

SHASHANK RAMESH

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EDUCATION

The University of Notre Dame Notre Dame, IN
Ph.D. Candidate, Aerospace and Mechanical Engineering May 2027
Research Areas: Computational robot design, kinematics and control
Dissertation: *AI Enhanced Ellipse Synthesis of Robot Mechanisms for Grasping and Manipulation*
Advisor: Dr. Mark Plecnik

Indian Institute of Technology Madras Chennai, India
Masters in Robotics, Mechanical Engineering July 2021
Thesis: *Singularity Analysis of Parallel Manipulators with Applications to Design and Path Planning*
Advisor: Dr. Sandipan Bandyopadhyay

Indian Institute of Technology Madras Chennai, India
B. Tech, Mechanical Engineering July 2021
CGPA: 9.49/10

JOURNAL PUBLICATIONS

S. Ramesh, T. Girard and M. Plecnik, "A Simple Compliant Gripper That Reconfigures Between Sensing and Grasping Modes," *IEEE Robotics and Automation Letters (RAL)*, vol. 11, no. 3, pp. 3796-3803, March 2026, doi: 10.1109/LRA.2026.3662656 2026

S. Ramesh and M. Plecnik, "A Direct-drive Five-bar Manipulator with Tuned Directional First-order Kinematics for Low Energy Consumption in Vertical Loading," *International Journal for Robotics Research (IJRR)*, vol. 44, no. 2, pp. 317-338, 2024, doi:10.1177/02783649241266852 2025

A. M. Kolte, S. Ramesh, and S. Bandyopadhyay, "Analytical derivation of singularity-free tubes in the constant-orientation workspace of 6-6 Stewart platform manipulators," *Robotica*, vol. 42, no. 11, pp. 3839-3866, 2024, doi:10.1017/S026357472400167X 2024

P. Golla, S. Ramesh, S. Bandyopadhyay, "Kinematics of the Hybrid 6-Axis (H6A) manipulator," *Robotica*, vol. 41, no. 8, pp. 2251-2282, 2023, doi:10.1017/S0263574723000334 2023

N. Govindan, S. Ramesh and A. Thondiyath, "Design of a Variable Stiffness Joint Module to Quickly Change the Stiffness and to Reduce the Power Consumption," *IEEE Access*, vol. 8, pp. 138318-138330, 2020, doi: 10.1109/ACCESS.2020.3012031. 2020

CONFERENCE PROCEEDINGS

- S. Ramesh, & M. Plecnik, "Ellipse Synthesis of the Planar Five-bar Mechanism Using Tandem Neural Networks." *Proceedings of the ASME 2026 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*. Houston, Texas, USA. August 23–26, 2026. (Under Review) 2026
- S. Ramesh, & M. Plecnik, "Ellipse Synthesis of the Planar 2R Using Convolutional Neural Networks." *Proceedings of the ASME 2025 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Volume 5: 21st IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications (MESA); 49th Mechanisms and Robotics Conference (MR)*. Anaheim, California, USA. August 17–20, 2025. V005T08A015. ASME. <https://doi.org/10.1115/DETC2025-169741> 2025
- S. Ramesh and M. Plecnik, "A Direct-Drive Gripper Designed by Ellipse Synthesis Across Two Output Modes," 2025 IEEE International Conference on Robotics and Automation (ICRA), Atlanta, GA, USA, 2025, pp. 16478-16484, doi: 10.1109/ICRA55743.2025.11127705. 2025
- S. Ramesh, P. M. Wensing and M. Plecnik, "Output Mode Switching for Parallel Five-bar Manipulators Using a Projection-based Direct Collocation Method," 2024 6th International Conference on Reconfigurable Mechanisms and Robots (ReMAR), Chicago, IL, USA, 2024, pp. 1-8, doi: 10.1109/ReMAR61031.2024.10617557. 2024
- S. Ramesh, M. Plecnik, "Synthesizing the Transmission Properties of a Five-Bar Linkage by Shaping Workspace Bounds," In: Lenarčič, J., Husty, M. (eds) *Advances in Robot Kinematics 2024*, Springer Proceedings in Advanced Robotics, vol 31. Springer, Cham. doi: 10.1007/978-3-031-64057-5_21 2024
- N. Govindan, S. Ramesh and A. Thondiyath, "A new gripper that acts as an active and passive joint to facilitate prehensile grasping and locomotion," 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Kyoto, Japan, 2022, pp. 1425-1431, doi: 10.1109/IROS47612.2022.9981475. 2022
- S. Ramesh, P. Golla, P. K. Prasad, S. Bandyopadhyay, "Forward Kinematics of a Novel 6-DoF Spatial Hybrid Manipulator," In: Altuzarra, O., Kecskeméthy, A. (eds) *Advances in Robot Kinematics 2022*, Springer Proceedings in Advanced Robotics, vol 24. Springer, Cham. doi: 10.1007/978-3-031-08140-8_20 2022

INVITED LECTURES

- S. Ramesh, "Introduction to Image Regression and Tandem Neural Networks," Scientific Artificial Intelligence (SAI) Spark Tutorials by the University of Notre Dame and Pontifical Catholic University of Chile, Santiago, Chile, Jan 26-28, 2026 2026
- S. Ramesh, "Introduction to Image Regression using Convolutional Neural Networks," Winter/Summer School on Scientific Artificial Intelligence jointly sponsored by the 2026

University of Notre Dame and Pontifical Catholic University of Chile, Santiago, Chile,
Jan 26-28, 2026

GRANTS & FELLOWSHIPS

Scientific Artificial Intelligence (SAI) Fellowship, Aug 2025 – Dec 2025
Notre Dame SAI Initiative

HONORS & AWARDS

Dr. Susan Calvin award for securing 1st rank in Masters 2020-21 2018
Ms. Pattamal Viswanathan award for securing the highest CGPA as an undergraduate 2017

RESEARCH & TECHNICAL EXPERIENCE

University of Notre Dame Notre Dame, IN
Graduate Research Assistant, Department Name July 2022 – Present

- Developed tandem neural network models using NVIDIA A100 GPU in PyTorch to generate multiple robot designs that meet the design requirements with up to ~96% accuracy
- Designed a novel multimodal robotic gripper using interior point optimization method to apply up to 3 kg grip force and sense 100 g force from motor currents without additional force sensors
- Mentored an undergraduate researcher in the design and fabrication of a fruit picking gripper that could estimate ripeness with up to ~90% accuracy solely from motor current feedback
- Built a C++ package for trajectory control of a five-bar manipulator with a Python GUI for dynamic visualization of feedback data
- Invented a novel high payload manipulator by biasing its transmission properties to carry 3.75x payload while consuming 3.7x less energy compared to a conventional manipulator

General Motors Warren, MI
Research Intern, Energy Propulsion Systems Research Lab May 2024 – Aug 2024

- Collaborated with researchers at General Motors to devise a novel mechanism that improves EV battery life by 6%, currently filed for a U.S. patent
- Developed a MATLAB framework for simulating battery packs with approximate cell models and used it to optimize the arrangement of cells leading to 7% improvement in energy efficiency

Indian Institute of Science Bangalore, India
Project Assistant, Robert Bosch Center for Cyber Physical Systems Aug 2021 – June 2022

- Programmed a C++ ROS node for trajectory planning of quadruped feet to control body pose while standing
- Collaborated with the electrical and mechanical team to deploy and test a body pose controller on the quadruped robot

Indian Institute of Technology Madras Chennai, India
Masters Thesis Researcher, Department of Engineering Design May 2020 – Aug 2021

- Analyzed the kinematics and identified singularities of a hybrid 6-axis robot for medical and surgical operations
- Performed singularity-free path planning for a Stewart platform manipulator using NSGA-II genetic algorithm in C++

Undergraduate Researcher, Department of Engineering Design Oct 2018 – Jul 2020

- Computed motor trajectories for a brachiator robot using direct collocation in MATLAB OptimTraj library
- Designed a novel cam-based variable stiffness actuator that can quickly change compliance during collaborative manipulation

TEACHING EXPERIENCE

University of Notre Dame Notre Dame, IN

Teaching Assistant, Aerospace and Mechanical Engineering July 2022 - Present

- Taught the concept of degrees of freedom to a class of 81 senior undergraduate students spanned for 50 minutes
- Conducted office hours for undergraduates discussing linear system analysis and resolving queries on assignments
- Guided 5+ students per shift at the machine shop on machining precise workpieces using lathe, mill, and drill press

Indian Institute of Technology Madras Chennai, India

Teaching Assistant, Department of Engineering Design Aug 2020 – Dec 2020

- Assisted students in learning Mathematica software for analyzing the kinematics and dynamics of robots
- Guided students in solving problems on robot kinematics and evaluated their assignments

ACADEMIC SERVICE & LEADERSHIP

2025 Indiana VEX Robotics Championship, Middle School IQ Judge Mar 2025

- Collaborated with fellow judges to select best teams with high performing robots to compete at the national level
- Evaluated over 10 teams and awarded accolades based on robot design, creativity, teamwork and professionalism

Northern Indiana Regional Science & Engineering Fair (NIRSEF), Senior Judge Feb 2024

- Provided constructive feedback to students to help them gain more knowledge and guide their future work
- Collaborated actively with fellow judges to determine awards for outstanding projects in robotics and engineering

International Conference on Intelligent Robots and Systems (IROS), Volunteer Oct 2023

- Assisted the registration desk by issuing ID cards and providing guidance on conference procedures to 100+ attendees

- Facilitated seamless interaction between the plenary speaker and audience by streamlining the questions and comments

Undergraduate Robotics Team, Electronics & Finance Lead

Aug 2018 – Jun 2019

- Spearheaded the electronics team of 8 members and developed a Mars Rover for international college competitions
- Directed the team towards innovating novel mechanisms by doubling the funds allocated to the R&D sector

CERTIFICATES

- Advanced Learning Algorithms, DeepLearning.AI, Stanford University, Dec 2023
- Supervised Machine Learning: Regression and Classification, DeepLearning.AI, Stanford University, Nov 2023
- Workshop instructor for CAD Modelling in Fusion 360, Mechanical, IIT Madras, Mar 2019

TECHNICAL SKILLS

Programming & Simulation: MATLAB, Wolfram Mathematica, Python, C/C++

Experimental & Laboratory Techniques: 3D printing, mechanical fabrication and testing

Design & Fabrication: CAD, SolidWorks, Autodesk, Eagle PCB design

Data & Analysis Tools: PyTorch, NumPy, Pandas, TensorFlow