the **top 0.35 %** of 1.4 million IIT-JEE candidates *06/2014*

EXTRA CURRICULAR

First Dan Black Belt in Taekwondo by World Taekwondo Federation *08/2017*
Represented State Uttarakhand in **National Taekwondo Championship** *12/2017*
Organiser and Instructor, Self Defense Camp, Unnat Bharat Abhiyaan *03/2017*
Led a 5-day trek, Himalayan Explorer Club, IIT Roorkee *11/2016*
Member, National Service Scheme, IIT Roorkee *07/2014 - 05/2015*

ACADEMIC AND PROFESSIONAL AFFILIATIONS

United States Association for Computational Mechanics (USACM), Technical Thrust Area in Uncertainty Quantification and Probabilistic Modeling, Graduate Student Member.
Society for Industrial and Applied Mathematics (SIAM), Graduate Student Member.