AKASH YADAV

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INTERESTS

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

EDUCATION

Doctor of Philosophy in Civil Engineering (CGPA: 4.0/4.0) *08/2023 - present*
Thesis: Quantifying and Reducing Model-form Uncertainty using Stochastic Subspaces
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 Languages & Packages Python, MATLAB, Julia, TensorFlow, PyTorch
Computational Softwares ABAQUS, LS-DYNA, Midas Civil, STAAD.Pro

ACADEMIC PROJECTS

UQ in Scientific Foundation Models - Mentor: Dr. Ruda Zhang *06/2025 - present*
Developing methods for quantifying and reducing uncertainty in scientific foundation models using probabilistic low-rank adaptation techniques.

Correcting Model-form Uncertainty - Mentor: Dr. Ruda Zhang *06/2024 - present*
Developing methods based on stochastic reduced-order modeling framework for correcting model-form uncertainty in computational mechanics and improving predictive performance of computational models under uncertainty.

Characterizing Model-form Uncertainty - Mentor: Dr. Ruda Zhang *08/2023 - 08/2025*
Developed a probabilistic framework for constructing stochastic subspaces using probabilistic principal component analysis (SS-PPCA) and a bootstrap-based (SS-Bootstrap) data-driven technique to characterize model-form uncertainty and enhance the accuracy of structural simulations in computational mechanics.

Bayesian Optimization under Uncertainty - Mentor: Dr. Ruda Zhang *07/2024 - 07/2025*
Developed a Bayesian optimization framework under uncertainty to improve the training of a concentration parameter in stochastic models, including SS-PPCA and SS-Bootstrap. The method reduced data requirements and accelerated hyperparameter training 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., Stochastic subspace via probabilistic principal component analysis for characterizing model error, arxiv 2025.

ACADEMIC PRESENTATIONS

1. **A. Yadav** & R. Zhang, Stochastic reduced-order modeling for model error characterization and correction, 18^{th} *United States National Congress on Computational Mechanics (USNCCM)*, Chicago, Illinois, USA, July 20-24, 2025.
2. **A. Yadav** & R. Zhang, Stochastic subspace via bootstrap for model-form uncertainty, *Conference on Applied AI & Scientific Machine Learning (CASML)*, IISc, Bangalore, India, December 14-18, 2024.
3. **A. Yadav** & R. Zhang, Stochastic subspace via probabilistic principal component analysis for model-form uncertainty, 16^{th} *World Congress on Computational Mechanics* & 4^{th} *Pan American Congress on Computational Mechanics (WCCM/PANACM)*, Vancouver, Canada, July 21-26, 2024.
4. **A. Yadav** & A. Ramaswamy, Structural health monitoring of steel truss bridges subjected to environmental variability, 8^{th} *International Congress on Computational Mechanics & Simulation (ICCMS)*, IIT, Indore, India, December 9-11, 2022.

RELEVANT WORK EXPERIENCE

Graduate Research Assistant - University of Houston *08/2023 - present*
Developing probabilistic and scientific machine learning methods to quantify and reduce model-form error in computational science and engineering.

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*
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 Aids 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.