Sayali Ravindra Kedari

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Education

University of Cincinnati (UC), Cincinnati, Ohio, US
Doctor of philosophy (PhD) candidate in mechanical engineering, GPA 3.76/4.0 — *Expected Dec 2021*
Advisor : Prof. Kumar Vemaganti, PhD
Research focus : Bayesian learning in computational rheology - applications to soft tissues and polymers

University of Kansas (KU), Lawrence, Kansas, US
Master of science in mechanical engineering, GPA 3.84/4.0 — *2016*

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 — *2017 – present*

- Developing hierarchical/multilevel Bayesian approaches for analysis of linear and nonlinear 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 polymers.
- 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 nonlinear rheological constitutive models, and address the question of finding optimal experimental parameters (strain, duration).
- Employing a parallel nested sampling-based Bayesian framework using message passing interface (MPI), Metropolis-within-Gibbs sampling and relevance vector machine (RVM) learning technique on the experiments performed on different soft biological materials and polymers under multiple modes of deformation, to establish a calibration and validation framework for the stochastic rheological constitutive models.

Graduate Research Assistant, UC Simulation Center/Procter & Gamble — *Aug 2018 – present*

- Collaborating with cross-functional design teams to resolve complex flow, thermal and mechanical challenges faced at P&G (baby and female 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 (FEM) 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 courses: general physics-I for engineers, intermediate mathematics, college algebra, trigonometry, and vector calculus at academic learning center (ALC) tutoring services.

Engineering Intern, Freudenberg Filtration Technologies, Pune, India — *Aug 2013 – June 2014*

- Computational fluid dynamics (CFD) analysis of filter assembly (senior design project): 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 CFD analysis using CATIA V5, STAR-CCM+ and FloMASTER

Skills

- **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

- **Kedari, S. R.**, Atluri, G., Vemaganti, K., *A hierarchical Bayesian approach to regularization with application to the inference of relaxation spectra*, Journal of Rheology, in revision since (2021)
- 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

- Developed a production-ready software in C++, trained and tested a simple feedforward neural network model using PyTorch C++ application programming interface (API) and applied it to the modified National Institute of Standards and Technology (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 hydrology 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 UC
- Implemented in-house code in Fortran for FE modeling and simulation (M&S) of 1D wave propagation in solid continua

Relevant Graduate Coursework

- **Engineering**: Continuum mechanics, finite element method, high performance computing, advanced fluid mechanics, gas dynamics
- **Mathematics & applied statistics**: Learning probabilistic models, applied probability and stochastic processes, advanced numerical analysis, applied partial differential equations, calculus of variations and integral equations, decision engineering

Workshops

- **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

- **CEAS Modeling & Simulation Fellowship**, UC Simulation Center/Procter & Gamble, 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, India, 2011

References

- Available upon request