Paritosh S. Mhatre — *Systems Research Engineer*

CONTACT INFORMATION

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RESEARCH INTERESTS

- **Manufacturing Systems Research-** Get acquainted with traditional manufacturing systems and development of advanced manufacturing systems ranging from machine tools, additive and hybrid systems.
- **Electrical Engineering -** Design and integration of custom control systems for novel manufacturing systems. Sensor integration for continued development of such systems.
- **Process Development -** Focused on large scale metal deposition with hot wire laser directed energy deposition process.

EDUCATION

Rochester Institute of Technology, Rochester, New York

Kate Gleason College of Engineering
M.S., Industrial and Systems Engineering, May 2019

Mumbai University, Mumbai, INDIA

Sardar Patel College of Engineering
B.Tech., Mechanical Engineering, May 2014

EXPERIENCE

Oak Ridge National Laboratory, Knoxville, Tennessee

- **Technical Professional Staff Member**
  Robotics & Intelligent Systems Group
  June 2020 - Present

  - Lead design and development of control systems and data acquisition systems for novel manufacturing systems
  - Develop multi-axis motion planning for a large format laser directed energy additive system using a 6-Axis industrial robot
  - Lead sensor integration and commissioning into research and commercially available manufacturing systems

- **Post-Master's Research Associate**
  Manufacturing Systems Research Group
  June 2019 - May 2020

  - Developed testbed software to implement a strategy for manipulating laser DED process parameters to achieve dynamic bead geometry. The technique was later incorporated in ORNL Slicer 2 software
  - Lead the electrical and software development of custom data acquisition systems
  - Designed experiments for developing process parameters for stable printing of multiple alloys with laser directed energy deposition process

- **Advanced Short Term Research Opportunity (ASTRO)**
  Manufacturing Systems Research Group
  October 2018 - April 2019

– Assisted with the development of electrical systems and motion planning for Infrastructure Additive Manufacturing, a new method of manufacturing structures of massive scale

Rochester Institute of Technology, Rochester, New York

- **Graduate Research Assistant**
  Center for Additive Manufacturing and Multifunctional Printing
  May 2017 - September 2018

  – Graduate Thesis: Developed a novel 4-Axis additive manufacturing/3D printing process, capable of utilizing multiple extruders for concurrent printing at higher deposition rate. Designed a process algorithm and implemented it using a Perl based post-processing script for toolpath generation. Also developed a MATLAB based toolpath simulator for verification of the G-code

Larsen & Toubro Hydrocarbon Engineering, Mumbai, INDIA

- **Project Planning & Controls Engineer**
  July 2014 - July 2016

  – Developed and monitored the project plan for design, execution, installation of offshore Oil & Gas facilities as part of the project management team

NOTABLE
PROJECTS

Concrete Base Machine Tool
ORNL is developing the world's first machine tool utilizing a 3D printed based filled with concrete, to investigate an alternative option to standard cast iron and steel weldment base.The 3 Axis machine tool demonstrates high damping and stiffness can be achieved using the concrete base construction at reduced cost and lead time.

Role: Design Engineer
- Lead the design, fabrication and commissioning of the electrical system for the 3-Axis system
- Continued support for addition of sensors to the system for increasing machine functionality

GKN Hot-wire Laser Directed Energy Large Format Deposition
ORNL is developing large format hot-wire laser directed energy deposition process in collaboration with GKN Aerospace. The research effort is focused on reducing the buy-to-fly ratio by building near-net preforms for aerospace parts, which frequently utilise expensive and tough alloys. The primary areas of research include control system development, metallurgy study and modelling and simulations.

Role: Controls Engineer
- Developed testbed software to evaluate new control strategies and motion planning, which were later incorporated in ORNL Slicer 2
- Design experiments to develop process parameters for stable deposition of new alloys

Additive Manufacturing - Compression Molding (AM-CM) System
Additive Manufacturing-Compression Molding (AM-CM), a new manufacturing process developed at ORNL combines the advantage of high fiber alignment possible in AM-printed parts with low porosity from traditional CM, which improves bead-to-bead

interfaces of the polymer composites. This high fiber alignment and low porosity is expected to provide exceptional mechanical properties as compared to traditional manufacturing processes. Additionally, the process can utilize multiple materials to introduce additional capabilities such as over-molding, selective reinforcement, and embedding electrically conductive pathways.

Role: Design Engineer
- Developed a novel multi-modal system to integrate the safety systems of the 6-Axis industrial robot used for deposition with the 500T compression molding press for independent and tandem modes of operation.

Sky BAAM - Cable Driven Large Scale AM
ORNL is developing a new, large format 3D printer that uses a cable driven mechanism rather than a Cartesian gantry. Initial scope is to build a test system with a 5'x5'x5' build volume that will enable the study of the dynamic motion capability of this platform at infrastructure scale.

Role: Intern
- Assisted in design and commissioning of electrical system
- Develop motion planning strategy to achieve constant velocity approximation at the corners

Patents and Invention Disclosures

Patent Filed US-17/478,842, "Site-Specific Melt Pool Size Control in Additive Manufacturing" Brian T. Gibson, Bradley Scott Richardson, Lonnie J. Love, **Paritosh Mhatre**, Michael Borish.

Publications

Borish, Michael,, Brian Gibson, Cameron Adkins, **Paritosh Mhatre**. "Automated Process Planning for Embossing and Functionally Grading Materials via Site-Specific Control in Large-Format Metal-Based Additive Manufacturing." Materials 15.12 (2022): 4152.

Honeycutt, Andrew, **Paritosh Mhatre**, Brian Gibson, Scott Smith, and Brad Richardson. "Iterative hybrid manufacture of a titanium alloy component." Manufacturing Letters 29 (2021): 90-93.

Billah, Kazi Md Masum, Jesse Heineman, **Paritosh Mhatre**, Alex Roschli, Brian Post, Vipin Kumar, Seokpum Kim et al. "Large-scale additive manufacturing of self-heating molds." Additive Manufacturing 47 (2021): 102282.

Saylor, Ryan, Peter L. Wang, Mark Bevelhimer, Peter Lloyd, Jesse Goodwin, Robert Laughter, David Young, Dustin Sterling, **Paritosh Mhatre**, Celeste Atkins. "Creation of a prototype biomimetic fish to better understand impact trauma caused by hydropower turbine blade strikes." PeerJ Materials Science 3 (2021): e16.

Gibson, Brian T., **Paritosh Mhatre**, Michael C. Borish, Justin L. West, Emma D. Betters, Scott S. Smith, Bradley S. Richardson et al. "Accelerating Large-Format Metal Additive Manufacturing: How Controls R&D Is Driving Speed, Scale, and Efficiency." In ASME International Mechanical Engineering Congress and Exposition, vol. 84485, p. V02AT02A038. American Society of Mechanical Engineers, 2020.

Chesser, Phillip, Brian Post, Randy Lind, Alex Roschli, Celeste Atkins, Alex Boulger, **Paritosh Mhatre**, and Peter Lloyd. SkyBAAM Large-Scale Fieldable Deposition

Platform System Architecture. Oak Ridge National Lab.(ORNL), Oak Ridge, TN (United States), 2019.

Boulger, Alex, Robert Laughter, Andrew Rhodes, **Paritosh Mhatre**, Nikolaos Tsiamis, Christopher Hershey, Stian Romberg, John Lindahl, and Vlastimil Kunc. Large-Scale Thermoset Pick and Place Testing and Implementation. Oak Ridge National Lab.(ORNL), Oak Ridge, TN (United States), 2019.

Paritosh Mhatre. Process Planning for Concurrent Multi-nozzle 3D Printing. Rochester Institute of Technology, 2019.

Technical Reports

Brian Gibson, **Paritosh Mhatre**, John Potter, Andrzej Nycz, Joshua Vaughan. Laser Hot-Wire Directed Energy Deposition of 316L Stainless Steel Cylinder and Nozzle Geometries

Yousub Lee, Srdjan Simunovic, Brian Gibson, Brad Richardson, **Paritosh Mhatre**, Alex Roschli. Modeling of Microstructure Evolution in Wire-Based Laser Direct Energy Deposition with Ti-6Al-4V

Brian Gibson, **Paritosh Mhatre**, Brad Richardson. Comparison of Control Systems for GKN LMD-w Deposition Cells 1 and 2 at the Manufacturing Demonstration Facility

Brad Richardson, Celeste Atkins, Brian Gibson, **Paritosh Mhatre**. GKN Cell 1 Modifications

Technical Skills

Experience focused in the advancement in additive manufacturing and other advanced manufacturing techniques through system design

- **Engineering Software:** Matlab, LabVIEW, Solidworks - Mechanical/Electrical, CATIA, AutoCAD, Insight, ORNL Slicer, Geomagics Control X, DipTrace

References

Available upon request