

# Omey M. Manyar

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## Research Interests

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

## Education

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<b>University of Southern California</b> <i>Ph.D. in Mechanical Engineering (Robotics)</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>Applied Science Intern</b> <i>Amazon Robotics</i>	May 2023 – Aug. 2023 Seattle, WA
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- Worked in the stow manipulation team focused towards perception for automation of package handling task (Link)

<b>Graduate Research Fellow</b> <i>Advisor: Dr. S. K. Gupta. Realization of Robotics Systems Lab, USC</i>	May 2021 – Present Los Angeles, CA
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- Devised an inverse reinforcement learning-based methodology to model expert behavior from sparse demonstrations for sequential planning problems for an autonomous agent
- 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 sheets with a test mAP of 0.98. Link: code and dataset
- Performed parameter estimation of differentiable simulators for robotic manipulation of compliant objects (sheets)

<b>Automation Technologist</b> <i>Rolls-Royce Plc.</i>	Jan. 2018 – Jul. 2019 Singapore
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- Seconded from Nanyang Technological University for leading the technological development in advanced robotics at the manufacturing facility of Rolls Royce
- Spearheaded the deployment of an AI-based smart predictive tool for surface finishing processes
- Developed a collaborative robotic solution that improved Cpk value of filleting operations to 1.98

<b>Graduate Engineer</b> <i>General Motors India Pvt. Ltd.</i>	Aug. 2016 – Jul. 2017 Bengaluru, India
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- Streamlined robotic welding process in the body shop unit of the manufacturing facility of GM India
- Created an investment forecasting tool with savings of 25% for Global Vehicle Development Program at Level 0
- Formulated a dealership improvement strategy, focusing towards customer satisfaction in the west zone of GM India

<b>Summer Undergraduate Researcher</b> <i>Advisor: Dr. Howie Choset. Biorobotics Lab, Carnegie Mellon University</i>	May 2015 – Aug. 2015 Pittsburg, PA
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- Designed a compliant gripper based on pseudo-rigid body modelling technique for snake robots

## 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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- **Omeiy M. Manyar**, Santosh V. Narayan, Rohin Lengade, and S. K. Gupta. Physics-Informed Learning to Enable Robotic Screw-Driving Under Hole Pose Uncertainties. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Detroit, MI, USA, 2023. (Accepted for Publication)
- **Omeiy 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.
- **Omeiy 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>
- **Omeiy 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**
- **Omeiy 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, **Omeiy 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>
- **Omeiy 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, **Omeiy 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>

## Projects

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| <b>Multi-Robot Cell for Automation of Composite Layup</b>   Project Link  | Nov. 2020 – Sep. 2021 |
| <ul style="list-style-type: none"><li>• Developed a multi-robot cell accomplishing sheet grasping/manipulation, sheet transport, sheet heating and sheet draping task</li><li>• Developed vision-based defect detection system for contingency planning for robotic manipulation of sheet</li><li>• Work was done in collaboration with ARM Institute and Lockheed Martin</li></ul> |                       |
| <b>Human-Robot Teaming for Sheet Manipulation Task</b>   Video Link   | Jan. 2020 – Oct. 2020 |
| <ul style="list-style-type: none"><li>• Developed a hybrid cell demonstrating the use of robots as assistants in sheet manipulation tasks on an industrial application</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>  |                       |

## 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, 2022), ICRA (2024, 2023, 2022), IDETC-CIE (2022)