

# SAGAR BHATT

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## EDUCATION

- **Rensselaer Polytechnic Institute** Troy, NY  
*Doctor of Philosophy in Mechanical Engineering* Dec 2021 (Expected)
- **University at Buffalo, State University of New York** Buffalo, NY  
*Master of Science in Mechanical Engineering* Feb 2017
- **Vellore Institute of Technology** Vellore, India  
*Bachelor of Technology in Mechanical Engineering* May 2014

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## PROJECTS

- **Adaptive Control of microstructure evolution:** Since Aug 2017
  - Using Monte-Carlo method and Finite Element Crystal Plasticity to simulate microstructure evolution of Ti-6Al-4V alloy under thermo-mechanical loading.
  - Successfully simulated grain growth in Ti-6Al-4V microstructure above  $\beta$ -transus temperature.
  - Currently working on calibrating Monte-Carlo model to simulate microstructure evolution under  $\beta$ -transus temperature and a deformation model for mechanical loading.
- **Finite Element Modeling of Columnar Grained Nickel Microstructure Deformation near Triple Junctions:** May 2020
  - Used Finite Element Crystal Plasticity to simulate 2% tensile strain on a columnar grained Nickel microstructure.
  - Accurately predicted slip activity and deformation fields at the triple junctions which were compared to the experimental observations.
  - Currently in the process of submission for publication.
- **Hybrid Potts-Phase field model to simulate microstructure evolution:** May 2018
  - Implemented a hybrid Monte-Carlo (Potts)-Phase field model to simulate coupled grain growth and phase change in a microstructure.
  - Produced comparable results to published studies on similar work and performed scalability study on the parallel code achieving speed up of 92X at 72% strong scaling efficiency for 8.2K MPI ranks.
- **Optimization of Temperature Profile of billet in Extrusion Process:** Dec 2017
  - Formulated a optimization problem to compute an initial temperature profile for a billet that will result in uniform grain size after extrusion.
  - Implemented it using Matlab's optimization toolbox coupled it with a parallel Monte-Carlo grain growth framework.
  - Final microstructure resulted in a 77.5% reduction in standard deviation of the grain size after optimization.
- **Particulate Matter measurement of a two-stage boiler:** Aug 2016
  - Designed, fabricated apparatus and carried out experiments to extract particulate matter from the flue gas of a two-stage wood fired boiler.
  - Developed a methodology to correctly estimate the mass of PM 2.5 particles in the collected residue, taking into account moisture and adsorption of water on carbon particles.
- **Solution to Laplace equation using preconditioned conjugate gradient method with compressed row storage and MPI:** Dec 2016
  - Implemented a Conjugate Gradient Krylov solver that uses Jacobi preconditioning to solve Laplace equation.
  - Used Compressed row storage and its matrix-vector product computational kernel to store and operate on large sparse matrices, reducing the memory required by the large matrices from 7.2 Terabytes to 60.7 Megabytes.
  - Decomposed the domain and matrix storage into well-balanced chunks and performed scalability study showing speedup of 115X and scaling efficiency of 87% on 132 processes.
- **Finite Element code for simulating deformation in an isotropic elastostatic body:** Dec 2016
  - Developed 3D FE code using Matlab for 8-node hexahedron elements and in 2D for Constant Strain Triangle, 4-noded and 8-noded Quadrilateral elements.
  - Performed convergence study based on the energy norm and compared the results with ABAQUS for a rectangular beam and I-beam with maximum displacement within 1% of those predicted by ABAQUS.
- **Simulation of steady, laminar flow over a backward-facing step:** May 2016
  - Developed a Navier-Stokes solver using a three-point, second order finite differencing scheme to discretize the convective and viscous fluxes in conjunction with scalar, fourth-difference, third-order artificial dissipation for stability.
  - Implemented dual time-stepping with a second-order backward scheme in time and four stage Runge-Kutta time stepping for pseudo time. Demonstrated reasonable agreement with experimental and computational resultss from literature.

## EXPERIENCE

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- **Rensselaer Polytechnic Institute** Troy, NY  
*Research and Teaching Assistant* Aug 2017 - Present
  - TA for courses Introduction to Engineering Design, Engineering Graphics & CAD and Engineering Dynamics.
  - Working as a RA in Prof. Antoinette M. Maniatty's research group on simulating microstructure evolution under thermomechanical loading.
- **University at Buffalo, State University of New York** Buffalo, NY  
*Grader and Tutor* July 2016 - Dec 2016
  - Grader for Thermodynamics class.
  - Tutored Math, Physics and Mechanical Engineering courses at the Academic resource center.
- **Greaves Cotton Ltd. (Automotive Sector, R&D)** Aurangabad, India  
*Intern* Jan 2014 - June 2014
  - Carried out a series of experiments to figure out root cause of startability issues and torque deficiency in low RPM range of one of the flagship engines. Increased low-end torque by 24% and enabled engine start without excess fuel while satisfying the emissions standards.
- **Mahindra and Mahindra (CDMM Department)** Mumbai, India  
*Intern* June 2012 - July 2012
  - Inspected and adjusted dimensions /tolerances in CAD of new parts to make them manufacturable with existing equipment and ensuring lower material loss and faster prototype development - reduced lead time by 67%.

## SKILLS

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- **Programming:** C++, C, Matlab, Python, MPI, Open MP, Bash Scripting, Julia
- **Softwares:** Simmetrix, ANSYS, Abaqus, Siemens NX, SolidWorks, CATIA, Pro E, Autodesk Fusion 360/Inventor, AutoCAD
- **Miscellaneous:** Git, Prview, L<sup>A</sup>T<sub>E</sub>X, Microsoft Office Suite

## PUBLICATIONS

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- **S. Bhatt**, A. Baskaran, D. Lewis, and A. Maniatty. Numerical modeling of ti-6al-4v microstructure evolution for thermomechanical process control. In *Proceedings of NUMIFORM 2019: The 13th International Conference on Numerical Methods in Industrial Forming Processes*, 2019

## AWARDS

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- **NSF Travel Grant for Early Career US-based Researchers:** Among selected number of people awarded this grant which covered the costs associated with attending the NUMIFORM 2019 conference. May 2019

## LEADERSHIP ROLES

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- **Rensselaer Polytechnic Institute**  
*Vice President, Graduate Council* May 2020 - Present
  - Elected Vice President of the 15 person graduate student council representing 1366 graduate students at RPI.
  - Worked with the institute to address issues related to graduate academics, Teaching and Research Assistants, ensuring smooth transition to remote research.
  - Organized various online programs to address student issues ranging from Mental Health to public safety to international student concerns apart from the usual fun events.
- Representative, Graduate Council* May 2019 - May 2020
  - Coordinated admissions activities with the Graduate School, Graduate Admissions office and International Student and Scholar Services.
  - Coordinated social functions for the Graduate Student Body.
- Graduate Council Representative, Executive Board, Rensselaer Union* May 2019 - May 2020
  - Prepared and approved the budget for Fiscal Year 2020-21 of the Student Union.
  - Managed the business affairs, approved the hiring and continuance of all administrative personnel and determined the classifications of student clubs and organizations at the Rensselaer Union.
  - Represented 5 clubs in the E-Board.