# Sagar Bhatt

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## Education

- **Rensselaer Polytechnic Institute** Troy, NY
  *Doctor of Philosophy in Mechanical Engineering* *Aug 2022(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*

## Experience

- **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.

## Projects

- **Modeling deformation caused by Phase Transformation from $\beta$ to $\alpha$ in Ti-6Al-4V:** *Feb 2022*
  - Developed and implemented a Finite Element Crystal Plasticity method to model deformation caused by phase transformation from BCC $\beta$ to HCP $\alpha$ during thermal processing in Ti-6Al-4V.
  - Studied impact of plastic relaxation on the driving energy of phase transformation and found it results in an order of magnitude lower strain energy when compared to purely elastic analysis.
  - Demonstrated that for a more accurate model of phase transformation, plastic relaxation must be considered.
- **Finite element modeling of 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.
- **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.
- **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 finite element code using Matlab for 8-node hexahedron elements and a 2D code 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 results from literature.

## Skills

- **Programming:** C++, C, Matlab, Python, MPI, OpenMP, Bash Scripting, Julia
- **Software:** PETSc, Simmetrix, ANSYS, Abaqus, Siemens NX, SolidWorks, CATIA, Autodesk Fusion 360
- **Miscellaneous:** Git, Paraview, LaTeX

## Publications

- **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

## Presentations and Posters

- **S. Bhatt** and A. Maniatty. Numerical modeling of columnar grained nickel microstructure deformation near triple junctions. CMDIS Annual Research Symposium, Center for Materials, Devices, and Integrated Systems, Rensselaer Polytechnic Institute, 2019
- M. Allahua, A. Baskaran, **S. Bhatt**, G. Kane, A. Kekre, R. Hull, D. Lewis, A. Maniatty, and J. Wen. *Poster:* Adaptive control of Ti-6Al-4V evolution during thermomechanical processing. CMDIS Annual Research Symposium, Center for Materials, Devices, and Integrated Systems, Rensselaer Polytechnic Institute, 2019
- **S. Bhatt**, A. Baskaran, D. Lewis, and A. Maniatty. Numerical modeling of Ti-6Al-4V microstructure evolution for thermomechanical process control. NUMIFORM 2019: The 13th International Conference on Numerical Methods in Industrial Forming Processes, 2019
- **S. Bhatt** and A. Maniatty. Numerical modeling of Ti-6Al-4V microstructure evolution for thermomechanical process control. SCOREC CSE Seminar Series, Rensselaer Polytechnic Institute, 2019
- A. Kekre, A. Baskaran, **S. Bhatt**, G. Kane, M. Allahua, D. Lewis, A. Maniatty, J. Wen, and Hull R. *Poster:* Towards integrating multiscale modeling methods with adaptive control of Ti-6Al-4V microstructure during thermomechanical processing. New York Manufacturing Conference 2019, Center for Automation Technologies and Systems, Rensselaer Polytechnic Institute, 2019
- A. Baskaran, **S. Bhatt**, G. Kane, M. Allahua, Z. Huang, D. Lewis, A. Maniatty, J. Wen, and Hull R. *Poster:* Adaptive control of Ti-6Al-4V using adaptive microscale simulator techniques. CMDIS Annual Research Symposium, Center for Materials, Devices, and Integrated Systems, Rensselaer Polytechnic Institute, 2018
- **S. Bhatt**. Physical system modeling and simulation using hpc. CMDIS Annual Research Symposium, Center for Materials, Devices, and Integrated Systems, Rensselaer Polytechnic Institute, 2017

## Awards

- **Argonne Training Program on Extreme Scale Computing (ATPESC):** Selected to participate in a competitive program that provided intensive two-week training on tools and approaches to computational science applications on current and future leadership class computing systems. *Aug 2021*
- **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

- **GRS Assistant, Graduate Research Symposium**, *Rensselaer Polytechnic Institute* *May 2021*
  - Judged presentations, organized and facilitated sessions at the research symposium organized by graduate students at RPI.
  - Chair and Organizer of the networking event component of the symposium.
- **Vice President, Graduate Council**, *Rensselaer Polytechnic Institute* *May 2019 - March 2021*
  - Elected Vice President of the 15 person graduate student council representing 1366 graduate students at RPI.
  - Served as an Executive Board member in the Student Union.
  - 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.