

Sai Deogekar

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RESEARCH INTERESTS

- Computational Solid Mechanics
- Fracture Mechanics
- Multiscale Modeling

EDUCATION

PhD, Mechanical Engineering December 2019 (Expected)
Rensselaer Polytechnic Institute (RPI), Troy, NY, **GPA: 3.89/4.00**

Master of Science, Mechanical Engineering August 2015
University of Cincinnati (UC), Cincinnati, OH, **GPA: 3.87/4.00**

Bachelor of Technology, Mechanical Engineering May 2012
Visvesvaraya National Institute of Technology (VNIT), Nagpur, India, **GPA: 8.79/10.00**

SKILLS

FEA Softwares: ABAQUS, ANSYS Mechanical

CAD Softwares: CATIA V5

Programming Languages: High performance computing using C, C++, FORTRAN

Scripting Languages: MATLAB, Python

General: Microsoft suite (Word, Excel, PowerPoint, Access, Outlook)

EXPERIENCE

Failure in Biological Tissues and Soft Materials Aug. 2016 - Present
PhD Thesis, RPI

- Perform nonlinear finite element analyses (FEA) to investigate failure in fibrous materials such as biological tissues, felt, paper, textiles due to inter-fiber bond breakage and the effect of micro-structural parameters on material strength.
- Study the role of fiber network parameters in transitioning from brittle to ductile failure.

Multiscale Modeling of Facet Capsule Ligament (FCL) Dec. 2015 - Present
Research Project, RPI (in collaboration with University of Pennsylvania)

- Work in a multi-disciplinary team of eight people, using an in-house multiscale FEA code written in C++, to model the deformation and damage in a human spinal ligament (FCL).
- The model will be used to study the deformation perceived by neurons under normal and accidental conditions to predict probability of injury.

Poisson Contraction and Fiber Kinematics in Biological Tissues Apr. 2017 - Aug. 2017
Research Project, RPI

- Developed finite element models to study the highly nonlinear behavior and the strong Poisson effect exhibited by connective tissue due to preferential alignment of collagen fibers.
- Studied the effect of microstructural parameters on tissue behavior and compared the simulation results to various experimental results from literature.

Characterizing the Behavior of Fibrous Materials Using Nonlocal Continuum Model Oct. 2015 - Present
Research Project, RPI (in collaboration with Université de Lorraine)

- Work in a team of four people to describe the deformation state of fibrous materials using nonlocal continuum theory and quantify the relations between mechanical properties of the effective continuum and micro-structural parameters of the material.

Computational Study of Dynamic Brittle Fracture Using the Phase-field Method Dec. 2012 - June 2015

Master's Thesis, UC

- Implemented and debugged a phase-field approach in MATLAB and in C (using SPOOLES library) to study dynamic crack propagation, eliminating the need for tracking discontinuities numerically.
- Modeled branching of cracks and interaction among multiple cracks in glass and ceramics, under dynamic loading. Crack propagation in composite materials was also simulated.

Research Assistant at University of Cincinnati Simulation Center

Feb. 2013 - June 2015

Research Project in collaboration with Procter & Gamble, UC

- Analyzed various components of diapers using FEA, as a part of the Baby Care division.
- Projects required using ABAQUS to simulate nonlinear systems with large deformations, material nonlinearity and contact, and documenting the procedures and bugs encountered.
- Wrote scripts in Python for automating data collection and analysis.

High Performance Implementation of 2D Laplace Solver

Oct. 2013 - Dec. 2013

Research Project, UC

- Implemented and parallelized (using Message Passing Interface) an additive Schwarz method in C.

PROJECTS

Design of a Staircase-Climbing Wheelchair

July 2011 - May 2012

Bachelor's Thesis, VNIT

- Designed and built a prototype for a wheelchair with center of gravity shifting mechanism (to prevent toppling) and an innovative design of the rear wheels for better traction on stairs.

Supra Society of Automotive Engineers India

June 2010 - May 2011

Student Competition Project, VNIT

- Designed, optimized and fabricated a Formula-style race car in a team of twenty people.
- Won the *fastest car* award among forty-three cars from all over India.

PUBLICATIONS

- **Deogekar, S.**, and R. C. Picu, *On the Strength of Random Fiber Networks*, Journal of the Mechanics and Physics of Solids, 116, 1, (2018).
- Picu R. C., **S. Deogekar** and M. R. Islam, *Poisson Contraction and Fiber Kinematics in Tissue: Insight from Collagen Network Simulations*, Journal of Biomechanical Engineering, 140 (2), 021002, (2018).
- **Deogekar, S.**, and R. C. Picu, *Structure-Properties Relation for Random Networks of Fibers with Noncircular Cross Section*, Physical Review E, 95, 033001, (2017).
- Berkache, K., **S. Deogekar**, I. Goda, R. C. Picu, and J. F. Ganghoffer, *Construction of Second Gradient Continuum Models for Random Fibrous Networks and Analysis of Size Effects*, Composite Structures, 181, 347, (2017).
- **Deogekar, S.**, and K. Vemaganti, *A Computational Study of the Dynamic Propagation of Two Offset Cracks Using the Phase Field Method*, Engineering Fracture Mechanics, 182, 303, (2017).

GRADUATE ACADEMIC COURSES

Advanced Finite Element Method	Solid Mechanics of Biomaterials	Continuum Mechanics
High Performance Computing	Plasticity	Fracture Mechanics
Scientific Computing	Elasticity	

SCHOLASTIC ACHIEVEMENTS AND AWARDS

- University Graduate Scholarship, University of Cincinnati 2012 - 2015
- Procter & Gamble Tuition Award 2013 - 2015

PROFESSIONAL ORGANIZATIONS

- American Physical Society 2018 - Present
- Materials Research Society 2017 - Present