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 β to α in Ti-6Al-4V:** *Feb 2022*
  - Developed and implemented a Finite Element Crystal Plasticity method to model deformation caused by phase transformation from BCC β to HCP α during thermal processing in Ti-6Al-4V.
  - Studied the impact of plastic relaxation on 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 current models of phase transformation need to account for plastic relaxation for more accurate results.
- **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.
- **Parallel preconditioned conjugate gradient solver with compressed row storage:** *Dec 2016*
  - Implemented a conjugate gradient Krylov solver with Jacobi preconditioning.
  - 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. When applied to Laplace equation, this resulted in reduction in matrix storage requirement from 7.2 Terabytes to 60.76 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.