

# Omey M. Manyar

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## Research Interests

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Robot Learning; Robotic Manipulation; Motion Planning; Learning from Demonstration; Reinforcement Learning; Physics-based Simulation; Computer Vision

## Education

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<b>University of Southern California</b> <i>Ph.D. in Mechanical Engineering</i>	May 2021 – May 2025 (Expected) Los Angeles, CA
<b>University of Southern California</b> <i>Master of Science in Mechanical Engineering</i>	Aug. 2019 – May 2021 Los Angeles, CA
<b>National Institute of Technology Karnataka</b> <i>Bachelor of Technology in Mechanical Engineering</i>	Jul. 2012 – May 2016 Surathkal, India

## Experience

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<b>Graduate Research Fellow</b> <i>Advisor: Dr. S. K. Gupta. Realization of Robotics Systems Lab, USC</i>	May 2021 – Present Los Angeles, CA
<ul style="list-style-type: none"><li>Devised a learning methodology to model expert behavior from sparse demonstrations for sequential planning problems for an autonomous agent</li><li>Designed a framework to generate physics-informed synthetic images for training a ResNet-50-based segmentation model in Pytorch to detect wrinkles and folds in a sheet. Link: <a href="#">code</a> and <a href="#">dataset</a></li><li>Analyzed the use of differentiable simulators for robotic manipulation of compliant objects (sheets)</li></ul>	
<b>Graduate Research Assistant</b> <i>Advisor: Dr. S. K. Gupta. Center for Advanced Manufacturing, USC</i>	Jan. 2020 – May 2021 Los Angeles, CA
<ul style="list-style-type: none"><li>Project lead for development of a multi-robot system for automation of composite sheet layup in collaboration with ARM Institute, Lockheed Martin and Boeing Inc</li><li>Devised a multi-constraint sheet grasping planner for robots using a high fidelity physics based simulator</li><li>Integrated multiple software modules developed in C++, Java and Python with ROS to accomplish a system that reduced cycle time by 30%</li></ul>	
<b>Automation Technologist</b> <i>Rolls-Royce Plc.</i>	Jan. 2018 – Jul. 2019 Singapore
<ul style="list-style-type: none"><li>Seconded from Nanyang Technological University for leading the technological development in advanced robotics at the manufacturing facility of Rolls Royce</li><li>Spearheaded the deployment of an AI-based smart predictive tool for surface finishing processes</li><li>Developed a collaborative robotic solution that improved Cpk value of filleting operations to 1.98</li></ul>	
<b>Graduate Engineer</b> <i>General Motors India Pvt. Ltd.</i>	Aug. 2016 – Jul. 2017 Bengaluru, India
<ul style="list-style-type: none"><li>Streamlined robotic welding process in the body shop unit of the manufacturing facility of GM India</li><li>Created an investment forecasting tool with savings of 25% for Global Vehicle Development Program at Level 0</li><li>Formulated a dealership improvement strategy, focusing towards customer satisfaction in the west zone of GM India</li></ul>	
<b>Summer Undergraduate Researcher</b> <i>Advisor: Dr. Howie Choset. Biorobotics Lab, Carnegie Mellon University</i>	May 2015 – Aug. 2015 Pittsburg, PA
<ul style="list-style-type: none"><li>Designed a compliant gripper based on pseudo-rigid body modelling technique for snake robots</li></ul>	

## Honors and Awards

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- Best Conference Paper Award. *Won the conference wide best paper award at the 42nd ASME's IDETC-CIE Conference 2022*
- Viterbi Graduate School Fellowship. *Recipient of the Viterbi Graduate School Fellowship awarded to selected Ph.D. students by the Viterbi School of Engineering, USC*
- Academic Excellence Award. *Given to the best outgoing Master of Science student by the Aerospace and Mechanical Engineering Department at the Viterbi School of Engineering, USC*
- National Science Foundation Travel Award. *Awarded at ASME MSEC Conference in 2022 and 2021, ASME IDETC-CIE 2022 and 2021*

## List of Publications

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- **Omey M. Manyar**, Zachary McNulty, Stefanos Nikolaidis, and S. K. Gupta. Inverse Reinforcement Learning Framework for Transferring Task Sequencing Policies from Humans to Robots in Manufacturing Applications. *IEEE's International Conference on Robotics and Automation, London, UK, May 2023. (Accepted for Publication)*
- **Omey M. Manyar**, Junyan Cheng, Reuben Levine, Vihan Krishnan, Jernej Barbic and Satyandra K. Gupta. (November 22, 2022). Physics Informed Synthetic Image Generation for Deep Learning based Detection of Wrinkles and Folds. *ASME. Journal of Computing and Information Sciences and Engineering*. doi: <https://doi.org/10.1115/1.4056295>
- **Omey M. Manyar**, Junyan Cheng, Reuben Levine, Vihan Krishnan, Jernej Barbic and Satyandra K. Gupta. Synthetic Image Assisted Deep Learning Framework for Detecting Defects During Composite Sheet Layup. *ASME IDETC-CIE Conference, St. Louis, MO, USA, August 2022. Best Paper Award*
- **Omey M. Manyar**, Alec Kanyuck, Bharat Deshkulkarni and Satyandra K. Gupta. Visual Servo-Based Trajectory Planning for Fast and Accurate Sheet Pick and Place Operations. *ASME MSEC, Purdue University, IN, USA, June 2022*
- Yi-Wei Chen, Rex Jomy Joseph, Alec Kanyuck, Shahwaz Khan, Rishi Malhan, **Omey M. Manyar**, Zachary McNulty, Bohan Wang, Jernej Barbic, and S. K. Gupta. A Digital Twin for Automated Layup of Prepreg Composite Sheets. *ASME Journal of Manufacturing Science and Engineering, September 2021*. <https://doi.org/10.1115/1.4052132>
- **Omey M. Manyar**, Jaineel Desai, Nimish Deogaonkar, Rex Jomy Joesph, Rishi Malhan, Zachary McNulty, Bohan Wang, Jernej Barbic, and S. K. Gupta. A Simulation-Based Grasp Planner for Enabling Robotic Grasping during Composite Sheet Layup. *IEEE's International Conference on Robotics and Automation, Xi'an, China, May 2021*. <https://doi.org/10.1109/ICRA48506.2021.9560939>
- Vigneashwara Pandiyana, Tegoeh Tjahjowidodo, Wahyu Caesarendra, **Omey M. Manyar** and David Then. In-process virtual verification of weld seam removal in robotic abrasive belt grinding process using deep learning. *Robotics and Computer Integrated Manufacturing Journal, Volume 57, June 2019*. <https://doi.org/10.1016/j.rcim.2019.01.006>
- Srinivasan Lakshminarayanan, **Omey M. Manyar**, Domenico Campolo. Toolpath Generation for Robot Filletting. Advanced Surface Enhancement. INCASE 2019, Singapore. [https://doi.org/10.1007/978-981-15-0054-1\\_28](https://doi.org/10.1007/978-981-15-0054-1_28)

## Projects

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- Multi-Robot Cell for Automation of Composite Layup** | Project Link Nov. 2020 – Sep. 2021
- Developed a multi-robot cell accomplishing sheet grasping/manipulation, sheet transport, sheet heating and sheet draping task
  - Developed vision-based defect detection system for contingency planning for robotic manipulation of sheet
  - Work was done in collaboration with ARM Institute and Lockheed Martin
- Human-Robot Teaming for Sheet Manipulation Task** | Video Link Jan. 2020 – Oct. 2020
- Developed a hybrid cell demonstrating the use of robots as assistants in sheet manipulation tasks on an industrial application
  - Integrated multiple software modules developed in C++, Java and Python with ROS to accomplish a system that reduced cycle time by 30%
- COVID-19 Disinfection Robot- ADAMMS-UV** | Forbes Link, Viterbi News Link Apr. 2020 – May 2020
- Extended a mobile manipulator platform to perform deep UV disinfection of indoor environments autonomously
  - Examined varied methods that can be deployed for sterilizing surfaces exposed to the coronavirus

## Technical Skills

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**Programming:** Python, C/C++, Java, MATLAB

**Libraries and Frameworks:** ROS, PyTorch, Tensorflow, OpenAI Gym, MoveIt, OpenCV, Open3D

**Simulators:** VegaFEM, WeBots, Gazebo, Unity, MuJoCo

**Robots:** KUKA LBR iiwa, ABB, UR5, Yaskawa

**Developer Tools:** Git, Docker, CUDA

## Leadership and Involvement

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**Viterbi CURVE Fellowship Mentor:** Mentored Undergraduate CURVE Fellowship Recipients

**Reviewer and Session Chair:** RAL (2023), ICRA (2023, 2022), IDETC-CIE (2022)