

# Sayali Ravindra Kedari

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## EDUCATION

### University of Cincinnati (UC), Cincinnati, Ohio, US

Doctor of Philosophy student in Mechanical Engineering, GPA 3.76/4.0

Expected Aug 2021

Advisor : Professor Kumar Vemaganti

Research focus : Bayesian learning in soft solid mechanics

### University of Kansas (KU), Lawrence, Kansas, US

Master of Science in Mechanical Engineering, GPA 3.84/4.0

2016

Advisor : Professor Karan Surana

Thesis : Investigation of More Complete Constitutive Theories for Heat Conduction in Solids and for Deviatoric Stress Tensor in Incompressible Fluids

### University of Pune, Pune, Maharashtra, India

Bachelor of Engineering in Mechanical Engineering, First Class with Distinction

2014

## EXPERIENCE

### Graduate Researcher, [Vemaganti Research Group](#), University of Cincinnati

Jan 2017 – present

- Developing hierarchical bayesian approaches for analysis of inverse problems in viscoelasticity to obtain optimal level of regularization in an automated manner, eliminate any subjectivity about the choice of noise parameters and predict the thermorheological behavior of a material.
- Developing information-theoretic approaches (Fisher Information, Kullback-Leibler divergence) to develop criteria for experimental design to maximize information gained about the parameters of linear and non-linear rheological constitutive models, in both deterministic and stochastic settings and address the question of finding optimal experimental parameters (strain rates, duration).
- Employing a parallel Nested sampling-based Bayesian framework using MPI, Gibbs sampling and Relevance Vector Machine (RVM) machine learning technique on the experiments performed on different soft solids under multiple modes of deformation, to establish a calibration and validation framework for the stochastic rheological constitutive models.

### Graduate Research Assistant, [UC Simulation Center](#)

Aug 2018 – present

- Collaborating with cross-functional design teams to resolve complex flow, thermal and mechanical challenges faced at P&G (BABY and FEM care units) for optimizing and improving production turnovers
- Employing physics-based 'predictive-design-approach' to drive and outline process design and optimization guidelines using commercial FEA and programming tools

### Instructor, University of Cincinnati

Jan 2018 – Aug 2018

- Instructed the lab sessions of 'Applied Computational Methods' in the [Mechanical Engineering](#) department

### Graduate Teaching Assistant, University of Cincinnati

Aug 2016 – Apr 2018

- Assisted Professor in teaching the courses 'Applied Computational Methods', 'Solid Mechanics', 'Finite Element Method' and 'Kinematics and Kinetics of Machines' for graduate and undergraduate classes in the [Mechanical Engineering](#) department
- Assisted the students to solve class theoretical problems and use ANSYS and Abaqus for the FEM projects

### Graduate Researcher, [Computational Mechanics Laboratory](#), University of Kansas

May 2015 – Aug 2016

- Formulated the numerical simulation of elastic solids and viscous fluids using FEM based on the constitutive theories of heat vector and stress tensor
- Transformed mathematical models into Least Squares FE Models for computation using Fortran
- Validated the constitutive theories using the model problems: 1D transient heat conduction in a rod, fully developed flow between parallel plates, square lid-driven cavity, and asymmetric expansion

### Graduate Teaching Assistant, University of Kansas

Sept 2014 – May 2016

- Instructed the lab sessions of 'College Physics-I' in the [Physics and Astronomy](#) department and 'Introduction to Digital Computational Methods in [Mechanical Engineering](#)'
- Tutored the students with learning differences for the subjects: General Physics-I for Engineers, Intermediate Mathematics, College Algebra, Trigonometry, and Vector Calculus at [AAAC Tutoring Services](#).

### Engineering Intern, [Freudenberg Filtration Technologies](#), Pune, India

Aug 2013 – June 2014

- Computational Fluid Dynamics (CFD) Analysis of Filter Assembly (Senior Design Project, MIT): Minimized the pressure drop across the filter assembly and optimized the geometry of the weather hood and the transition section at the entry to the compressor, in collaboration with undergraduate students
- Created realistic models using CAD tool PTC Creo, performed the simulations using ANSYS Fluent, Star CCM+ and validated the results using MATLAB

### Engineering Intern, [Hindustan Aeronautics Limited](#), Bengaluru, India

Dec 2013

- Performed simulation of the wing tank refueling system and optimized the pressurization and transfer system of Military Aircraft, in collaboration with undergraduate students
- Simulated the systems by Computational Fluid Dynamics (CFD) analysis using CATIA V5, STAR-CCM+ and FloMASTER

## SKILLS

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- **Programming/Scripting languages:** Python, Julia, C++, C, MATLAB, LaTeX
- **FEA/CFD Packages:** Abaqus
- **CAD/CAE:** CATIA V5, PTC Creo, Autodesk AutoCAD, SOLIDWORKS
- **HPC:** MPI, OpenMP
- **OS:** Linux, Windows
- **Technologies:** Github, Docker, Jetstream

## PUBLICATIONS

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- **Kedari, S.**, Atluri, G., Vemaganti, K., *A hierarchical bayesian approach to regularization with application to the inference of relaxation spectra*, In Preparation, (2020)
- Vemaganti, K., Madireddy, S., **Kedari, S.**, *On the Inference of Viscoelastic Constants from Stress Relaxation Experiments*, Mechanics of Time-Dependent Materials, (2019): 1-24
- Surana, K. S., Joy, A. D., **Kedari, S. R.**, Nunez, D., Reddy, J. N., Dalkilic, A. S., *A Nonlinear Constitutive Theory for Heat Conduction in Lagrangian Description Based on Integrity*, Journal of Thermal Engineering, Vol. 3, no. 6, Special Issue 6, (2017): 1615-1631
- Surana, K. S., Joy, A. D., **Kedari, S. R.**, Nunez, D., Reddy, J. N., Wongwises, S., *A Nonlinear Constitutive Theory for Deviatoric Cauchy Stress Tensor for Incompressible Viscous Fluids*, Journal of Thermal Engineering, Vol. 3, no. 3 (2017): 1221-1240
- **Kedari, S. R.**, *Investigation of More Complete Constitutive Theories for Heat Conduction in Solids and for Deviatoric Stress Tensor in Incompressible Fluids*, MS Thesis, KU (2016)

## PROJECTS

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- Developed production ready software in C++, trained and tested a simple feedforward neural network model using PyTorch C++ API and applied on MNIST dataset
- Implemented the A-star search optimization algorithm in the route planner problem, produced a replica of a system monitor, built a multithreaded traffic simulator using C++
- Developed a MATLAB based tool to study the responses of hyperelastic material models using both force and constitutive equations under different load cases, over two weeks
- [NSF Cyber Carpentry: Data Life-Cycle Training](#) – Containerized the published codes (in Python and R) for modeling the flood severity based on datasets of environmental conditions using Poisson regression and Random Forest, as Docker and Singularity images on Jetstream cloud; in collaboration with graduate/post-doctorates from different universities/national labs and fields ranging from statistics, biology to molecular dynamics over one week
- Developed MATLAB based codes using the global optimization algorithms (Genetic Algorithm (GA), Particle Swarm Optimization (PSO)) to calibrate the soft tissue hyperelastic constitutive models and proved their advantage over the traditional least-squares approach, over two weeks
- Implemented the parallel Additive Schwartz domain decomposition algorithm using MPI in C and applied it to the Poisson problem on High Performance Computing (HPC) cluster at University of Cincinnati
- Implemented in-house code in Fortran for FE Modeling and Simulation of 1D wave propagation in solid continua
- Developed a design optimization algorithm using Probability Collectives approach for estimating the size of a wire bundle

## RELEVANT GRADUATE COURSEWORK

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- **Engineering:** Continuum Mechanics, Finite Element Method, High Performance Computing, Advanced Fluid Mechanics
- **Mathematics & Applied Statistics:** Applied Partial Differential Equations, Calculus of Variations and Integral Equations, Advanced Numerical Analysis, Learning Probabilistic Models, Applied Probability and Stochastic Processes, Decision Engineering

## WORKSHOPS

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- **XSEDE HPC monthly workshop - OpenACC**, Pittsburgh Supercomputing Center, 2019
- **Abaqus/Explicit - Advanced Topics**, Dassault Systèmes, 2019
- **XSEDE HPC monthly workshop - Big Data**, Pittsburgh Supercomputing Center, 2018
- **NSF Cyber Carpentry: Data Life-Cycle Training**, University of North Carolina at Chapel Hill, 2018
- **NSF Jetstream Atmosphere - Hands On**, University of Cincinnati, 2018

## HONORS & ACHIEVEMENTS

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- **CEAS Modeling & Simulation Fellowship**, UC Simulation Center, 2018 – present
- **University Graduate Scholarship**, University of Cincinnati, 2016 – present
- **University Graduate Scholarship**, Government of Maharashtra, India, 2014 – 2015
- Certificate of Appreciation for volunteering at "**YOU at KU**" **International Student Orientation**, University of Kansas, 2015
- Certificate of Appreciation for **Engineering Mathematics-I** course, Bachelor of Engineering, Maharashtra Institute of Technology, India, 2011

## REFERENCES

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- Available upon request