

# Nikhil Gotawala

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## RESEARCH INTERESTS

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- Coupled numerical modeling
- Microstructure evolution in material process
- Additive manufacturing
- Computational material science
- Microstructure characterization
- Additive friction stir deposition

## EDUCATION

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### Ph.D., Mechanical Engineering

Indian Institute of Technology (IIT) Bombay, Mumbai, India

Jan 2017 – Dec 2021 | CGPA: 9.0/10

Dissertation: *Numerical modeling and microstructure evolution in friction stir welding of dissimilar materials*

Advisor: Prof. Amber Shrivastava

### M.Tech, Mechanical Engineering

Sardar Vallabhbhai National Institute of Technology (SVNIT), Surat, India

Jul 2014 – Jun 2016 | CGPA: 9.25/10

### B.E., Mechanical Engineering

Government Engineering College, Surat, India

Jul 2009 – Jun 2013 | CGPA: 7.53/10

## POSTDOCTORAL RESEARCH

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### Postdoctoral Researcher

Department of Materials Science and Engineering, Virginia Tech, USA

Mar 2022 – Present

Supervisor: Prof. Hang Yu

- Developed 3D CFD-based thermo-mechanical model for additive friction stir deposition.
- Predicted material flow path and thermo-mechanical properties (strain rate, temperature, stress).
- Assisted in material characterization and supported industrial projects.
- Guided Ph.D. and M.S. students in data acquisition and analysis.

## RESEARCH EXPERIENCE

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### Research Assistant

National Centre for Aerospace Innovation and Research (NCAIR), IIT Bombay  
Jul 2016 – Dec 2016

- Investigated friction effects on hot working of titanium alloy using Gleeble 3800 system.

### Ph.D. Research

IIT Bombay, India

- Developed a coupled CFD and VOF-based model for dissimilar FSW.
- Modeled phase transformations, IMC growth using diffusion and thermodynamic analysis.
- Characterized microstructure evolution in FSW and FSP.

## TEACHING EXPERIENCE

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### Teaching Assistant (TA)

Department of Mechanical Engineering, IIT Bombay  
2017 – 2021

- Assisted in ME338 (Manufacturing Process II): prepared tutorials, exams.
- Lead TA in ME213 (Manufacturing Practice Lab): taught CNC programming and simulator.

## JOURNAL PUBLICATIONS

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- **Nikhil Gotawala**, Abhishek Wadighare, and Amber Shrivastava. "Phase transformation during friction stir processing of dual-phase 600 steel." *Journal of Materials Science* 55, no. 10 (2020): 4464-4477. <https://doi.org/10.1007/s10853-019-04270-5>
- **Nikhil Gotawala**, and Amber Shrivastava. "Microstructural analysis and mechanical behavior of SS 304 and titanium joint from friction stir butt welding." *Materials Science and Engineering: A* 789 (2020): 139658. <https://doi.org/10.1016/j.msea.2020.139658>
- **Nikhil Gotawala**, and Amber Shrivastava. "Analysis of material distribution in dissimilar friction stir welded joints of Al 1050 and copper." *Journal of Manufacturing Processes* 57 (2020): 725-736. <https://doi.org/10.1016/j.jmapro.2020.07.043>
- **Nikhil Gotawala**, Abhishek Kumar, Sushil Mishra, and Amber Shrivastava. "Microstructure and texture evolution of complete Mg-3Al-0.2 Ce alloy blanks upon multi-pass friction stir processing with spiral strategy." *Materials Today Communications* (2020): 101850. <https://doi.org/10.1016/j.mtcomm.2020.101850>
- **Nikhil Gotawala**, and Amber Shrivastava. "Investigation of interface microstructure and mechanical properties of rotatory friction welded dissimilar aluminum-steel joints." *Materials Science and Engineering: A* (2021): 141900. <https://doi.org/10.1016/j.msea.2021.141900>
- **Nikhil Gotawala**, and Amber Shrivastava. "Thermodynamics-based analysis of formation and growth of FeTi and  $\beta$ -Ti during friction stir welding of SS304 and pure titanium." *Journal of Materials Science* (2021): 1-19. <https://doi.org/10.1007/s10853-021-06491-z>
- **Nikhil Gotawala**, Neeraj Kumar Mishra, and Amber Shrivastava. "Solid-state depositions of multilayer SS304 by friction stir metal deposition." *Materials Letters* 314 (2022): 131881. <https://doi.org/10.1016/j.matlet.2022.131881>

- **Nikhil Gotawala**, and Amber Shrivastava. "X-ray tomography and characterization of dissimilar interface revealing the interplay of intermetallics, interlocking, and voids on joint strength of Al6061 and AZ31Mg dissimilar friction stir welds." *CIRP Journal of Manufacturing Science and Technology* 44 (2023): 70-81. <https://doi.org/10.1016/j.cirpj.2023.05.002>
- **Nikhil Gotawala**, and Hang Z. Yu. "Material flow path and extreme thermomechanical processing history during additive friction stir deposition." *Journal of Manufacturing Processes* 101 (2023): 114-127. <https://doi.org/10.1016/j.jmapro.2023.05.095>
- Abhishek Kumar, **Nikhil Gotawala**, Sushil Mishra, and Amber Shrivastava. "Defects, microstructure and mechanical behaviour upon multi-pass friction stir processing of magnesium alloy with spiral tool path." *CIRP Journal of Manufacturing Science and Technology* 32 (2021): 170-178. <https://doi.org/10.1016/j.cirpj.2020.12.006>
- R. Joey Griffiths, **Nikhil Gotawala**, Greg D. Hahn, David Garcia, and Hang Z. Yu. "Towards underwater additive manufacturing via additive friction stir deposition." *Materials & Design* 223 (2022): 111148. <https://doi.org/10.1016/j.matdes.2022.111148>
- Zhu, Yunhui, Xiaofeng Wu, **Nikhil Gotawala**, David M. Higdon, and Z. Yu Hang. "Thermal prediction of additive friction stir deposition through Bayesian learning-enabled explainable artificial intelligence." *Journal of Manufacturing Systems* 72 (2024): 1-15. <https://doi.org/10.1016/j.jmsy.2023.10.015>
- Greg D. Hahn, Kendall P. Knight, **Nikhil Gotawala**, and Hang Z. Yu. "Additive Friction Stir Deposition of AA7050 Achieving Forging-Like Tensile Properties" *Materials Science and Engineering: A*, <https://doi.org/10.1016/j.msea.2024.146268>
- Gottwald, Ryan B., **Nikhil Gotawala**, Donald J. Erb, and Z. Yu Hang. "An exploratory study on miniaturized additive friction stir deposition." *Journal of Manufacturing Processes* 126 (2024): 154-164. <https://doi.org/10.1016/j.jmapro.2024.07.076>
- Wu, Xiaofeng, Abhishek Rastogi, **Nikhil Gotawala**, Mark A. Pandol, Yunhui Zhu, and Hang Z. Yu. "Shear-driven solid-state additive manufacturing of aerospace aluminum on impurity contaminated surfaces." *Materials & Design* (2025): 114312. <https://doi.org/10.1016/j.matdes.2025.114312>

## CONFERENCE PUBLICATIONS

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- **Nikhil Gotawala**, and Amber Shrivastava. "Investigation of interfacial diffusion during dissimilar friction stir welding." In *Friction Stir Welding and Processing X*, pp. 109-119. Springer, Cham, 2019. [https://doi.org/10.1007/978-3-030-05752-7\\_11](https://doi.org/10.1007/978-3-030-05752-7_11)
- **Nikhil Gotawala**, and Amber Shrivastava. "Analysis of Al 6061 and Mild Steel Joints from Rotary Friction Welding." In *TMS 2021 150th Annual Meeting & Exhibition Supplemental Proceedings*, pp. 669-678. Springer International Publishing, 2021. [https://doi.org/10.1007/978-3-030-65261-6\\_60](https://doi.org/10.1007/978-3-030-65261-6_60)
- **Nikhil Gotawala**, and Amber Shrivastava. "Effect of Diffusion on Intermetallics at Interface During Friction Stir Welding of Stainless Steel and Pure Titanium." In *Friction Stir Welding and Processing XI*, pp. 135-146. Springer International Publishing, 2021. [https://doi.org/10.1007/978-3-030-65265-4\\_13](https://doi.org/10.1007/978-3-030-65265-4_13)
- Abhishek Kumar, **Nikhil Gotawala**, Aarush Sood, Sushil Mishra, and Amber Shrivastava. "Experimental Investigation of Raster Tool Path Strategy for Friction Stir Processing of Magnesium Alloy." In *Magnesium Technology 2020*, pp. 341-346. Springer, Cham, 2020. [https://doi.org/10.1007/978-3-030-36647-6\\_51](https://doi.org/10.1007/978-3-030-36647-6_51)
- Abhishek Kumar, Aarush Sood, **Nikhil Gotawala**, Sushil Mishra, and Amber Shrivastava. "Friction Stir Processing of Magnesium Alloy with Spiral Tool Path Strategy." In *Magnesium Technology 2020*, pp. 197-205. Springer, Cham, 2020. [https://doi.org/10.1007/978-3-030-36647-6\\_31](https://doi.org/10.1007/978-3-030-36647-6_31)
- **Nikhil Gotawala**, and Amber Shrivastava. "Microstructure and texture analysis of dissimilar friction stir welded AZ31 mg and Al 6061 Joint." In *Magnesium Technology 2022*, pp. 191-196. Cham: Springer International Publishing, 2022. [https://doi.org/10.1007/978-3-030-92533-8\\_32](https://doi.org/10.1007/978-3-030-92533-8_32)
- **Nikhil Gotawala**, Neeraj Kumar Mishra, and Amber Shrivastava. "Microstructure Evolution and Mechanical Properties of Friction Stir Metal Deposited SS304." In *TMS 2022 151st Annual*

## HONORS & AWARDS

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- Best Poster Presentation, NMD-ATM 2019
- Hands-on Process Award, TMS 2019 (“Talwar”)
- Annual Progress Seminar Award, IIT Bombay (Ph.D. Year 2)
- TA Scholarship, IRCC IIT Bombay (2017–2021)
- MHRD Scholarship for M.Tech (2014–2016)

## PROFESSIONAL SERVICE

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- Peer Reviewer: *Journal of Manufacturing Processes*, *Materials Letters*, *Scientific Reports*, *CIRP J. of Manufacturing Science and Technology*, *Materialia*, *Materials Today Communications*, *Metallurgical and Materials Transactions A*, *Advances in Materials and Processing Technologies*, *Progress in Additive Manufacturing*

## TECHNICAL SKILLS

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- **Software:** Matlab, Abaqus, AutoCAD, ImageJ, 3D Slicer, MTEX, TSL OIM, HKL
- **Experimental:** SEM, EBSD, TKD, EDS, XRD (2-theta, bulk texture), CNC machining, Optical & Digital Microscopy

## REFERENCES

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### **Prof. Hang Yu**

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### **Prof. Amber Shrivastava**

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