

ROOPA ADEPU

Boston, MA | adepu.r@northeastern.edu | +1 (617) 606-8954 | [linkedin.com/in/roopa-adepu](https://www.linkedin.com/in/roopa-adepu)

EDUCATION

Northeastern University, Boston, MA Expected Dec 2026
Candidate for Master of Science in Mechanical Engineering GPA - 3.89
Relevant Coursework: Scientific Machine Learning, Fundamentals of Advanced Materials, Mathematical Methods for Mechanical Engineers, Mechanical and Dynamic Vibrations
National Institute of Technology (NIT), Warangal, Warangal, India Aug 2018 - May 2022
Bachelor of Technology in Mechanical Engineering

SKILLS

Computational Mechanics & CFD: OpenFOAM, ANSYS (Fluent, Mechanical), FEM, Solid Mechanics, HPC Cluster Simulations
CAD & Modeling: SolidWorks (CSWA certified), Simulink, Simscape, Dymola
Version Control & Workflow: Git, SVN, Polarion, Team Center
Programming & Data: MATLAB; Python - NumPy, Matplotlib, SQL
Machine Learning: TensorFlow, PyTorch, PINNs, NeuralODEs, Bayesian Optimization, PySR

WORK EXPERIENCE

Northeastern University | Boston, MA Jun 2025 - Present
Graduate Research Assistant, Prof. Juner Zhu

- Designed a physics-informed ML framework (ICNN) with quadratic strain energy and constraints (energy positivity, symmetry, positive definiteness), achieved 98% R^2 accuracy on FEM strain-stress datasets.
- Applied dimensionality reduction to enable efficient symbolic regression (PySR), to derive interpretable stiffness constants $C_{11}, C_{12}, C_{22}, C_{66}$ and closed-form stress-strain equations consistent with classical elasticity.
- Extending the framework toward plasticity modeling, exploring RNN/LSTM architectures to capture path-dependent material responses.

Collins Aerospace (RTX) | Bengaluru, India Feb 2022 - Dec 2024
Lead Engineer - Research, Applied Research and Technology

Multi-Physics Modeling

- Performed large-scale CFD simulations on High-Performance Computing (HPC) clusters to generate training data for AI-based Reduced Order Models (ROMs), reducing runtime from 6 hours to 20 seconds, enabling integration into system-level simulations.
- Secured \$80K funding to mature a Multi-Physics Modeling project after demonstrating a proof of concept on a Solenoid Valve, leveraging dynamic ROMs trained on high-fidelity CFD models.
- Applied workflows to Airbus A320 Oxygen Systems' Pressure Regulator and developed algorithms using NeuralODEs and Physics-Informed Neural Networks (PINNs), benchmarking them against digital twin COTS tools for dynamic ROM generation.

Surrogate Modeling and Optimization

- Achieved 95% R^2 accuracy and reduced model compilation time by 60% for Air Management Systems (MA700, Boeing 777X) through advanced regression techniques and automated hyperparameter tuning using Bayesian optimization.
- Applied Uncertainty Quantification techniques using KNN and MCMC to enhance ROM predictions and integrated Python algorithms into MATLAB with an interactive GUI.
- Matured the project into a fully developed solution, now deployed in the workflow for Air Management Systems plant model development.
- Earned 2 trade secrets, 2 Star Awards for delivering innovative solutions and driving success in Surrogate Modeling.

PROJECTS

Numerical investigation of two DrivAer models in a platoon | NIT, Warangal Aug 2021 - Apr 2022

- Conducted aerodynamics performance CFD simulations using OpenFOAM, analyzing drag reduction strategies that improved fuel efficiency by 8% in a platoon formation.
- Engineered a shark fin vortex generator, reducing rear-end drag by 12%, leading to significant aerodynamic performance improvements.
- Recognized as one of the top three projects in the Mechanical Engineering Department for exceptional research quality and practical application.

CONFERENCES

Paper - Chandran, V. V., & Adepu, R. (2022, October). Reduced Order Modeling of a Heat Exchanger with a Stacking Ensemble to reduce Computational Inefficiencies. In *2022 IEEE International Symposium on Systems Engineering (ISSE)* (pp. 1-5). IEEE.

- Developed a Reduced Order Model (ROM) for a heat exchanger using stacking ensemble learning with genetic programming, improving computational efficiency while maintaining high fidelity ($R^2 > 95\%$).

Presentation - *Multiphysics Modeling - Leveraging the power of AI in Aerospace* - Altair's AI-powered Engineering, 2024, Bengaluru, India

TRADE SECRETS

Submitted novel concepts to Collins Aerospace - classified as trade secrets to save company's proprietary information

- Dynamic Weighted Ensemble for Regression Modeling (Designated Strategic Information)
- KNN Based Walking Algorithm to solving unconverged cases automatically (Designated Strategic Information)